# REMEDIAL INVESTIGATION REPORT

**Site:**
Country Cleaners
410 West Main Street
Huntington, New York 11743
Site No. 152187

**Submitted to:**
New York State Department of Environmental Conservation (NYSDEC)
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Albany, New York 12233

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# 1 INTRODUCTION

AECOM Technical Services Northeast, Inc. (AECOM) has been issued Work Assignment # D004436-13 under the New York State Department of Environmental Conservation (NYSDEC) State Superfund Standby Contract for Investigation and Design Services (D00436). The scope of work is to conduct a remedial investigation and feasibility study at Country Cleaners, Huntington, New York, located in Suffolk County (NYSDEC registry number 152187). The site location is shown on Figure 1-1.

AECOM submitted a final dynamic work plan in May 2008 incorporating NYSDEC comments on the proposed scope of work. This plan formed the basis of the remedial investigation (membrane interface probe [MIP]), Hydropunch groundwater sampling, installation of permanent wells, and groundwater sampling). In 2008 and 2009, AECOM conducted the first phase of the field investigation consisting of the MIP investigation and Hydropunch groundwater sampling. In October 2009, NYSDEC approved budget to install and sample from the permanent wells. This budget did not include the cost of transportation and disposal because the exact quantity of the soil cuttings generated from monitoring well installation was not known. In December 2009, NYSDEC approved collection of additional groundwater samples and a limited number of subsurface soil samples to support evaluation of remedial alternatives. Installation of the permanent monitoring wells was completed in January 2010. Groundwater samples were collected in late January 2010 to early February 2010.

The scope of work is divided into six principal tasks:

- Task 1 – Work Plan Development
  - Task 1.1 - Draft RI/FS Work Plan Development
  - Task 1.2 - Final RI/FS Work Plan Development
- Task 2 – Remedial Investigation
  - Task 2.1 - Remedial Investigation Field Activities
  - Task 2.2 - Data Usability Summary Report
- Task 3 - Remedial Investigation Report
- Task 4 – Feasibility Study
  - Task 4.1 - Development and Screening of Alternatives
  - Task 4.2 - Treatability Investigation
  - Task 4.3 - Draft Feasibility Study Report
  - Task 4.4 - Final Feasibility Study Report
  - Task 4.5 - Public Participation
- Task 5 - Monthly Report
- Task 6 - Citizen Participation Plan

This Task 3 RI report presents the findings of the field investigations.

Task 4 Feasibility Study will be conducted after the RI is completed and submitted to NYSDEC.

### 1.1 Report Organization

This RI Report consists of ten sections with associated tables, figures and appendices. This introduction chapter (**Section 1.0 – Introduction**) presents the organization of the report, background information (such as the location and description of Country Cleaners, site history, and previous investigations), and the physical characteristics of surrounding area (land use, geology, and hydrogeology).

The remainder of the report is structured as follows:

- **Section 2.0 - Remedial Investigation**: summarizes the scope of work implemented during the field investigations and associated activities.
- **Section 3.0 – Laboratory Analytical Results**: presents the field and analytical results of the field investigations.
- **Section 4.0 – Analytical Data and Usability**: presents a data usability assessment of the laboratory analytical data.
- **Section 5.0 – Geology/Hydrogeology**: describes the regional and site geology and hydrogeology.
- **Section 6.0 – Contamination – Nature and Extent:** presents an analysis of the nature and extent of contamination at the Country Cleaners site.
- **Section 7.0 – Contaminant Fate and Transport:** presents an analysis of the contaminant fate and transport at the Country Cleaners site.
- **Section 8.0 – Qualitative Human Health Risk Assessment:** presents a qualitative human health risk assessment for the Country Cleaners site.
- **Section 9.0 – Conclusions and Recommendations:** presents conclusions and recommendations for the RI Report.
- **Section 10.0 – References**: presents a bibliography of documents referenced in the text of the report.

### 1.2 Site/Study Area Background Information

Dry cleaning operations have been conducted at the site since at least 1985 by Jim Dandy Cleaners and previous tenants including Country Cleaners and Pamper Cleaners. Jim Dandy

Cleaners currently leases the building at the site. According to the manager, Jim Dandy Cleaners does not currently use chlorinated solvents having ceased its dry cleaning operations at the site around 2007. The site was listed as Class 2 in 2003.

#### 1.2.1 Land Use

The site is located at 410 West Main Street in Huntington, NY at the southeast corner of the intersection of West Main Street and Hillside Avenue. The site contains a single occupancy building. The site is located in a mixed commercial and residential area in Huntington, New York. The site consists of a single story building with parking spaces in the front. Residences are located in the surrounding areas. There is a large residential complex (Nathan Hale condominiums) located north of the site. Commercial properties are located along West Main Street, including a Getty service station to the east of the site, a Rite Aid convenience store, and a medical doctor's office. St. Patrick's Roman Catholic Church and primary school are located east of the site.

#### 1.2.2 Prior Investigations Conducted at the Site

The disposal of tetrachloroethene (perchloroethylene, or PCE) at the site has led to the contamination of on-site soil and groundwater, and off-site groundwater above the applicable NYSDEC standards. Information was gathered from a site investigation conducted at the Getty station located adjacent to the site, sampling by Suffolk County Department of Health Services (SCDHS), and NYSDEC.

Lou Halperin Properties, Inc. contracted Berninger Environmental, Inc. (BEI) to perform a limited subsurface investigation at the Getty Service Station property. BEI installed monitoring wells MW-1 and MW-2 on October 28, 1996 and November 5, 1996, respectively. A strong PCE odor was noted during installation of MW-1. No groundwater samples were collected from MW-1 because the well was dry. (This well has always been dry and groundwater samples have not been collected from it. BEI expected to encounter groundwater at 20 to 30 ft bgs and installed the well to 50 ft bgs, but no water was encountered.) MW-2 was installed to a depth of 60 ft bgs, with water encountered at 52 ft bgs. PCE was detected at MW-2 at 2,170 µg/L and TCE at 398 µg/L. Methyl-tert-butyl ether (MTBE) (960 µg/L), benzene (6.5 µg/L), and toluene (31 µg/L) were also detected. Sample locations and results are shown on Figure 1-2. BEI attributed the presence of chlorinated solvents PCE and TCE to Country Cleaners.

Sampling at the Country Cleaners site was conducted by SCDHS starting in 1997. One source of contamination is located in a narrow yard at the south side of the property. PCE impacts were found in the soil beneath a condensate pipe at the southeast corner of the on-site building and in a nearby storm drain. In October 1997, soil samples were collected from the rear of the site. The PCE concentration in sludge collected in the area near the boiler blowdown was 12,000 mg/kg (3-WS-10-20). Sample locations are shown on Figure 1-2.

Subsequent to the October 1997 investigation, SCDHS conducted a second round of investigation at the site in March 1998. Sample locations are shown on Figure 1-3. Four soil samples (1-WS-3-24, 2-WS-3-24, 3-WS-3-24, and 4-WS-3-24) were collected on March 24, 1998 and one groundwater sample from monitoring well MW-2 was collected on January 14, 1998. The samples were analyzed for VOCs by USEPA Method 8260. 1-WS-3-24 and 3-WS-3-24 were collected from 9 inches below ground surface (bgs); 2-WS-3-24 and 4-WS-3-24 were surficial soil samples. PCE was detected at a concentration of 0.72 mg/kg, 9.3 mg/kg, 1.6 mg/kg, and 0.44 mg/kg in the soil samples collected from 1-WS-3-24, 2-WS-3-24, 3-WS-3-24, and 4-WS-3-24, respectively. PCE was detected at a concentration of 3,500 µg/L in the groundwater sample collected from MW-2, TCE at 65 µg/L, and cis-1,2 DCE at 450 µg/L; MTBE was also detected at 410 µg/L.

Impact Environmental (Impact) performed additional sampling of the Country Cleaners site for SCDHS in 2000. The investigation included four borings (SP-1, SP-2, SP-3, and UIW) from which soil headspace readings were obtained at multiple intervals. Headspace concentrations collected from three soil borings on the south side of the site ranged up to 2,000 ppm at 13-16 ft bgs. Impact collected two soil samples from these borings: from SP-2, 25-27 ft bgs interval, and SP-3, 4-6 ft bgs interval. Impact also installed one new monitoring well, MW-1, in the southern portion of the site and collected two groundwater samples (MW-1 [new on-site well] and MW-2 [existing Getty Service Station well, installed in 1996 by BEI]) in September 2000. The PCE concentrations in groundwater were 1,888 µg/L (MW-1) and 2,853 µg/L (MW-2); TCE and cis-1,2-DCE were also detected. Impact Environmental reported that PCE was detected at concentrations of 0.01 mg/kg (SP-2) and 0.031 mg/kg (SP-3) in the soil samples collected. Sample locations and results from the Impact investigation are shown on Figure 1-3.

Under the order and oversight of the SCDHS, the owner remediated the storm drain in December 2001. Approximately 1,000 gallons of oily water and 36 tons of contaminated soil/sediments were removed to a depth of 26 ft bgs. An unknown quantity of soil was also removed from the unpaved portions of the yard. Subsequent sampling confirmed that PCE contamination remains in a location near the southeast corner of the building. An old floor drain was also found in the floor of the boiler room during the course of the investigation. NYSDEC was unable to conduct a thorough evaluation of the floor drain and associated piping because the new boiler was located directly over the drain. NYSDEC believes that this floor drain represents a possible point of past discharges contributing to the contaminated groundwater originating from the site.

Indoor air sampling was conducted in August 2003 by the New York State Department of Health (NYSDOH) at two structures. The samples were collected using a passive organic vapor monitoring badge and analyzed for PCE. At the structure on Hillside Avenue, the PCE was identified as present at a concentration less than 5 µg/m$^3$ in the indoor air. At the structure on Scudder Avenue, the PCE was identified as present at a concentration less than 5 µg/m$^3$ on the first floor and at concentrations of 12 µg/m$^3$ and 13 µg/m$^3$ in the basement air.

### 1.3 Topography

The site property is located at 110 ft above mean sea level (amsl), sloping to the northeast toward Huntington Harbor. The surrounding area peaks to the west of the site at approximately 180 ft amsl.

### 1.4 Surface Water Hydrology

The site is located approximately 1.5 miles east of Cold Spring Harbor and approximately 1.3 miles southwest of Huntington Harbor. The site is not located in an area mapped as either a 100 year or 500 year flood zone (FEMA, 2010). Surface drainage from the site generally follows topography, flowing toward the municipal storm drains located on West Main Street. A sewage disposal facility is located adjacent to Huntington Harbor.

### 1.5 Groundwater Hydrology

Groundwater at the site was encountered at 57 ft bgs, and is interpreted to flow northeast towards Huntington Harbor. According to the potentiometric surfaces of the upper glacial aquifer, Magothy aquifer, and Lloyd aquifer prepared by the United States Geological Survey (USGS, 1995), groundwater flow in the Huntington, NY area is generally towards the north.

### 1.6 Local and Site Geology

Recent deposits (0 to 20 ft bgs) consist of sand, gravel, silt and clay, organic mud, peat, loam and shells. Colors are brown, yellow and gray. Upper Pleistocene deposits (0 to 300 ft bgs) consist of the following: till (clay, sand and boulders as ground moraine in the area north of the Harbor Hill terminal moraine), outwash deposits (brown well stratified sand and gravel), and ice contact deposits (crudely stratified sand and gravel and isolated masses of till). The colors are pale to yellowish brown. Below these formations, are the Magothy formation, the Raritan formation clay member (aquitard) and Lloyd sand member overlaying bedrock (USGS, 1964).

## 2 REMEDIAL INVESTIGATION

A remedial investigation was conducted to determine the sources of contamination within the site and its threat to human health or the environment. The scope and execution of the RI is discussed below. The work to date consisted of three main efforts:

- Membrane interface probe investigation (July 2008)
- Hydropunch – screening level investigation (September 2008 and February 2009; Triad/dynamic work plan approach)
- Groundwater monitoring well installation and sampling (December 2009 – February 2010)

### 2.1 Membrane Interface Probe (MIP) Investigation 2008

A MIP investigation was conducted in July 2008 as a screening effort to optimize the locations and extent of subsequent investigative phases (e.g., Hydropunch borings and monitoring well installation). Prior to conducting any intrusive site work for the MIP investigation, AECOM utilized the services of Enviroscan, Inc. for geophysical survey and utility clearance for the MIP boring locations. Enviroscan utilized a combination of ground penetrating radar (GPR) and electro-magnetic (EM) geophysical methods to locate buried utility lines and structures at the proposed boring locations. Borings were relocated to maintain a minimum of 3-ft clearance from the utilities. The final locations of these boring were marked out with spray paints. A photo log of the field investigation is included in Appendix A. Figure 2-1 shows the sampling locations for the MIP borings. The driller contacted DIGSAFE prior to the field effort.

AECOM, Zebra, and NYSDEC personnel mobilized to the site on July 8, 2008. A total of 41 MIP soil probes were installed between July 8, 2008 and July 17, 2008 to depths ranging from approximately 60 ft bgs to 130 ft bgs, varying the depth of the probe to track the plume. The MIP was advanced to collect remote sensing data indicating the possible presence of chlorinated solvents in the soils or groundwater based on the response of the electron capture detector (ECD). The boring was continued until either the response returned to baseline conditions or to refusal of the probe. A summary log and graphs of individual probe point data are included in the summary report provided by Zebra (Appendix B).

The first phase of MIP investigation delineated the horizontal and vertical extent of chlorinated VOC impacts. MIP locations in the vicinity of the site (MIP-1 through MIP-4) were advanced at the start of the investigation. AECOM advanced subsequent borings in a direction perpendicular to the assumed groundwater flow direction (north or northeast) in order to determine the plume width and the vertical extent of groundwater contamination. After the plume width and trend was determined by several transects, AECOM advanced borings in the downgradient direction to determine the extent of off-site groundwater impacts.

An ECD strip log showing the MIP results is provided on Figure 2-2. Elevated MIP readings were found at MIP-4 on the site downgradient from the building; and MIP-31 and MIP-2 on the Getty Service Station. Lower responses were found at MW-1 on the site behind the building and at the upgradient location MW-28. The plume appears to be moving to the north and northeast where MIP responses were found in MIP-36 and MIP-39. Near the site, the plume is located in the interval roughly between 50 ft amsl and 30 ft amsl.

## 2.2 Direct Push Soil Sampling and Hydropunch Groundwater Sampling September 2008 and February 2009

Upon completion of the MIP investigation, AECOM initiated an interval-specific confirmatory grab sampling program for soil and groundwater. The MIP responses were reviewed to select boring locations and the vertical location of groundwater and soil samples to collect during direct push sampling in September 2008. Zebra mobilized to the site on September 3, 2008 to conduct the direct push drilling, Hydropunch groundwater collection, and soil sampling. The driller reoccupied selected MIP boring locations. Direct push borings were advanced at nine locations shown on Figure 2-3 for groundwater sampling (HP-series samples). Soil samples (SS-series) were also collected from nine direct push boring locations as shown on Figure 2-4; eight of the soil sample borings were at HP groundwater sample locations. Boring logs are provided in Appendix C.

Table 2-1 summarizes the soil and groundwater sampling intervals and the MIP ECD responses at these intervals. Most soil samples were collected from intervals showing elevated ECD responses in the MIP results indicating the potential for VOC contamination. Soil samples were collected at MIP-28 at intervals with low ECD levels (11-12 ft bgs and 23-24 ft bgs) to confirm there is no soil contamination at this background location. A soil sample was collected at MIP-12 at an interval with low ECD levels because the adjacent location (MW-05) showed an elevated ECD response at this interval (47-50 ft bgs). Soil samples were collected from 19 intervals. Two soil field duplicates were collected.

Most groundwater samples were collected at intervals with low ECD responses or no MIP measurements to locate the vertical extent of VOC groundwater contamination. Groundwater samples were collected from 26 intervals. Three groundwater field duplicates were collected.

Sampling was conducted from September 3 through September 19, 2008. Due to access issues, boring locations at the Nathan Hill residences, MIP-16 and MIP-39, were not completed until February 9, 2009, when access issues were resolved with the owner.

The Hydropunch device was advanced to the targeted depth and retracted to expose the stainless steel screened interval. Groundwater was purged from the Hydropunch device with the goal of obtaining clear water prior to sampling. Groundwater samples from the Hydropunch locations were collected using a pump fitted with Teflon-lined poly tubing.

Groundwater samples were collected in pre-preserved (HCl) bottles provided by the laboratory, cooled to 4ºC after collection, and shipped to Chemtech, a NYSDOH Environmental Laboratory Approval Program (ELAP #11376) laboratory in Mountainside, New Jersey for VOC analysis (EPA Method SW846 8260).

The soil samples were collected from macrocores in unpreserved jars provided by the laboratory. The samples were kept cooled at 4ºC and sent to AECOM's subcontract laboratory (Chemtech; Mountainside, NJ). Samples were analyzed for VOCs (EPA Method SW846 8260).

NAIK Consulting Group, P.C. conducted a land survey of the MIP locations. The coordinates are provided in Appendix D.

## 2.3 Well Installation and Groundwater Sampling

### 2.3.1 Rationale for Monitoring Well Locations

Six monitoring well locations were installed by AECOM as shown on Figure 2-5. Monitoring well screened intervals are summarized on Table 2-1. Screened intervals for the deeper wells were selected at intervals with low MIP ECD responses or groundwater contaminant concentrations less than the NYS Class GA groundwater criteria to identify (bound) the vertical extent of the groundwater contamination. To characterize the plume, shallow wells were screened in intervals with elevated ECD responses or where groundwater (Hydropunch) sample results exceeded the NYS Class GA groundwater criteria.

- MW-1S and MW-1D are located upgradient of the site. The screened intervals of both these wells are at depths greater than the deepest extent of the MIP measurements.
- MW-2S/D, MW-3 S/D, and MW-4S/D are located on the site and adjacent Getty Service Station property where the highest groundwater PCE concentrations have been detected. Where possible, the shallow well screen interval is located within the plume and the deeper screened interval is located below the extent of the plume where possible. The

screened interval for MW-3D was originally planned for 115-125 ft bgs, but was changed in the field to 84-94 ft bgs due to the presence of clay. A split spoon sample collected at MW-3D from 95-97 ft bgs showed light brown clay with sand lenses. The well was screened above this layer.

- MW-5S/D, MW-7S/D, and MW-8S/D are located downgradient of the site. Clay was identified at depth. The screening interval was adjusted to be above the clay layer based on split spoon results at MW-5D and MW-7D. The screen at MW-8D straddles the top of the clay layer.
- MW-6S is located northwest of the site to bound the extent of the groundwater plume.

### 2.3.2 Monitoring Well Installation

AECOM and the drilling subcontractor (Aztech Technologies, Inc. [Aztech]) installed 14 permanent monitoring wells between December 2, 2009 and January 8, 2010 at the direction of NYSDEC. Advanced Geophysical Survey, Inc. (AGS) conducted a geophysical survey and utility clearance at each boring location on December 2, 2009. A letter report for the survey was prepared by AGS and is provided in Appendix E. The driller contacted DIGSAFE prior to the field effort. The borings were advanced using 4.25-inch hollow stem augers (HSAs). The HSAs were advanced to the target depth for well installation. Split spoon samples were collected at deeper well locations to confirm that the well is screened in a water-bearing zone. Monitoring wells were single-cased. The monitoring wells were constructed of 2-inch schedule 80 PVC pipe for deep wells and schedule 40 PVC pipe for the shallow wells. The well screens are 10 ft long with a 0.010 slot size. The filter pack material (Morie 00 sand) was placed a minimum of 2 ft above the top of the screen using a tremie pipe. A bentonite seal (bentonite chips) was placed in the annular space to a minimum depth of 2 ft above the sand pack. The remainder of the borehole was grouted using cement-bentonite grout. A flush-mounted protective casing was installed and the wellhead for each riser was labeled distinctly and fitted with a sealing cap. Soil cuttings were collected in 55-gallon drums. Boring logs and monitoring well construction forms are provided in Appendix C.

After the grout was allowed to set for at least eight hours, each new monitoring well was developed to achieve a hydraulic connection between the formation and the well screen. The wells were developed using a surge and pump method. A Waterra pump with poly tubing was used for development at each well. Groundwater quality measurements were collected at approximately 10-minute intervals. Monitoring well development logs are provided in Appendix C. Purge water from wells MW-2S/D, MW-3S/D and MW-4S/D was collected in 55-gallon drums. All other purge water was disposed to the ground or a nearby storm drain.

The depth and elevation of the wells, screens, and a round of groundwater elevation readings collected on May 27, 2010 are summarized on Table 2-2. NY Land Surveyor PLLC conducted a land survey of the permanent monitoring wells in March 2010. The coordinates are provided in Appendix D.

### 2.3.3 Soil Sampling

Soil samples were collected at two locations during well installation to confirm the soil classifications observed in the field and to have site-specific total organic carbon (TOC) measurements. Soil was collected from split spoons at MW-2D from 54-56 ft bgs and MW-4S from 60-62 ft bgs. The samples were transferred to unpreserved jars provided by the laboratory (Hampton Clark-Veritech [HCV]; Fairfield, NJ) for particle size analysis by ASTM method D422 and TOC by SW846 method 9060. The particle size analysis was subcontracted by HCV to TerraSense, LLC.

### 2.3.4 Groundwater Sampling

Groundwater sampling activities were conducted from January 29, 2010 to February 1, 2010 by AECOM. Samples were collected from the 14 installed monitoring wells and the existing well MW-2 at the Getty Service Center. Groundwater samples were collected using the low-flow sampling method. Water quality parameters (pH, dissolved oxygen [DO], specific conductivity, temperature, and turbidity) were measured using a flow-through cell. A water level indicator was used to measure depth to water during sampling. The wells were purged at a rate of approximately 300 mL/min. A QED MP10 controller was used with the QED Sample Pro bladder pump. Water samples were collected after stabilization of the water quality parameters. Purging was considered complete when the indicator parameters stabilized over three consecutive readings. Stabilization parameters are:

- pH: ± 0.1
- Conductivity: ± 3%
- DO: ± 10 mV
- ORP: ±10% and
- Turbidity: less than 50 NTU.

During sample collection, the flow through cell was disconnected and the sample tubing discharge was transferred directly into the laboratory-supplied sample containers. Both field-filtered (dissolved) and unfiltered (whole water) samples were collected for manganese and iron analysis. Dissolved phase samples were field filtered. The non-dedicated sampling equipment was decontaminated prior to collecting each sample. Groundwater sampling logs are provided in Appendix C.

### 2.2.5 Analysis of Groundwater Samples

Water samples were collected in pre-preserved bottles provided by the laboratory, cooled to 4ºC after collection, and shipped to the subcontract laboratory (HCV; Fairfield, NJ; NYSDOH ELAP certification 11939 and 11408) for analysis. Groundwater samples from the monitoring wells were analyzed for VOCs (EPA SW846 Method 8260). Groundwater samples from MW-3S, MW-2, and MW-8S were collected for the following additional analyses: manganese and iron (whole water and field filtered; EPA Method 200.7), biochemical oxygen demand (BOD; Standard Methods [SM] 5210B), chemical oxygen demand (COD; SM 8000), alkalinity (SM 2320B), ammonia (SM 4500NH3B), nitrate, chloride, and sulfate (EPA 300.0), phosphorous (SM 4500-P), sulfide (SM 4500-S), total organic carbon (SM 5310B), and methane, ethane, and ethene (PM01C/AM20GAx). Analysis for methane, ethane, and ethane was subcontracted by HCV to Microseeps.

## 2.4 Decontamination

Augers were decontaminated with a hot water pressure washer between probe holes. All poly tubing and acetate liners were discarded after use. All groundwater sampling equipment were decontaminated with a laboratory grade detergent (e.g., Alconox) between monitoring wells. Decontamination water was disposed on site. Wash buckets and potable water were available on site for personnel decontamination.

## 2.5 Investigation-Derived Waste (IDW) Disposal

Investigation derived wastes (IDW) generated from the MIP study, and direct push soil and Hydropunch groundwater sampling were temporarily stored at the site in 55-gallon drums. The Environmental Quality Company labeled and transferred the drums to a disposal facility as nonhazardous waste on December 10, 2008. The waste manifests are provided in Appendix C.

Investigation derived wastes generated from installation and development of the permanent monitoring wells were temporarily stored behind St. Patrick's Roman Catholic Church in 55 gallon drums. AECOM collected composite samples from the drums on January 8, 2010. Purge water samples were collected for VOCs (EPA Method 624) and metals (EPA Methods 200.7/245.1) analysis. Soil cutting samples were collected for VOC (8260B), toxicity characteristic leaching procedure (TCLP) VOC (8260B), and TCLP metals (6010B/7470A). The data are provided in Appendix F. Clean Venture/CycleChem, Inc. labeled and transferred the drums to a disposal facility as nonhazardous waste on February 9, 2010. The waste manifests are provided in Appendix C.

## 2.6 Probe Hole Closure

All probe holes were backfilled with bentonite, indigenous soil, and/or clean sand.

## 2.7 Freedom of Information Law Requests

AECOM submitted Freedom of Information Law requests for the Country Cleaners site to the United States Environmental Protection Agency (USEPA), NYSDOH, NYSDEC, and SCDHS. USEPA provided a notification of hazardous waste activity for Pamper Cleaner dated April 4, 1985 for F002 wastes (spent halogenated solvents). A notification of regulated waste activity from Country Cleaners dated November 10, 1998 was provided which lists the following hazardous waste codes for the site: F002 (spent halogenated solvents), D007 (chromium), D008 (lead), D039 (PCE), and D040 (TCE). D007 waste is associated with the use of solvents that are intermittently corrosive and may cause leaching of metals from the dry cleaning machine. A regulated waste activity form from Country Cleaners dated November 2, 1998 lists the following hazardous waste codes for the site: F001 and F002 (spent halogenated solvents), and F003, F004, and F005 (spent non-halogenated solvents). Country Cleaners was listed in the Envirofacts Warehouse on November 2, 2007 as a hazardous waste handler with reported air releases. The facility was listed as a small generator having potential uncontrolled emissions of less than 100 tons per year and in violation with regard to both emissions and procedural compliance.

# 3 LABORATORY ANALYTICAL RESULTS

This section summarizes the laboratory analytical results and provides a comparison to the applicable NYS environmental criteria or guideline values.

## 3.1 Hydropunch Groundwater Sample Data 2008

Groundwater samples were collected in 2008 from nine direct push borings using a Hydropunch sampler for VOCs analysis utilizing USEPA SW-846 Method 8260. The groundwater data are compared to the NYS Class GA groundwater criteria and presented in Table 3-1. Sample locations and analytical results for compounds with one or more exceedances of the NYS Class GA groundwater criteria are summarized in Figure 3-1. Only PCE and incomplete dechlorination compounds - TCE, and cis-1,2-dichloroethene (DCE) – were detected at concentrations exceeding the NYS Class GA groundwater criteria. PCE concentrations exceeded the NYS Class GA groundwater criterion of 5 µg/L at the HP-04 on the site, HP-02 and HP-33 at the Getty Service Station, and HP-05 located downgradient on the parking lot at St. Patrick’s Roman Catholic Church:

- HP-04 - 1,200 µg/L (52-65 ft bgs)
- HP-02 - 1,300 µg/L (54-57 ft bgs) and 11 µg/L (72-75 ft bgs)
- HP-33 - 270 µg/L (52-55 ft bgs), 34 µg/L (72-75 ft bgs), 92 µg/L (87-90 ft bgs), and 14 µg/L (100-103 ft bgs),
- HP-05 – 16 µg/L (47-50 ft bgs)

There are no exceedances of the NYS Class GA groundwater criteria in the remaining borings.

## 3.2 Soil Sampling 2008

Soil samples (plus two field duplicates) were collected from nine boring locations. The samples were submitted for laboratory analysis of VOCs. The soil analytical results are compared to the NYS Part 375 Residential Soil Cleanup Objective (SCO) (6 NYCRR Part 375-6.8(b)) and presented in Table 3-2. VOC detections are summarized in Figure 3-2. No concentrations exceed the NYSDEC Residential SCO. There are low level detections of PCE ranging from 0.26 µg/L to 2.5 µg/L at samples collected from borings in the vicinity of the dry cleaner (SS-02, SS-33, SS-28, and SS-41).

## 3.3 Groundwater Sampling 2010

Groundwater samples were collected in January and February 2010 from 15 permanent wells and analyzed for VOCs. Samples from three wells (MW-3S, MW-2S, and MW-8S) were analyzed for additional parameters to support evaluation of remedial alternatives. The groundwater data are compared to the NYS Class GA groundwater criteria and presented in Table 3-3 for VOCs and Table 3-4 for other parameters. The analytical results for PCE and dechlorination compounds are summarized in Figure 3-3. Concentrations in the groundwater samples exceeded the NYS Class GA groundwater criteria for PCE, TCE and cis-1,2-DCE.

- PCE concentrations exceeded the NYS Class GA groundwater criterion at the three shallow wells located in the immediate vicinity of the dry cleaner: MW-4S (680 µg/L), MW-2 (630 µg/L) and MW-3 (560 µg/L [530 µg/L for the sample duplicate]); and at the shallow downgradient wells MW-7S (42 µg/L) and MW-8S (21 µg/L). PCE was detected below the NYS Class GA groundwater criterion at MW-5S (1.1 µg/L). There were no PCE detections in the deeper wells.

- TCE concentrations exceeded the NYS Class GA groundwater criterion of 5 µg/L at one shallow well located in the vicinity of the dry cleaner: MW-2 (8 µg/L). There were no other detections of TCE.

- DCE concentrations exceeded the NYS Class GA groundwater criterion of 5 µg /L at one shallow well located in the immediate vicinity of the dry cleaner: MW-4S (9.3 µg/L). There were no other detections of DCE.

Two other compounds were detected but at concentrations below the NYS Class GA groundwater criteria: MTBE at MW-1D (0.51 µg/L) and MW-4D (0.58 µg/L) and chloroform at MW-7S (3.3 µg/L).

Analytical results for the additional parameters are provided in Table 3-4. Iron exceeded the NYS Class GA groundwater criterion of 300 µg/L in the whole water (unfiltered) samples from MW-2S, MW-3S, and MW-8S, but was not detected in the filtered water samples. The iron concentrations are within the range of iron concentrations in Pleistocene deposits, 0 µg/L to 1,500 µg/L (USGS, 1964). There are no other exceedances of the NYS Class GA groundwater criteria for the additional parameters.

## 3.4 Soil Sampling During Well Installation

Two soil samples were collected during well installation to provide confirmation of the soil characterization and TOC content in the vicinity of the groundwater plume. The data are provided in Table 3-5. The soil was characterized as poorly graded sand with silt at MW-2D 54-56 ft bgs; TOC was not detected in this sample. The soil was characterized as poorly graded sand with silt and gravel at MW-4D 60-62 ft bgs with a TOC concentration of 2,000 mg/kg.

# 4 ANALYTICAL DATA AND USABILITY

The Hydropunch data collected in 2008 were used as a screening tool to determine the appropriate screened interval for permanent monitoring well installation. Therefore, these data were not validated. Data from the two soil samples collected in 2009 for TOC and particle size analysis were not validated.

Data were generated and validated for the groundwater sampling event in 2010. The laboratory data packages and the data usability summary reports (DUSRs) are provided in Appendix F on CD. The groundwater data generated for this RI were validated by an independent subcontractor, Environmental Data Services, Inc. (EDS) of Williamsburg, VA. The tabulated data used in this report include any qualifiers applied during validation. A summary of the data quality review is provided below.

Groundwater data from samples collected in January and February of 2010 were reported by HCV in one sample delivery group (SDG), AC49672. One DUSR was prepared for this SDG. A total of 19 analyses were validated, including one trip blank, one MS/MSD pair, one field duplicate, and 15 environmental samples.

Data for two compounds (t-butyl alcohol and 1,4-dioxane) were rejected in all samples due to low continuing calibration relative response factors. However, neither of these compounds is expected to be present at the site, and the loss of data for these two compounds does not adversely affect the overall usability of the project data.

Data for several compounds were qualified as estimated in all samples due to high continuing calibration percent difference values.

One field duplicate pair was analyzed; the precision (expressed as relative percent difference [RPD] was very good, with an RPD of 6 percent for the one analyte detected in the sample and duplicate.

With the qualifiers and concerns noted above, the analytical data were generally acceptable and appropriate for their intended use.

# 5 GEOLOGY/HYDROGEOLOGY

## 5.1 Regional Geology

The Long Island aquifer system lies within the Atlantic Coast Plain physiographic province, and is bounded on the north by the Long Island Sound and on the east and south by the Atlantic Ocean and on the west by New York Bay and the East River. The geologic formations of Long Island are composed of unconsolidated glacial deposits of Pleistocene age, and coastal plain deposits of continental and marine origin of Cretaceous age. The unconsolidated deposits consist of gravel, sand, silt, and clay underlain by bedrock of Lower Paleozoic and/or Precambrian age, which forms the base of the groundwater reservoir. The distribution of soil types in the Huntington area are shown on Figure 5-1 from USGS (1964). Ronkonkoma terminal moraine (crudely stratified sand, gravel, and boulders; some till) forms an irregular ridge which runs to the west across Huntington. The west and Half Hollow Hills extend south through central and southern Huntington. Harbor Hill end moraine is present in the southern portion of Huntington.

A geologic section through Huntington is shown on Figure 5-2 from USGS (1964). The crystalline bedrock, generally consisting of schist and gneiss, indicates a gentle southeasterly dipping weathered surface. Above the bedrock are sediments from the Raritan formation, Magothy formation, and Upper Pleistocene deposits. The Raritan formation consists of two units: the Lloyd sand member and the overlying Raritan clay member, which is a confining unit. The Lloyd sand member is of continental origin, having been deposited in a large fresh water lake. The material consists of fine to coarse-grained sands, gravel, and inter-bedded clay and silty sand. The Raritan clay member is also of continental origin and consists of clay, silty clay, clayey silt and fine silty, sand. This member acts as a confining layer over the Lloyd sand member. The Magothy formation and Pleistocene sedimentary deposits are similar to the underlying sediments and are composed of sand, gravel, and clay deposits.

Bedrock is composed primarily of granite, diorite, gneiss, and schist. In the Huntington-Smithtown area, the bedrock surface ranges from -400 ft amsl to -1,300 ft amsl. A weathered zone overlies fresh rock, varying in thickness from 5 to 100 ft. The bedrock has a low permeability and is not a source of groundwater.

The Raritan formation has been identified in well logs throughout the Huntington-Smithtown area. The upper surface of the formation slopes to the southeast. The Lloyd sand member rests directly on the bedrock layer. The surface of the Lloyd sand member ranges from -200 ft amsl to -850 ft amsl in this area. Additionally, the thickness of the Lloyd sand member ranges from approximately 200 ft to 300 ft in this area. The Lloyd sand member consists of lenses of fine to coarse sand and gravel with clay and silt in thin layers or as intergranular fillings. The Lloyd formation is a source of water to the region.

The clay member of the Raritan formation overlies the Lloyd sand member. It is composed of clay and silt with interbedded layers of sand in some places. The clay member averages approximately 170 ft in thickness. This formation acts as an aquiclude, slowing interchange of water with the overlying formation.

The Magothy formation overlies the Raritan clay formation. The formation is found from 0 ft amsl to -700 ft amsl. This formation may be missing in some portions of the Huntington-Smithtown area. It is composed generally of fine to medium quartz sand. The soils are generally clayey and interbedded with layers of clay and silt. Gravelly layers are present in some places and the formation is generally coarser at depth. In the area of Huntington, the Magothy formation is approximately 400 ft thick and acts as a source of groundwater to the area.

Pleistocene deposits are present throughout most of the Huntington-Smithtown area. The average thickness of the deposits is 200 ft, ranging up to 650 ft. The Pleistocene deposits consist of stratified sand and gravel with thick layers of silt and clay. Thick discontinuous clay bodies of Pleistocene age are present in the Huntington-Smithtown area. The Pleistocene deposits are a source of groundwater to the area, but the clay layers act to confine the flow of groundwater in water-bearing zones.

Streams in the Huntington-Smithtown area include the Nissequogue River, Mill Creek, Stony Hollow Run, Sunken Meadow Creek, and Cold Spring Brook. Streams discharge to Long Island Sound.

## 5.2 Site Geology

Soil borings were advanced in the vicinity of the Country Cleaners site. Soil was generally classified as fine to medium sand with varying amounts of silt and gravel. A thick clay layer at an elevation of approximately 5 ft amsl was encountered throughout the site during installation of the deep wells. These soils are consistent with the Pleistocene deposits.

## 5.3 Regional Hydrogeology

Long Island groundwater is present in three major aquifers: the Upper Glacial aquifer (shallow), the Magothy aquifer (intermediate), and the Lloyd Aquifer (deep). The uppermost hydrogeologic unit consists of Pleistocene saturated coarse sand and gravel and finer grained sand and gravel beds in the upper part of the Magothy formation. The lower limit of the shallow aquifer is identified by discontinuous clay bodies. The intermediate aquifer includes the Magothy formation to the top of the clay member of the Raritan formation. The deep aquifer is located within the sand member of the Raritan formation.

Predominant regional groundwater flow is to the north towards Long Island Sound and south towards the Atlantic Ocean, away from the water table divide which runs along the center of Long Island. Figure 5-3 shows groundwater contours in the Huntington area prepared by USGS (1964). Groundwater flow is generally toward the north. At the Country Cleaners site, the flow is toward the north with an easterly component. Vertical groundwater movement is restricted by discontinuous silt and clay lenses, and confining units. There is downward movement of groundwater from the shallow aquifer to the intermediate aquifer. Connection between the intermediate aquifer and the deep aquifer is limited by the clay member of the Raritan formation.

Groundwater in the shallow aquifer on Long Island is generally under unconfined conditions. Artesian conditions exist in some other parts of the groundwater reservoir of Long Island, where the saturated deposits are overlain and confined by silty and clayey layers of low hydraulic conductivity, such as the Magothy and Lloyd Aquifers. The hydraulic head in the confined aquifers varies from several feet below the water table to about 20 ft above it. At places along the north and south shores, the head in the Lloyd Aquifer is high enough to result in flowing artesian conditions.

Groundwater from the Cretaceous and Pleistocene unconsolidated deposits in the Huntington-Smithtown area is derived from precipitation. A portion of the precipitation entering the ground circulates in the shallow part of the aquifer. The remainder of the precipitation recharges the intermediate and deep aquifer at depths up to several hundred feet below mean sea level.

Perched water tables have been observed in the area. The perched water overlies impermeable glacial till or clay. These areas are small and not a dependable source of water.

Figure 5-4 shows the location of known Suffolk County Water Authority (SCWA) production wells located in the Huntington area (NYSDEC, 2007). Domestic, industrial, and irrigation well locations were identified in USGS (1964), but it is not know whether these wells are still in operation. Three of the public well locations identified in the 1964 USGS study are still in use: S-57354, S-68385, and S-26681. The nearest SCWA well (S-26681) in the direction of groundwater flow, which is to the northeast, is approximately 4,700 ft from the site.

## 5.4 Site Hydrogeology

Groundwater level measurements were recorded on May 27, 2010 from the monitoring wells installed in December 2009 through January 2010 and the existing well MW-2; groundwater was encountered at about 52 ft amsl. Monitoring well locations are shown on Figure 2-5. Both the deep and shallow wells are located in the shallow aquifer. Perched groundwater was identified in wells MW-3S/D, MW-4S/D, and MW-1S/D. A clay barrier may be present at approximately 30 ft amsl. The presence of clay at these elevations was not observed during the MIP study drilling, direct push investigations soil and Hydropunch groundwater sampling, or during groundwater monitoring well installation conducted between 2008 and 2010. This clay layer may act as an aquiclude limiting vertical movement of the groundwater from the zone where the shallow wells are screened.

Groundwater elevations for the shallow wells are shown on Figure 5-5. Groundwater elevations for the deep wells are shown on Figure 5-6. For both the shallow and deep wells the groundwater flow is towards the north or northeast. Groundwater flow patterns are consistent with those reported previously (USGS, 1964) and shown on Figure 5-3.

# 6 CONTAMINATION – NATURE AND EXTENT

## 6.1 Nature of Contamination

Historical data collected at the site since 1996 have identified chlorinated VOCs as the contaminants in groundwater at the Country Cleaners site and immediate vicinity. Data collected during this RI are consistent with previous data with regard to the nature of contamination found. As shown on Tables 3-1 and 3-3, the VOCs detected at concentrations exceeding the NYS Class GA groundwater criteria are the chlorinated aliphatics PCE, TCE, and DCE. Since dry cleaners typically use PCE based solvents, PCE is considered a source contaminant. TCE and DCE are detected infrequently and are considered “daughter” compounds resulting from the degradation or dechlorination of PCE. In 2010, PCE was detected in six of the eight shallow wells (five of which exceeded the NYS Class GA groundwater criterion) at concentrations ranging from 1.1 µg/L to 680 µg/L (see Table 3-3). TCE was detected in one well at 8 µg/L (MW-2S), and DCE was detected in one well at 9.3 µg/L (MW-4S). No other VOCs were detected at concentrations exceeding the NYS Class GA groundwater criteria. The data from the 2010 groundwater sampling event and the 2008 Hydropunch sampling event are also consistent with data from previous investigations (see Section 1.2.2).

Iron concentrations (Table 3-4) exceeded the NYS Class GA groundwater criteria in unfiltered samples from the three shallow wells chosen for additional analyses to support remedial alternative evaluation. Iron is not considered a site related compound and is not evaluate further as a contaminant.

## 6.2 Extent of Contamination (Contaminant Distribution)

This section discusses the distribution of contamination on all properties from which samples were collected and data are available. For this RI, the wells (and groundwater data) have been assigned to one of two depth intervals. It should be noted that the well depth suffix (S and D) reflects a relative depth of a well within a well pair. Well MW-2 is a shallow well installed by BEI in 1996 for the owners of the Getty Service Station property.

- Shallow. The top of screen elevation for shallow wells ranges from 40.7 ft amsl to 54.9 ft amsl. These wells were screened at the depth of higher MIP ECD responses.
- Deep. The top of screen elevation for deep wells ranges from 10.8 ft amsl to 28.7 ft amsl. These wells were screened at the depth below the MIP ECD response in a water bearing zone (above or straddling the clay layer).

While the major discussion of contaminant migration (transport) is in the following sections of this report, the discussion of contaminant distribution in this chapter does assume that groundwater flow is generally to the north or northeast.

A contaminant distribution map was developed for PCE in the shallow wells (Figure 6-1). The PCE concentration contours were developed using ESRI Spatial Analyst interpolation by inverse distance weighting and are presented essentially as the output from the program. The 5 µg/L limit is shown on Figure 6-1, representing the horizontal extent of the groundwater plume exceeding the NYS Class GA groundwater criterion for PCE. The extent of the line is extrapolated beyond the extent of the shallow wells. The highest concentrations of PCE (up to 680 µg/L) are centered at the Country Cleaners site and downgradient at the Getty Service Center property. The concentrations decrease moving downgradient towards the Nathan Hale condominiums where PCE was detected at 21 µg/L and 42 µg/L. It is assumed that the plume extends toward the north, decreasing in concentration below the NYS Class GA groundwater criterion of 5 µg/L prior to encountering a Suffolk County Water Authority production well (Figure 5-4). There are no detections of PCE in the deep wells, indicating that the maximum depth of contamination has been adequately bounded.

There are single detections of TCE (8 µg/L) and DCE (9.3 µg/L) in shallow wells where the highest PCE concentrations were detected (MW-2S and MW-4S). There were no detections of TCE and DCE in the deep wells.

### 6.3 Volume of PCE Contaminated Groundwater

The volume between the groundwater surface and the depth of PCE contamination was estimated. The horizontal extent is limited to the 5 µg/L contour shown on Figure 6-1. The thickness of the groundwater plume at shallow wells with concentrations below the NYS Class GA groundwater criterion of 5 µg/L was set at 0 ft. For shallow wells with PCE concentrations above 5 µg/L, the depth of groundwater with PCE exceeding 5 µg/L was estimated by linear interpolation between the bottom of the shallow well screen and top of the deep well screen. The thickness of the PCE-contaminated groundwater was interpolated by inverse distance weighting using Spatial Analyst. This volume was multiplied by the effective porosity to estimate the volume of impacted groundwater. A default effective porosity value of 0.33 was selected from Argonne National Laboratory (1993) assuming the soil is composed primarily of fine sand. This estimate of the effective porosity is conservatively high since there are deposits of silt and clay within the shallow aquifer which would lower the effective porosity. The estimated volume of contaminated groundwater is 9.1 million gallons.

### 6.4 Uncertainties in Nature and Extent of Contaminant Distribution

The identity of the contaminants is well-established, with data collected from the permanent monitoring wells generally confirming findings from the MIP investigation and Hydropunch sampling in terms of compounds detected (PCE, TCE and DCE), and the spatial distribution of the contamination.

The vertical extent of contamination is bounded, since PCE was not detected in any of the deep wells. The precise depth at which the PCE concentration falls below the NYS Class GA groundwater criterion is not known.

The horizontal (areal) extent of contamination is not fully defined to the north and north east where shallow wells on the Nathan Hill condominium property have concentrations exceeding the NYS Class GW groundwater criterion of 5 µg/L for PCE.

The estimated volume of PCE contaminated groundwater is likely to be conservatively high, because the shallow groundwater may be partially contained by a clay lens located above the interpolated depth of contamination.

## 7 Contaminant Fate and Transport

Fate and transport properties are important for understanding the behavior of the chemicals of concern at the site. As discussed in Chapter 3, the most significant contaminant at the site (i.e., detected at the greatest frequency, the highest concentrations, and often exceeding groundwater criteria) is PCE. Degradation products (TCE and cis-1,2-DCE) are detected infrequently. This section focuses on the subsurface fate and the mobility of PCE. An understanding of the fate and transport of PCE is necessary to evaluate future potential exposure risks and to evaluate remedial technologies at the FS stage. Physical properties of PCE are summarized on Table 7-1.

### 7.1 Potential Routes of Contaminant Transport

Contaminant transport pathways provide the mechanisms for contamination to travel from its area of deposition and to potentially leave the site. Potential contaminant transport pathways include:

- Groundwater flow off site
- Vertical infiltration of free phase chemicals into the unconfined and/or semi-confined aquifer(s)
- Discharge of contaminated groundwater to downgradient surface water bodies
- Rainwater flow through contaminated soils with subsequent flushing and dissolution into the deeper vadose zone and aquifer matrix

Of these potential mechanisms, groundwater flow, and movement of contaminants with groundwater, is the most significant route of migration for chlorinated contaminants.

Vertical infiltration of free-phase chemicals (non-aqueous phase) is not relevant as no non-aqueous phase liquid (NAPL) has been observed at the site, and observed contaminant concentrations do not suggest the potential presence of NAPL.

Discharge of groundwater to downgradient surface water bodies is not relevant in the vicinity of the site.

Rainwater flow through contaminated soils (contaminant leaching) may have been a transport mechanism of historical significance. However, most of the site is paved, and contamination in the deep groundwater is related to migration and dispersion of contaminants in the dissolved phase.

## 7.2 Groundwater Flow

Groundwater surface elevation data collected in May 2010 and contours are presented in Figure 5-5 for shallow wells and Figure 5-6 for deep wells, and summarized on Table 2-2. As illustrated in these figures, the groundwater flow direction in the shallow wells and the deep wells is towards the north or northeast. These results confirm the presumed groundwater flow direction and are generally consistent with the literature (e.g., USGS, 1964).

The following modified Darcy equation provides an estimate of the local groundwater seepage velocity, using the hydraulic gradient information with the average hydraulic conductivity:

$$\mathbf{V_s = KI/n_e}$$

Where:

$V_s$ -- groundwater seepage velocity (ft/day),
K-- hydraulic conductivity (ft /day),
i -- hydraulic gradient (ft/ft), and
$n_e$ -- effective porosity.

Groundwater flow estimated by USGS (1964) for the Pleistocene deposits in the Huntington-Smithtown area using the above equation ranged from 0.8 ft/day to 1.1 ft/day.

## 7.3 Contaminant Transport

The process by which a solute (dissolved phase contaminant) is transported by the bulk movement of groundwater flow is referred to as advection (Driscoll, 1986). The average linear velocity of groundwater through a porous aquifer is determined by the hydraulic conductivity, effective porosity of the aquifer formation, and hydraulic gradient (Freeze and Cherry, 1979). The velocity of a contaminant in the groundwater can be decreased if there is precipitation/dissolution or partitioning of the contaminant into other media (e.g., adsorption). These physiochemical processes are discussed below.

### 7.3.1 Adsorption

One of the most important geochemical processes affecting the rate of migration of chemicals dissolved in groundwater is adsorption to and desorption from the soil matrix. If the organic chemical is strongly adsorbed to the solid matrix (i.e., the aquifer material), the chemical is relatively immobile and will not be leached or transported from the source. If the organic chemical is weakly adsorbed, the chemical can be transported large distances from the source, contaminating large quantities of groundwater. The degree of adsorption also affects other transformation reactions such as volatilization, hydrolysis, and biodegradation since these reactions require the chemical to be in the dissolved phase.

The distribution of chemicals between water and the adjoining solid matrix is often described by the soil/water distribution coefficient, $K_d$. For dissolved chemicals at environmental concentrations, the distribution coefficient is usually defined as the ratio of concentrations in the solid and water phase (Freeze and Cherry, 1979). $K_d$ has been shown to be proportional to the fraction of natural organic carbon (foc) in the solid matrix, the solubility of the chemical in the aqueous phase and the n-octanol/water or octanol/carbon partition coefficient ($K_{ow}$ or $K_{oc}$, respectively). Retardation factors, described below, and $K_d$ values are site specific.

A convenient way to express chemical mobility is by use of the retardation factor (Rd), which is a function of the average velocity of the retarded constituent, velocity of the groundwater, soil bulk density, and total porosity. If $K_d = 0$, the chemical species of concern is not affected by physiochemical reactions and migrates at the same velocity as the water based on convective-dispersive mechanisms. If $K_d > 0$, the chemical species will be retarded. More accurately, the retardation factor is the average linear velocity of the groundwater divided by the velocity of the contaminant chemical at the point when the chemical concentration is one-half the concentration of the chemical at its source. When $K_d$ equals zero (no adsorption), R equals one (i.e., the chemical and water move at the same velocity). If R equals 10, the contaminant chemicals move at 1/10 the velocity of the groundwater.

Adsorption of chlorinated aliphatics at the Country Cleaners site may be an important process influencing the transport of contaminants in groundwater. The importance of adsorption depends significantly upon the characteristics of the aquifer matrix material, which acts as the adsorbing medium. In particular, adsorption of hydrophobic organic compounds has been shown to be a function of the amount of natural organic carbon in the aquifer matrix. PCE has a $K_d > 0$ and, therefore, will be adsorbed/retarded to a degree. The calculated retardation factors are based on literature default values for some aquifer characteristics for which site-specific data are not available.

#### 7.3.2 Dispersion

The study of dispersion at a site is important to determine the concentration of a contaminant and the time it will take to reach a specific location (e.g., a drinking water well). In other words, dispersion of a contaminant affects the velocity and spatial distribution of a contaminant. Although the above discussion implies one-dimensional dispersion, in actuality, dispersion is three dimensional (i.e., longitudinal, transverse, and vertical). The longitudinal and transverse dispersion coefficient are affected primarily by aquifer heterogeneity, whereas, the vertical dispersion is also affected by the density of the contaminant. Because chlorinated aliphatics as a group are denser than water, they have a tendency to migrate vertically faster than many other contaminants (e.g., gasoline-related hydrocarbons such as benzene and toluene).

### 7.3.3 Dilution

Dilution is an effect of dispersion. When contaminants come in contact with uncontaminated groundwater, mixing occurs, resulting in a decrease in contaminant concentration. Rainwater precipitation can also cause dilution of contaminant concentrations. The majority of the study area is paved.

## 7.4 Contaminant-Specific Transport Velocity

As noted above, contaminant-specific migration in the groundwater is affected (reduced) by adsorption, expressed as the retardation factor. The retardation factor, Rd, is calculated as:

$$\mathbf{Rd = 1 + \boldsymbol{K_{oc}} * \boldsymbol{f_{oc}}\, \rho_b / n_e}$$

where:

Rd = retardation factor
$K_{oc}$ = organic carbon partition coefficient
$f_{oc}$ = fraction of organic carbon
$\rho_b$ = dry bulk density of aquifer matrix
$n_e$ -- effective porosity

The fraction of organic carbon is taken from the total organic carbon measured for a soil sample collected during installation of MW-4S (60-62 ft bgs; Table 3-5). The $K_{oc}$ value for PCE was obtained from www.state.nj.us/dep/srp/vaporintrusion.htm. Bulk density is estimated at 1.7 g/cc for sand (NRCS, 2010).

The contaminant transport rate $V_{pt}$ is determined by dividing the groundwater seepage velocity $V_s$ by the retardation factor Rd:

$$\mathbf{V_{pt} = \boldsymbol{V_s} / Rd}$$

The distance (D) that a contaminant travels in a given time (t) is calculated using the following equation:

$$\mathbf{D = \boldsymbol{V_{pt}} * \boldsymbol{t}}$$

Using the equations above, the transport rate and distance for the principle contaminants were calculated and are shown on Table 7-2. The estimated seepage rates range from 30 ft/yr to 41 ft/yr. The contaminated groundwater would reach the nearest known Suffolk County Water Authority well S-26681 between 119 and 163 years from the time of the release. The Country Cleaners plume is likely to have dissipated from dispersion and dilution prior to reaching S-26681, resulting in no significant impacts on the well. The point at which the plume is expected to decrease below the NYS Class GA groundwater criteria is beneath the Nathan Hale condominiums near MW-8S. Clay layers and lenses within the shallow aquifer may act as a barrier, limiting the spread of the groundwater plume. Additionally, S-26681 is screened in the deep aquifer (-485 ft amsl to -557 ft amsl; Lloyd Sand). The clay member of the Raritan formation may act as an additional barrier preventing transport of the PCE contaminated groundwater plume to this well.

## 7.5 Contaminant Fate

The fate of organic chemicals in the subsurface environment is affected by a variety of physiochemical and biological processes. Abiotic transformations are not significant factors in contaminant fate. Biodegradation is the one process which may have reduced PCE concentrations because breakdown products were detected in groundwater samples near the site.

### 7.5.1 Abiotic Transformation

Examples of abiotic degradation pathways include hydrolysis, dehydrochlorination, and abiotic reductive dechlorination. Abiotic reductive dechlorination and dehydrochlorination of PCE can occur in the presence iron minerals. Hydrolysis is the reaction of a compound with water resulting in the fragmentation of the molecule into two parts. These are chemical degradation reactions not typically associated with biological activity. PCE, TCE, DCE, and vinyl chloride are susceptible to abiotic transformation processes. In practice, it may not be possible to distinguish between the abiotic and biotic reactions at the field scale. Under natural conditions, abiotic reactions may be slow relative to biological degradation processes.

### 7.5.2 Biotransformation

Degradation or transformation of organic chemicals in the subsurface environment can occur through the action of microorganisms that may be attached to the soil or contained in the void space. Active microbial populations are found in most typical subsurface conditions. Even in low numbers, subsurface microbes possess adequate metabolic activity to reduce the levels of organic compounds migrating through the subsurface soil profiles.

Biodegradation of chlorinated organic chemicals ultimately produces microbial cells, water, carbon dioxide, and chloride ion (i.e., complete “mineralization”). The enzymes produced by the microorganisms are essentially responsible for the degradation of the organic chemicals. Whether or not a chemical is transformed depends on the microbial population present and the types of enzymes they express.

**Biodegradation of Chlorinated Ethenes**

There are many potential reactions that can degrade chlorinated ethenes (e.g., PCE) in the subsurface, under both aerobic and anaerobic conditions. Not all contaminants are amenable to degradation by each of these processes.

**Potential Degradation Processes for Contaminants**

Biodegradation occurs when indigenous microorganisms consume organic compounds to obtain energy for reproduction and growth. Microorganisms obtain this energy by facilitating the transfer of electrons from an electron donor (organic substrate) to an electron acceptor (typically native inorganics). Common electron donors at contaminated sites can be natural organic carbon or fuel hydrocarbons. Electron acceptors commonly found in groundwater include oxygen, nitrate, manganese, ferric iron, sulfate, and carbon dioxide. Under certain conditions, contaminants may be used as an electron donor, as in the aerobic oxidation of vinyl chloride. Under anaerobic conditions, contaminants may be used as an electron acceptor, as in the reductive dechlorination of TCE.

The aerobic biodegradation of contaminants consume oxygen and produces inorganic carbon in well-established ratios. Estimating the oxygen supply rate and correlating it with increases in inorganic carbon can yield a quantitative estimate of the rate of contaminants biodegradation, if the changes in inorganic carbon concentration can be measured properly.

The biodegradation of organic contaminants under denitrifying or sulfate-reducing conditions consumes nitrate or sulfate and produces inorganic carbon and alkalinity. Estimating the supply rates of sulfate or nitrate and correlating them with changes in inorganic carbon concentration and alkalinity can provide evidence for these anaerobic biodegradation reactions.

PCE and TCE are not susceptible to aerobic degradation processes (Table 7-3), with the exception of the aerobic cometabolism of TCE which requires the presence of a primary substrate such as toluene or methane which were not detected at the site. Therefore, anaerobic degradation pathways are of interest for the chloroethenes. DCE can be degraded by all the processes listed in Table 7-3. In general, anaerobic reductive dechlorination occurs by sequential removal of a chloride ion. For example, the chlorinated ethenes are transformed sequentially from PCE to TCE to the DCE isomers (cis- or trans-) to vinyl chloride to ethene.

The degree to which this biological transformation proceeds depends on three factors:

1. The presence of dechlorinating microorganisms
2. The presence of suitable electron donors
3. The presence of competing electron acceptors

### 7.5.3 Biodegradation at the Site

Samples were collected from three wells to assess whether or not biological transformation is occurring at the site. MW-2S and MW-3S are located near the site within the groundwater plume. MW-8S is located downgradient at the outer edge of the plume with a PCE concentration that is an order of magnitude lower than the values measured on the site and neighboring Getty Service Station property. Therefore, MW-8S is considered background compared to MW-2S and

MW-3S. A description of the analytical results with respect to the potential for biological transformation is provided below:

- Alkalinity – The alkalinity concentrations are the same at all wells, possibly indicating little biological activity is occurring in the groundwater plume.

- Levels of nitrate/nitrite (3.6 mg/L to 3.7 mg/L), dissolved manganese (not detected), dissolved iron (not detected), sulfate (23 mg/L to 36 mg/L), and methane (0.11 µg/L to 0.66 µg/L) are consistent in the three wells (the same order of magnitude). Since the levels are not higher within the plume (MW-2S and MW-3S) as compared to background (MW-8S), this indicates these compounds are unlikely to be used as electron acceptors within the area of elevated PCE concentrations within the plume.

- Dissolved Oxygen (DO), oxidation-reduction potential (ORP), and pH were measured in the field during groundwater sampling. Because the levels were measured through use of a bladder pump and a flow cell, the values may not be indicative of static conditions in the aquifer. DO levels were similar in all wells (greater than 7 mg/L). DO values greater than 2 mg/L indicate aerobic conditions are present. ORP field measurements in the three shallow wells are approximately 250 mV. This condition is between the ORP levels expected if manganese reduction (580 mV) or iron reduction (-80 mV) were occurring. pH levels in the three wells range from 5.71 pH to 5.84 pH, which is within the optimum range for biotransformation.

Based on this data, biological transformation activity does not appear to be significant at this time. This finding is consistent with the VOC concentrations detected in the monitoring wells which shown infrequent detections of the daughter products TCE and DCE, and at low concentrations, relative to the PCE concentrations.

# 8 QUALITATIVE HUMAN HEALTH RISK ASSESSMENT

A qualitative baseline risk assessment was completed based on the information presented in the preceding sections of this RI report. Generally, the human health evaluation involves an exposure assessment, an evaluation of site occurrence, hazard identification and comparison to New York State and USEPA criteria.

This section discusses the exposure assessment, an evaluation of site occurrence, and a comparison to New York State and USEPA criteria related to potential impacts to human health. It should be noted that several conservative assumptions were used in completing this assessment; and, thus, the risks identified are expected to be "worst-case" scenarios.

## 8.1 Exposure Assessment

This exposure assessment discusses potential migration routes by which chemicals in the environment may be able to reach human receptors. This discussion is based on current and hypothetical future site conditions and the extrapolation of site conditions to off-site areas.

Currently, the site is used for commercial purposes. The site is located in a mixed commercial and residential area in Huntington, New York. Residences are located in the surrounding areas. There is a large residential complex (Nathan Hale condominiums) located north of the site. Commercial properties are located along West Main Street, including a Getty service station to the east of the site, a Rite Aid convenience store, and a medical doctor's office. St. Patrick's Roman Catholic Church and primary school are located east of the site. For the purposes of this evaluation, it is assumed that the general use of the area will remain unchanged.

The hypothetical future conditions for the site and surrounding areas include development and/or intrusive site work in areas near the site; the possibility for the facilities to be abandoned and left unattended; on-site workers; and use of the groundwater as a potable water source.

A complete exposure pathway must exist for a population to be impacted by the chemicals at the site. A complete exposure pathway consists of five components:

1. a source and mechanism of chemical release;
2. a transport medium;
3. a point of potential human contact with the contaminated medium;
4. an exposure route at the contact point; and
5. a receptor population.

The extent of contamination was discussed in previous sections (6 and 7) of this RI. This section focuses primarily on identifying points of human contact with contaminated media.

The potential exposure pathways identified for the Country Cleaners site are discussed below.

Exposure to groundwater, if used as a drinking water supply, includes ingestion, dermal contact and inhalation of vapors. Public water supply wells are located downgradient, the closest is about 4,865 feet away from the site. The well is located below the Raritan clay member confining layer and may not be impacted by VOCs from the site. FOIL requests were sent to the Suffolk County Department of Health Services in August 2010 requesting analytical data for the public wells owned by Suffolk County Water Authority and information on domestic wells in the vicinity of the site.

Based on the groundwater flow direction, it appears that groundwater flows in a north-easterly direction, towards the Huntington Harbor. Potential human exposure may occur at the point of groundwater contact. The likelihood of exposure to groundwater due to construction activities is considered to be low since the groundwater is generally encountered at 52 ft amsl (approximately 58 ft bgs) in the shallow aquifer and approximately 80 ft amsl (approximately 30 ft bgs at the site) for perched groundwater. Potential human exposures include ingestion, dermal contact, and inhalation of vapors. Ingestion of groundwater (as drinking water), dermal contact and vapor inhalation scenarios are potential future exposure scenarios.

Potential human exposures to subsurface soils include ingestion, dermal contact, and inhalation under the future development scenarios with excavation.

Potential inhalation exposure from PCE volatilization from subsurface soils and groundwater near the site source areas may occur under current conditions and under the future development scenarios with excavation (e.g., migration of vapors into buildings, basements, foundations, utilities, and outdoor areas).

## 8.2 Evaluation of Site Occurrence

Tables 8-1, 8-2, and 8-3 present the range of concentrations for the chemicals detected in groundwater from shallow wells, groundwater from deeper wells, and subsurface soil respectively. The summary includes the frequency of detection, the frequency of criterion exceedance, the number of samples analyzed, the maximum concentration detected, and the location where the maximum value was reported. For purposes of this qualitative and conservative assessment, the exposure point concentration was set as the maximum reported value, and this value was compared to New York State and USEPA risk-based criteria. Data from the 2008 to 2010 sampling events, as summarized in the tables in Section 3, were used for this assessment.

The contaminant concentrations reported for the site were used for potential off-site exposure points (i.e., potable water concentrations). This is a conservative approach as off-site concentrations may be lower due to dispersion, retardation, and other attenuating mechanisms.

## 8.3 Hazard Identification and Comparison to Criteria

The potential hazards due to human exposures were reviewed based on chemical-specific criteria. Both New York State and Federal criteria were examined.

### 8.3.1 Groundwater

Human health risks associated with exposure to groundwater were examined by considering use of the groundwater as a drinking water source. Groundwater data collected from shallower depths (above 30 ft amsl) are assessed separately from the deeper groundwater results, since vertical groundwater movement appears to be slowed by a clay layer which has limited contaminant movement over the years since Country Cleaners was in operation.

The SCGs used for human health risks associated with use of groundwater at the site as a drinking water source includes the following:

- NYSDEC Class GA Groundwater Quality Criteria, 6NYCRR Part 701-703, as summarized in TOGS 1.1.1, June 1998, with updates through June, 2004.
- New York State Drinking Water Standards (10 NYCRR 5-1.52; Tables 1-7)
- USEPA National Primary Drinking Water Standards [Maximum Contaminant Levels (MCLs)], 40 CFR 141 (last revised June 2008).

As shown on Table 8-1, shallow groundwater contained three VOC compounds (cis-1,2-DCE, PCE, and TCE) exceeding risk-based criteria. PCE was the most significant VOC detection (maximum 1,500 µg/L at HP-02), compared to the criterion of 5 µg/L. PCE was detected in 6 of 10

Hydropunch samples and exceeded the criterion in 4 of the samples. In the permanent wells, PCE was detected in 6 of 8 samples from shallow wells and exceeded the criterion in 5 of the samples.

Shallow groundwater also contained unfiltered iron exceeding the NYS risk-based Class GA groundwater and drinking water criterion (300 µg/L). The filtered iron samples did not exceed the criterion.

As shown on Table 8-2, deep groundwater collected by Hydropunch contained only one VOC compound (PCE) exceeding risk-based criteria. PCE was detected in 11 out of 16 hydropunch samples. Five of these samples had PCE concentrations in exceedance of the 5 µg/L criterion. PCE was not detected in the samples from the seven permanent deep wells.

#### 8.3.2 Soil

Human health risks associated with exposure to subsurface soil were examined by considering future excavation at the site. The concentrations were screened against the NYSDEC Part 375-6.8(b) SCO values. As shown on Table 8-3, three VOC compounds were detected in subsurface soils (cis-1,2-DCE, PCE, and TCE). None of the detected concentrations exceeded risk-based criteria.

#### 8.3.3 Soil Vapor

Human health risks associated with exposure to soil vapors were examined by considering the inhalation of vapors. Indoor air sampling was conducted in August 2003 by NYSDOH at two structures. The samples were collected using a passive organic vapor monitoring badge and analyzed for PCE. At the structure on Hillside Avenue, PCE was identified as present at a concentration less than 5 µg/$m^3$ in the indoor air. At the structure on Scudder Avenue, PCE was identified as present at a concentration less than 5 µg/$m^3$ on the first floor and at concentrations of 12 µg/$m^3$ and 13 µg/$m^3$ in the basement air.

These values are compared below to the following SCGs:

- 1.1 µg/$m^3$ from the 75th percentiles reported in the NYSDOH 2003 Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes and the EPA 2001 Building Assessment and Survey Evaluation (BASE) database (Appendix C of NYSDOH, 2006).
- 0.41 µg/$m^3$ from the screening toxicity values, EPA Regional Screening Level (RSL) Resident Air (May 2010). The RSL corresponds to a cancer risk of 1E-6.

The levels of PCE in the indoor air exceeded the background and risk-based criteria at both structures.

The indoor air concentrations can also be compared to the NYSDOH Soil/Vapor decision matrix as shown in NYSDOH (2006). Matrix 2 (which includes PCE) has an indoor air tier of 3 µg/$m^3$ to less than 30 µg/$m^3$. Depending on the corresponding concentrations of the sub-slab vapors the recommended actions are:

- Sub-slab less than 100 µg/m$^3$, take reasonable and practical actions to identify source(s) and reduce exposures
- Sub-slab 100 µg/m$^3$ to less than 1,000 µg/m$^3$, monitor/mitigate
- Sub-slab 1,000 µg/m$^3$ or greater, mitigate

## 8.4 SUMMARY OF HUMAN HEALTH RISK ASSESSMENT

A qualitative human health risk assessment was completed for the site. Generally, the human health evaluation involves an exposure assessment, an evaluation of site occurrence, hazard identification and comparison to Federal and New York State criteria. Exposure scenarios were identified and evaluated based on analytical laboratory results of groundwater, subsurface soil and ambient air samples collected. A summary of the results of the risk assessment is presented below.

Since the screen for the public water supply well in the direction of groundwater flow is located under a confining layer the potential for exposure to contaminants in the groundwater at the site is expected to be minimal under current conditions. FOIL requests were sent to the Suffolk County Department of Health Services in August 2010 requesting analytical data for the public wells owned by Suffolk County Water Authority and information on domestic wells in the vicinity of the site. Risks would exceed generally acceptable ranges associated with ingestion of untreated groundwater at the site due to high concentrations of PCE and other contaminants.

The potential for exposure to the contaminants in the subsurface soils are minimal since receptors are not currently exposed to subsurface soils (i.e., the pathway is incomplete) and contact is unlikely. Additionally, the concentrations in the soil are below the screening levels.

There is a potential for exposure to soil vapor inside of buildings. Due to the high concentrations of PCE, exposure to on-site soil vapors could pose a significant risk. Based on PCE concentrations in indoor air at the two structures sampled, it is recommended to at least take reasonable and practical actions to identify source(s) and reduce exposures and potentially to monitor or mitigate in these buildings.

# 9 CONCLUSION

AECOM Technical Services Northeast, Inc. (AECOM) has been issued Work Assignment # D004436-13 under the New York State Department of Environmental Conservation (NYSDEC) State Superfund Standby Contract for Investigation and Design Services (D00436). The scope of work is to conduct a remedial investigation and feasibility study at Country Cleaners, Huntington, New York, located in Suffolk County (NYSDEC registry number 152187). The site location is shown on Figure 1-1. AECOM submitted a final dynamic work plan in May 2008 incorporating NYSDEC comments on the proposed scope of work. Additional details regarding the planned execution of this project are found in the project plans, included as appendices to the Work Plan, including a Field Activities Plan, Quality Assurance Project Plan, and Site Safety and Health Plan.

## 9.1 Remedial Investigation

A remedial investigation was conducted to determine the sources of contamination within the site and its threat to human health or the environment. The scope and execution of the RI is discussed below. The work to date consisted of three main efforts:

- Membrane interface probe investigation (July 2008)
- Hydropunch – screening level investigation (September 2008 and February 2009; Triad/dynamic work plan approach)
- Groundwater monitoring well installation and sampling (December 2009 – February 2010)

The MIP borings were advanced to collect remote sensing data indicating the possible presence of chlorinated solvents in the soils or groundwater based on the response of the ECD. No samples were collected for laboratory analysis during the initial phase of the investigation.

Hydropunch groundwater and soil samples were collected from reoccupied MIP boring locations using direct push drilling in 2008 and early 2009. Groundwater and soil samples were shipped to Chemtech in Mountainside, New Jersey for VOC analysis (EPA Method SW846 8260). The Hydropunch data were used as a screening tool to determine the appropriate screened interval for permanent monitoring well installation. Therefore, these data were not validated.

During monitoring well installation in December 2009 and January 2010, AECOM collected two soil samples for TOC and grain size analysis. Data from the two soil samples collected in 2009 for TOC and particle size analysis were not validated.

Groundwater samples collected from the monitoring wells in 2010 were analyzed for VOCs (EPA SW846 Method 8260) by Hampton-Clarke Veritech. The groundwater data from the permanent wells were validated by an independent subcontractor, Environmental Data Services, Inc. (EDS) of Williamsburg, VA. The laboratory data packages and the DUSRs are provided in Appendix F on CD. The analytical data were generally acceptable and appropriate for their intended use. Minor exceptions are detailed in the DUSRs and did not affect the usability of the data for the principal site contaminants (chlorinated aliphatics).

## 9.2 Site Geology

The Long Island aquifer system lies within the Atlantic Coast Plain physiographic province, and is bounded on the north by the Long Island Sound and on the east and south by the Atlantic Ocean and on the west by New York Bay and the East River. The geologic formations of Long Island are composed of unconsolidated glacial deposits of Pleistocene age, and coastal plain deposits of continental and marine origin of Cretaceous age. The unconsolidated deposits consist of gravel, sand, silt, and clay underlain by bedrock of Lower Paleozoic and/or Precambrian age, which forms the base of the groundwater reservoir. The distribution of soil types in the Huntington area are shown on Figure 5-1 from USGS (1964). Ronkonkoma terminal moraine (crudely stratified sand, gravel, and boulders; some till) forms an irregular ridge which runs to the west across Huntington. The west and Half Hollow Hills extend south through central and southern Huntington. Harbor Hill end moraine is present in the southern portion of Huntington.

Soil borings were advanced in the vicinity of the Country Cleaners site. Soil was generally classified as fine to medium sand with varying amounts of silt and gravel. A thick clay layer at an elevation of approximately 5 ft amsl was encountered throughout the site during installation of the deep wells. These soils are consistent with the Pleistocene deposits.

### 9.3 Site Hydrogeology

Long Island groundwater is present in three major aquifers: the Upper Glacial aquifer (shallow), the Magothy aquifer (intermediate), and the Lloyd Aquifer (deep). The uppermost hydrogeologic unit consists of Pleistocene saturated coarse sand and gravel and finer grained sand and gravel beds in the upper part of the Magothy formation. The lower limit of the shallow aquifer is identified by discontinuous clay bodies. The intermediate aquifer includes the Magothy formation to the top of the clay member of the Raritan formation. The deep aquifer is located within the sand member of the Raritan formation.

Groundwater level measurements were recorded on May 27, 2010 from the monitoring wells installed in December 2009 through January 2010 and the existing well MW-2. Both the deep and shallow wells are located in the shallow aquifer. Perched groundwater was identified in wells MW-3S/D, MW-4S/D, and MW-1S/D. A clay lens may be present at approximately 30 ft amsl. This clay layer may act as an aquiclude limiting vertical movement of the groundwater from the zone where the shallow wells are screened.

The groundwater elevation measurements were interpolated using inverse distance weighting for the shallow and deep wells separately. For both the shallow and deep wells the groundwater flow is towards the north or northeast. Groundwater flow patterns are consistent with those reported previously (USGS, 1964).

### 9.4 Nature of Contaminants Detected

The principle contaminants detected were chlorinated aliphatics. Principle chlorinated aliphatics include PCE and infrequent detection of the degradation products TCE and cis-1,2-DCE.

### 9.5 Extent of Contamination

The PCE groundwater plume is centered at the Country Cleaners site and neighboring Getty Service Center. The plume extends downgradient towards the northeast onto the Nathan Hale condominium property. The plume concentrations are expected to drop below the NYS Class GA groundwater criteria below the Nathan Hale property. There are no detections of PCE in the deep wells, indicating that the maximum depth of contamination has been adequately bounded.

### 9.6 Uncertainties in Nature and Extent of Contaminant Distribution

The identity of the contaminants is well-established, with data from collected from the permanent monitoring wells confirming findings from the MIP investigation and Hydropunch sampling in terms of compounds detected (PCE, TCE and DCE), and the spatial distribution of the contamination. The horizontal (areal) extent of contamination is not fully defined to the north and northeast where shallow wells on the Nathan Hale condominium property have concentrations exceeding the NYS Class GW groundwater criterion of 5 µg/L for PCE. The vertical extent of contamination is bounded, since PCE was not detected in any of the deep wells. However, the exact depth at which the PCE concentration falls below the NYS Class GA groundwater criterion is not known.

## 9.7 Contaminant Transport

Groundwater flow is generally to the north or northeast. The process by which a solute (dissolved phase contaminant) is transported by the bulk movement of groundwater flow is referred to as advection. The average linear velocity of groundwater through a porous aquifer is determined by the hydraulic conductivity, effective porosity of the aquifer formation, and hydraulic gradient.

Adsorption of chlorinated aliphatics at the site may be an important process influencing the movement of contaminants in groundwater. The importance of adsorption depends significantly upon the characteristics of the aquifer matrix material, which acts as the adsorbing medium. In particular, adsorption of hydrophobic organic compounds has been shown to be a function of the amount of natural organic carbon in the aquifer matrix. PCE has a $K_d > 0$ and, therefore, will be adsorbed/retarded to a degree.

The estimated seepage rates range from 30 ft/yr to 41 ft/yr. The contaminated groundwater would reach the nearest known Suffolk County Water Authority well S-26681 between 119 and 163 years from the time of the release. The Country Cleaners plume is likely to have dissipated from dispersion and dilution prior to reaching S-26681, resulting in no significant impacts on the well. The point at which the plume is expected to decrease below the NYS Class GA groundwater criteria is beneath the Nathan Hale condominiums near MW-8S. Clay layers and lenses within the shallow aquifer may act as a barrier, limiting the spread of the groundwater plume. Additionally, S-26681 is screened in the deep aquifer (-485 ft amsl to -557 ft amsl; Lloyd Sand). The clay member of the Raritan formation may act as an additional barrier preventing transport of the PCE contaminated groundwater plume to this well.

## 9.8 Contaminant Fate

The fate of organic chemicals in the subsurface environment is affected by a variety of physiochemical and biological processes. Abiotic transformations such as hydrolysis, oxidation, and volatization are not significant factors in contaminant fate. Biodegradation is the one process which may have reduced PCE concentrations as evidenced by the breakdown products detected infrequently in groundwater samples within the plume. However, review of data collected from three shallow wells across the PCE plume indicates that biological transformation is currently not active at an appreciable rate.

### 9.9 Human Health Risk Assessment

A qualitative human health risk assessment was completed for the site. Generally, the human health evaluation involves an exposure assessment, an evaluation of site occurrence, hazard identification and comparison to Federal and New York State criteria. Exposure scenarios were identified and evaluated based on analytical laboratory results of groundwater, subsurface soil and ambient air samples collected.

- Since the screen for the public water supply well in the direction of groundwater flow is located under a confining layer the potential for exposure to contaminants in the groundwater at the site is expected to be minimal under current conditions.
- Risks would exceed generally acceptable ranges associated with ingestion of untreated groundwater at the site due to high concentrations of PCE and other contaminants.
- Concentrations in the soil are below the screening levels.
- There is a potential for exposure to soil vapor inside of buildings based on the PCE detections from air samples collected by NYSDOH at two structures in the vicinity of the site.

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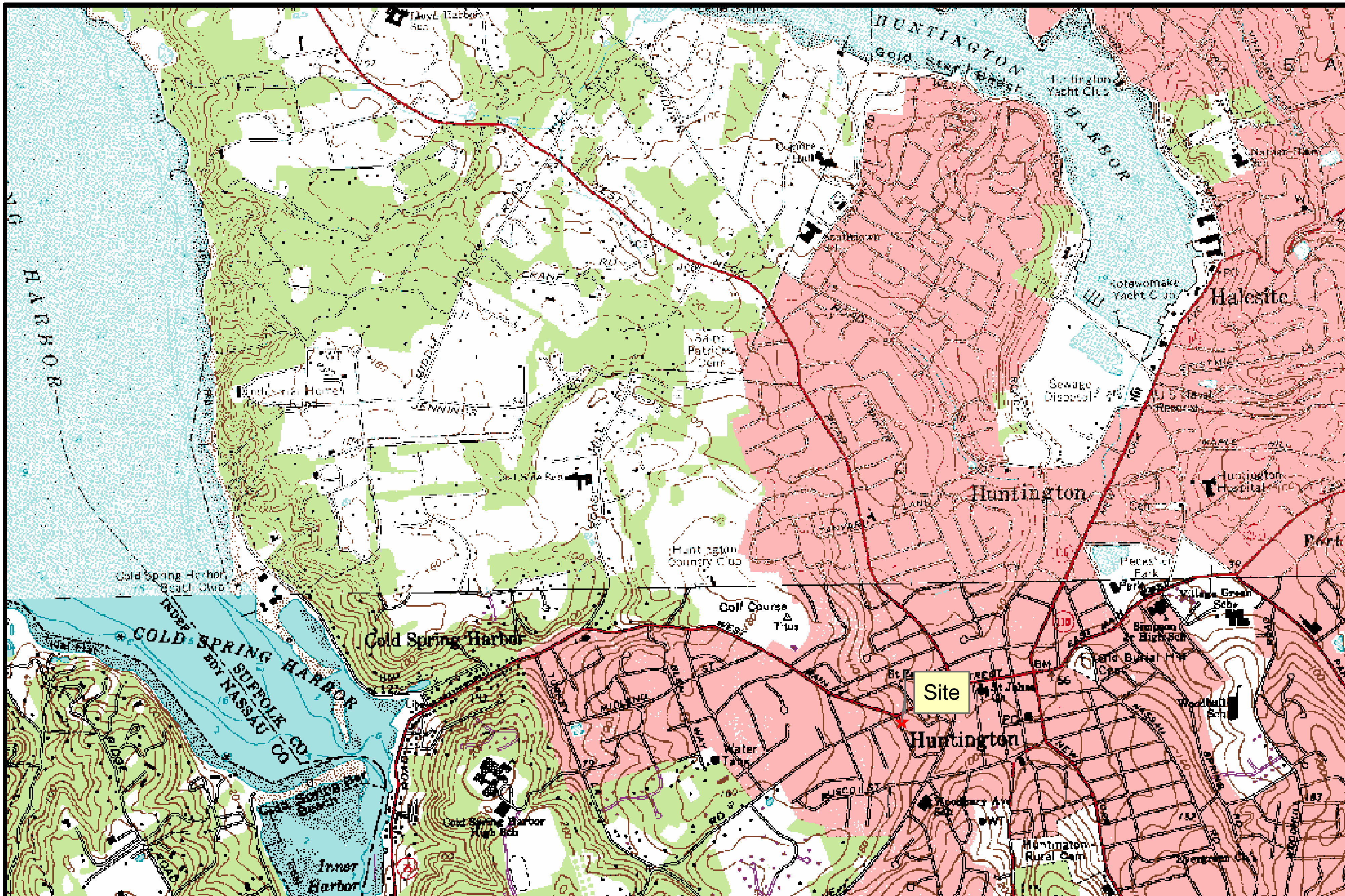



**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 500 1,000 2,000
Feet

★ Site

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Site Location Map

Project No: 60133623
Figure No: 1-1
August 19, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 5 10 20
Feet

Permanent Monitoring Well
Site
Suffolk County Dept. of Health Services Soil Samples 1997
Storm Drain

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Prepared by:
AECOM

Historical Data 1996-1997

Project No: 60133623
Figure No: 1-2
July 29, 2010


| Head Space | SP-1 | SP-2 | SP-3 | UIW |
|---|---|---|---|---|
| Depth (ft) | ppm | ppm | ppm | ppm |
| 0-2 | NA | NA | 2.6 | NA |
| 2-4 | NA | NA | 2.4 | NA |
| 4-6 | NA | NA | 7.3 | NA |
| 6-8 | NA | NA | 0 | NA |
| 5-7 | 0 | NA | NA | NA |
| 10-12 | 0 | NA | NA | NA |
| 13-16 | NA | NA | NA | 2000+ |
| 15-17 | 0 | 4.6 | NA | NA |
| 20-22 | 0 | 2.2 | NA | 9 |
| 25-27 | 0 | 0 | NA | 15.2 |
| 30-32 | 0 | 0 | NA | NA |

NA-Not Available

**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 5 10 20
Feet

- Soil Samples 1998
- Permanent Monitoring Well
- Head Space Samples 1998
- Storm Drain
- Site

Samples collected by Suffolk County Depart. of Health Services.

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Prepared by:
AECOM

Historical Data Post 1997

Project No: 60133623
Figure No: 1-3
July 29, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70
Feet

● MIP Locations
★ Site

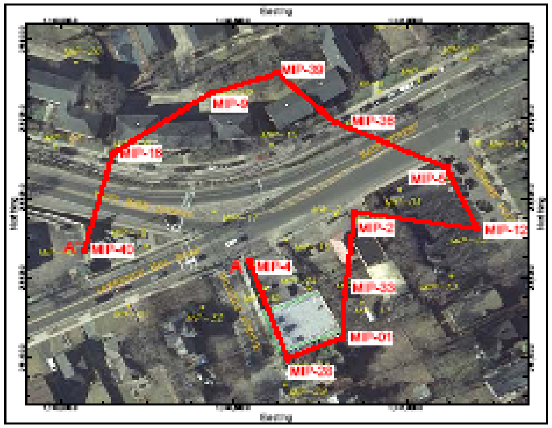
Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

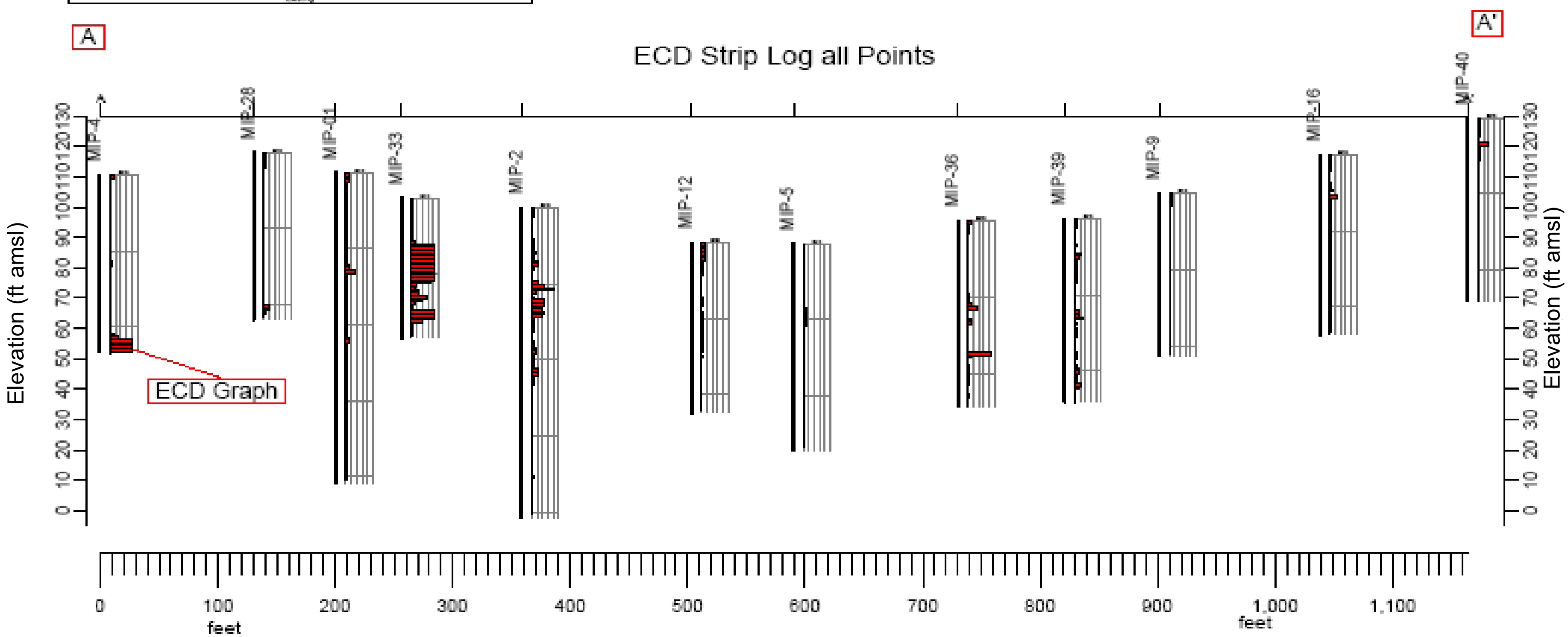
MIP Locations

Project No: 60133623
Figure No: 2-1

July 29, 2010



# ECD Strip Log




Prepared by ZEBRA ENVIRONMENTAL Subsurface Sampling, Injection and Data Collection For Environmental Professionals

| | | | |
|---|---|---|---|
| **NYSDEC Site No. 152187**<br>Country Cleaners<br>Huntington, New York | | Prepared for: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION<br>Prepared by: AECOM | MIP Strip Log<br>Project No: 60133623<br>Figure No: 2-2<br>July 29, 2010 |


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70
Feet

● Groundwater Sample Locations (Hydropunch)

★ Site

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Groundwater Sampling Locations - 2008 and 2009

Project No: 60133623

Figure No: 2-3

July 29, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70
Feet

- Soil Sample Locations (Direct Push)
- Site

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AECOM

Soil Sampling Locations
- 2008 and 2009

Project No: 60133623
Figure No: 2-4
July 29, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70
Feet

Permanent Monitoring Well
★ Site

Prepared for:
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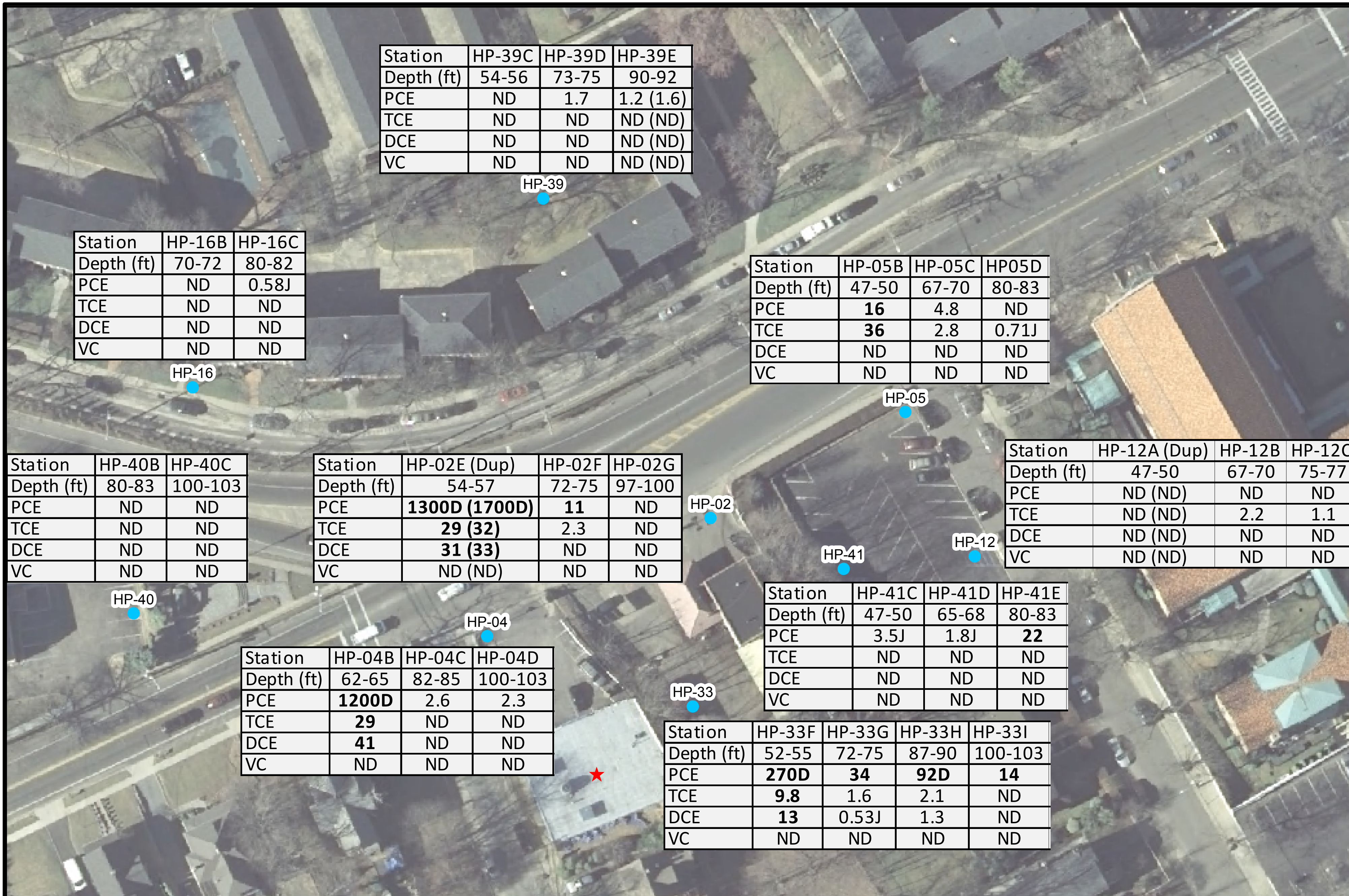
Prepared by:
AECOM

Monitoring Well Locations

Project No: 60133623
Figure No: 2-5
July 29, 2010




| Station | HP-39C | HP-39D | HP-39E |
|---|---|---|---|
| Depth (ft) | 54-56 | 73-75 | 90-92 |
| PCE | ND | 1.7 | 1.2 (1.6) |
| TCE | ND | ND | ND (ND) |
| DCE | ND | ND | ND (ND) |
| VC | ND | ND | ND (ND) |

| Station | HP-16B | HP-16C |
|---|---|---|
| Depth (ft) | 70-72 | 80-82 |
| PCE | ND | 0.58J |
| TCE | ND | ND |
| DCE | ND | ND |
| VC | ND | ND |

| Station | HP-05B | HP-05C | HP05D |
|---|---|---|---|
| Depth (ft) | 47-50 | 67-70 | 80-83 |
| PCE | **16** | 4.8 | ND |
| TCE | **36** | 2.8 | 0.71J |
| DCE | ND | ND | ND |
| VC | ND | ND | ND |

| Station | HP-12A (Dup) | HP-12B | HP-12C |
|---|---|---|---|
| Depth (ft) | 47-50 | 67-70 | 75-77 |
| PCE | ND (ND) | ND | ND |
| TCE | ND (ND) | 2.2 | 1.1 |
| DCE | ND (ND) | ND | ND |
| VC | ND (ND) | ND | ND |

| Station | HP-40B | HP-40C |
|---|---|---|
| Depth (ft) | 80-83 | 100-103 |
| PCE | ND | ND |
| TCE | ND | ND |
| DCE | ND | ND |
| VC | ND | ND |

| Station | HP-02E (Dup) | HP-02F | HP-02G |
|---|---|---|---|
| Depth (ft) | 54-57 | 72-75 | 97-100 |
| PCE | **1300D (1700D)** | **11** | ND |
| TCE | **29 (32)** | 2.3 | ND |
| DCE | **31 (33)** | ND | ND |
| VC | ND (ND) | ND | ND |

| Station | HP-41C | HP-41D | HP-41E |
|---|---|---|---|
| Depth (ft) | 47-50 | 65-68 | 80-83 |
| PCE | 3.5J | 1.8J | **22** |
| TCE | ND | ND | ND |
| DCE | ND | ND | ND |
| VC | ND | ND | ND |

| Station | HP-04B | HP-04C | HP-04D |
|---|---|---|---|
| Depth (ft) | 62-65 | 82-85 | 100-103 |
| PCE | **1200D** | 2.6 | 2.3 |
| TCE | **29** | ND | ND |
| DCE | **41** | ND | ND |
| VC | ND | ND | ND |

| Station | HP-33F | HP-33G | HP-33H | HP-33I |
|---|---|---|---|---|
| Depth (ft) | 52-55 | 72-75 | 87-90 | 100-103 |
| PCE | **270D** | **34** | **92D** | **14** |
| TCE | **9.8** | 1.6 | 2.1 | ND |
| DCE | **13** | 0.53J | 1.3 | ND |
| VC | ND | ND | ND | ND |

**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70
Feet

● Groundwater Sample Locations (Hydropunch)

★ Site

Bold values exceed the NYS Class GA groundwater criteria.

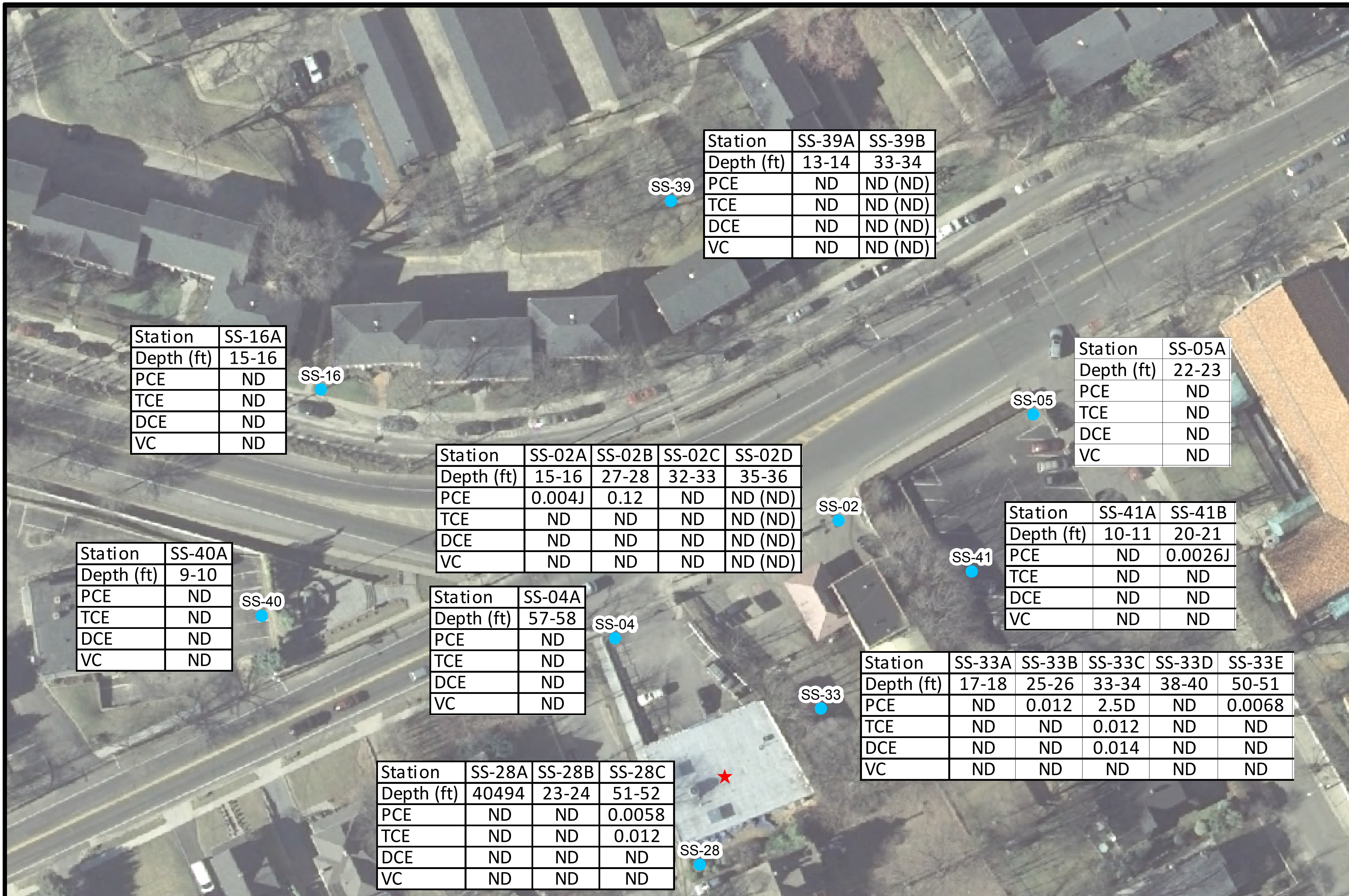
PCE - Tetrachloroethene
DCE - cis-1,2-dichloroethene
TCE - Trichloroethene
VC - Vinyl Chloride

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Groundwater Sample Results - 2008 and 2009

Project No: 60133623
Figure No: 3-1
July 29, 2010




| Station | SS-39A | SS-39B |
|---|---|---|
| Depth (ft) | 13-14 | 33-34 |
| PCE | ND | ND (ND) |
| TCE | ND | ND (ND) |
| DCE | ND | ND (ND) |
| VC | ND | ND (ND) |

| Station | SS-16A |
|---|---|
| Depth (ft) | 15-16 |
| PCE | ND |
| TCE | ND |
| DCE | ND |
| VC | ND |

| Station | SS-05A |
|---|---|
| Depth (ft) | 22-23 |
| PCE | ND |
| TCE | ND |
| DCE | ND |
| VC | ND |

| Station | SS-02A | SS-02B | SS-02C | SS-02D |
|---|---|---|---|---|
| Depth (ft) | 15-16 | 27-28 | 32-33 | 35-36 |
| PCE | 0.004J | 0.12 | ND | ND (ND) |
| TCE | ND | ND | ND | ND (ND) |
| DCE | ND | ND | ND | ND (ND) |
| VC | ND | ND | ND | ND (ND) |

| Station | SS-41A | SS-41B |
|---|---|---|
| Depth (ft) | 10-11 | 20-21 |
| PCE | ND | 0.0026J |
| TCE | ND | ND |
| DCE | ND | ND |
| VC | ND | ND |

| Station | SS-40A |
|---|---|
| Depth (ft) | 9-10 |
| PCE | ND |
| TCE | ND |
| DCE | ND |
| VC | ND |

| Station | SS-04A |
|---|---|
| Depth (ft) | 57-58 |
| PCE | ND |
| TCE | ND |
| DCE | ND |
| VC | ND |

| Station | SS-33A | SS-33B | SS-33C | SS-33D | SS-33E |
|---|---|---|---|---|---|
| Depth (ft) | 17-18 | 25-26 | 33-34 | 38-40 | 50-51 |
| PCE | ND | 0.012 | 2.5D | ND | 0.0068 |
| TCE | ND | ND | 0.012 | ND | ND |
| DCE | ND | ND | 0.014 | ND | ND |
| VC | ND | ND | ND | ND | ND |

| Station | SS-28A | SS-28B | SS-28C |
|---|---|---|---|
| Depth (ft) | 40494 | 23-24 | 51-52 |
| PCE | ND | ND | 0.0058 |
| TCE | ND | ND | 0.012 |
| DCE | ND | ND | ND |
| VC | ND | ND | ND |

**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70
Feet

● Soil Sample Locations (Direct Push)
★ Site

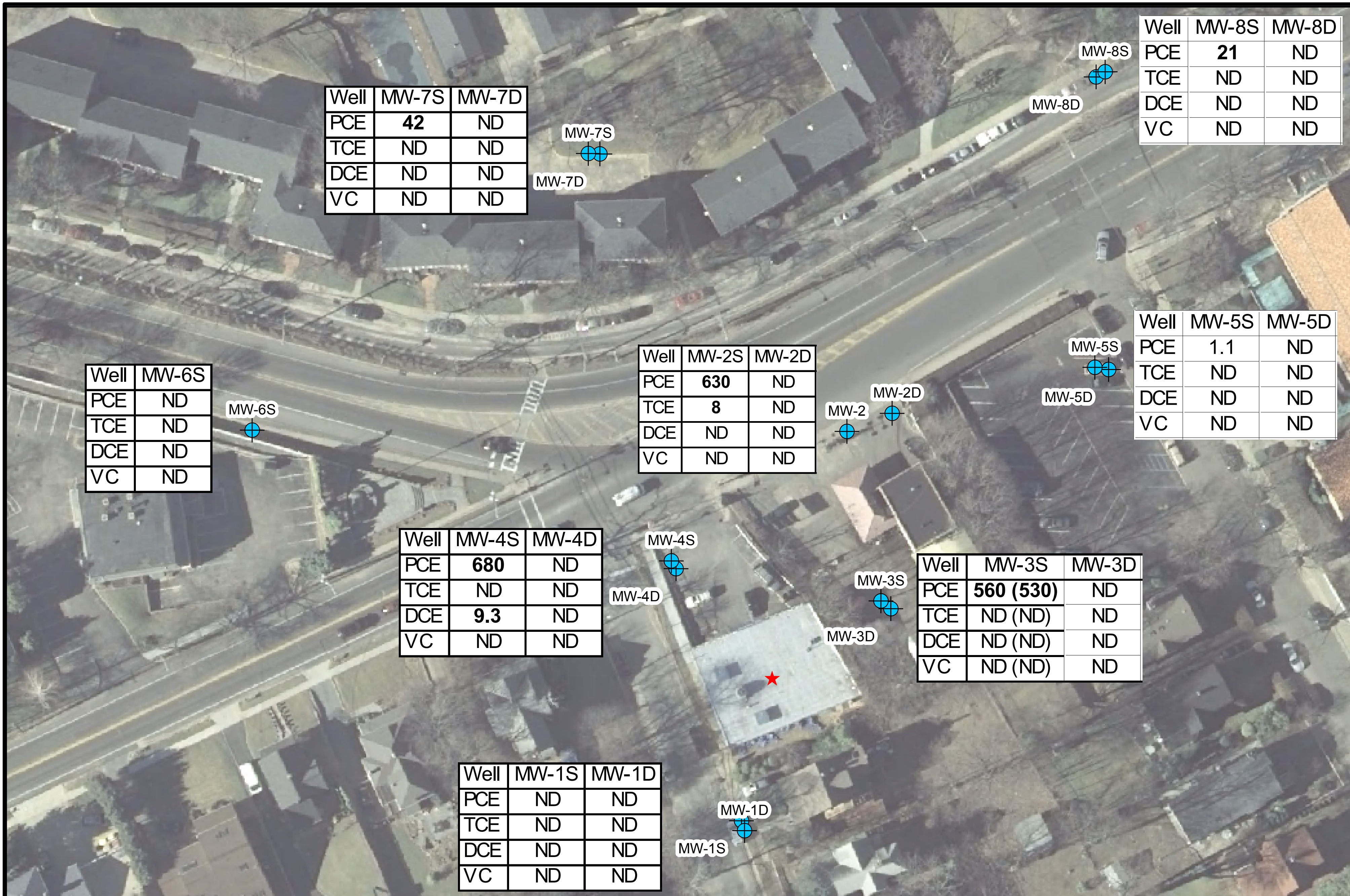
Concentrations are in ug/L.

PCE - Tetrachloroethene
TCE - Trichloroethene
DCE - cis-1,2-dichloroethene
VC - Vinyl Chloride

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Prepared by:
AECOM

Soil Sample Results - 2008 and 2009

Project No: 60133623
Figure No: 3-2
July 29, 2010




| Well | MW-7S | MW-7D |
|---|---|---|
| PCE | **42** | ND |
| TCE | ND | ND |
| DCE | ND | ND |
| VC | ND | ND |

| Well | MW-8S | MW-8D |
|---|---|---|
| PCE | **21** | ND |
| TCE | ND | ND |
| DCE | ND | ND |
| VC | ND | ND |

| Well | MW-5S | MW-5D |
|---|---|---|
| PCE | 1.1 | ND |
| TCE | ND | ND |
| DCE | ND | ND |
| VC | ND | ND |

| Well | MW-6S |
|---|---|
| PCE | ND |
| TCE | ND |
| DCE | ND |
| VC | ND |

| Well | MW-2S | MW-2D |
|---|---|---|
| PCE | **630** | ND |
| TCE | **8** | ND |
| DCE | ND | ND |
| VC | ND | ND |

| Well | MW-4S | MW-4D |
|---|---|---|
| PCE | **680** | ND |
| TCE | ND | ND |
| DCE | **9.3** | ND |
| VC | ND | ND |

| Well | MW-3S | MW-3D |
|---|---|---|
| PCE | **560 (530)** | ND |
| TCE | ND (ND) | ND |
| DCE | ND (ND) | ND |
| VC | ND (ND) | ND |

| Well | MW-1S | MW-1D |
|---|---|---|
| PCE | ND | ND |
| TCE | ND | ND |
| DCE | ND | ND |
| VC | ND | ND |

**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70 Feet

Permanent Monitoring Well
Site

Concentrations are in ug/L.
Bold values exceed the NYS Class GA groundwater criteria.

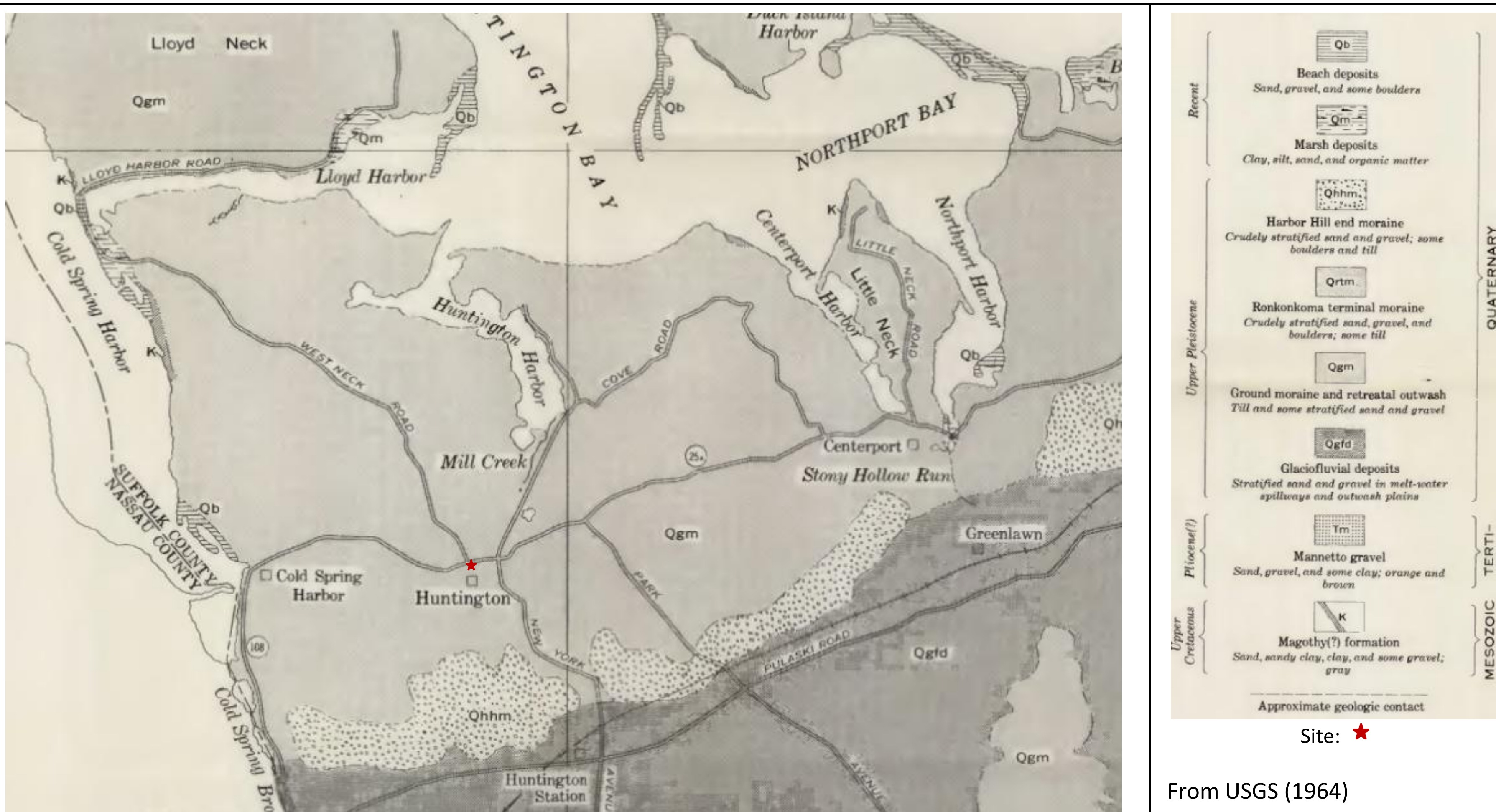
PCE - Tetrachloroethene
TCE - Trichloroethene
DCE - cis-1,2-dichloroethene
VC - Vinyl Chloride

Prepared for: New York State Department of Environmental Conservation

Prepared by: AECOM

Groundwater Sample Results - 2010

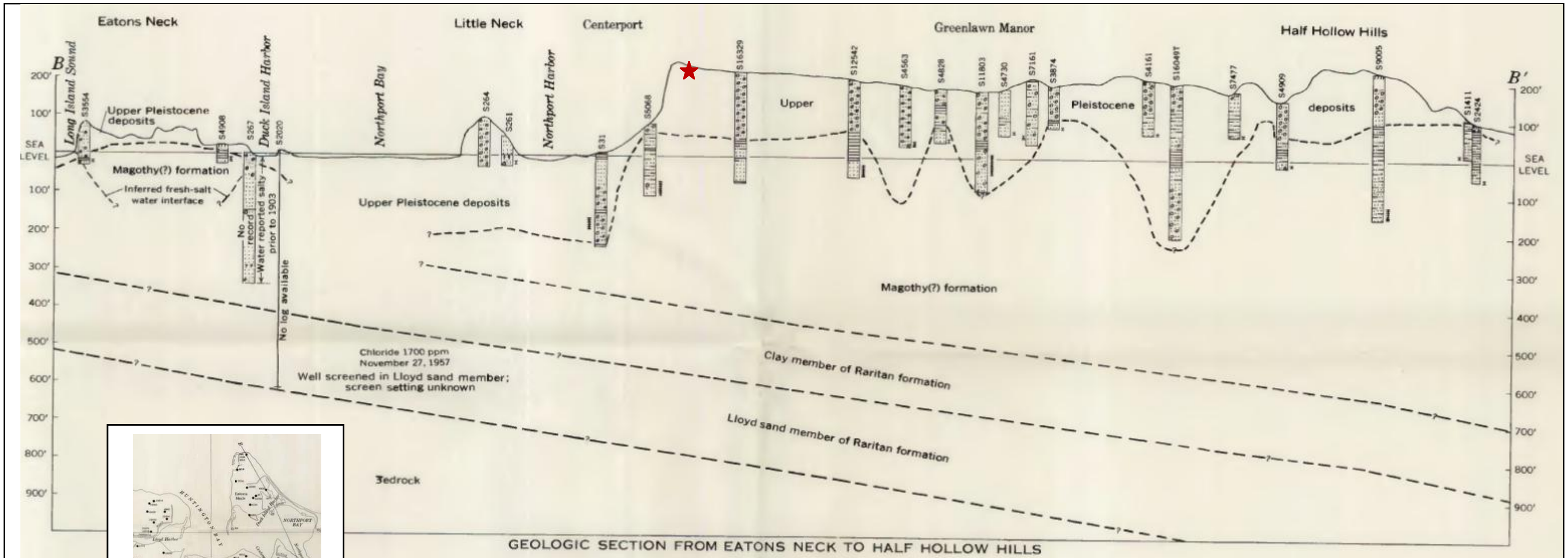
Project No: 60133623
Figure No: 3-3
July 29, 2010



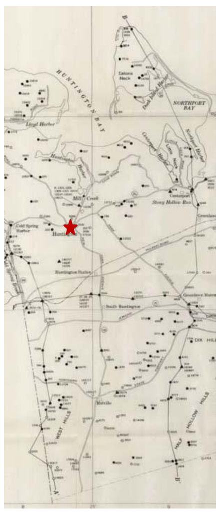

Site: ★

From USGS (1964)

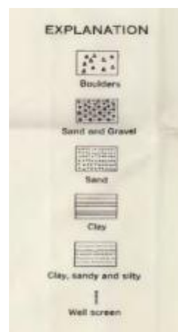
| | | |
|---|---|---|
| **NYSDEC Site No. 152187**<br>**Country Cleaners**<br>**Huntington, New York**<br>N | Prepared for:<br>AECOM<br>Prepared by:<br>NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION | Soil Types<br>Project No.: 60133623<br>Figure No: 5-1 August 19, 2010 |




From USGS (1964).

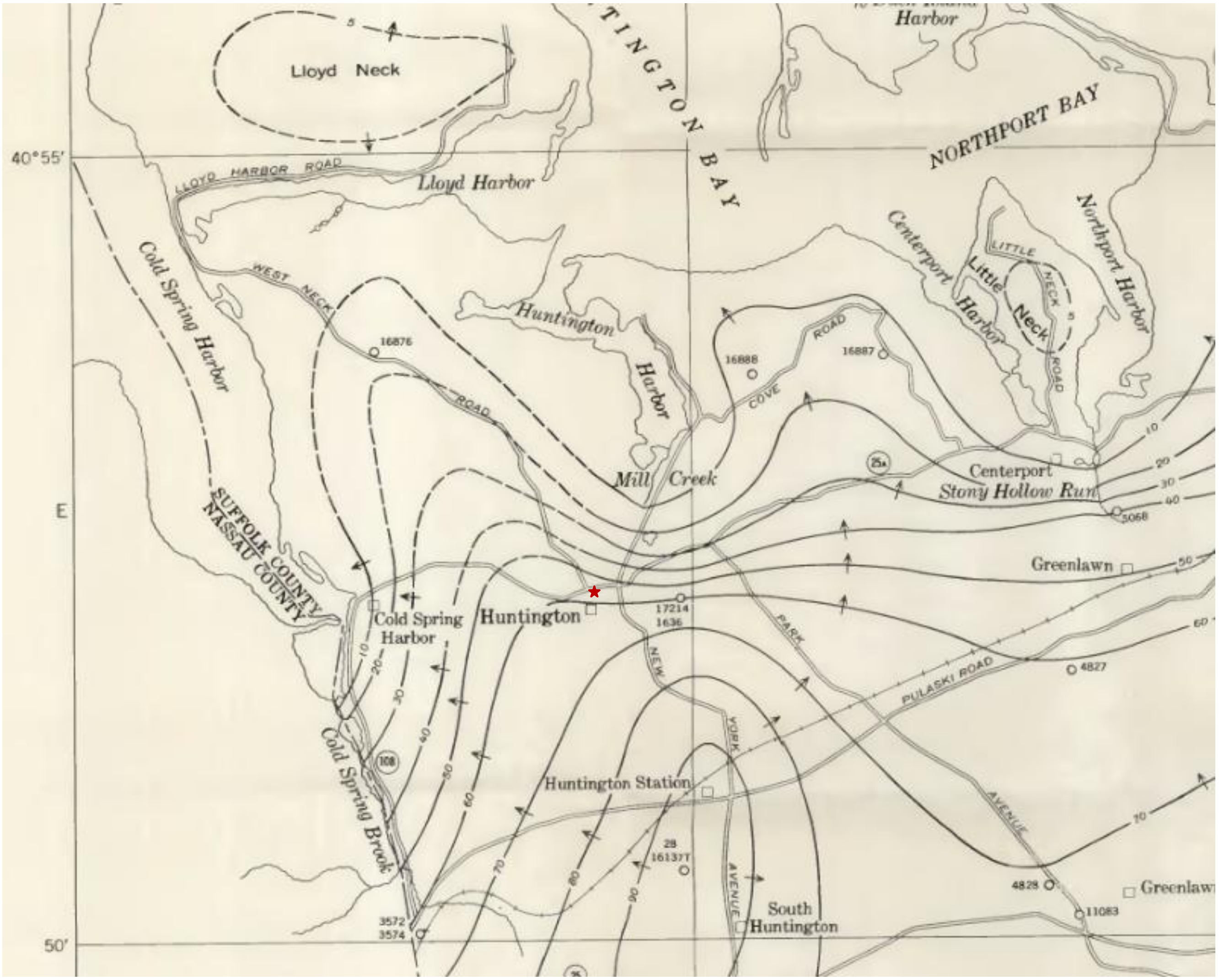


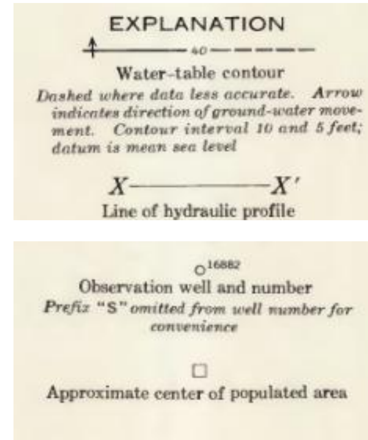
Cross-Section




Site: ★

| | | |
|---|---|---|
| **NYSDEC Site No. 152187**<br>**Country Cleaners**<br>**Huntington, New York**<br>N | Prepared for:<br>AECOM<br>Prepared by:<br>NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION | Geologic Section<br>Project No.: 60133623<br>Figure No: 5-2 August 19, 2010 |




Site: ★

From USGS (1964).

**NYSDEC Site No. 152187**
**Country Cleaners**
**Huntington, New York**

N

Prepared for:

AECOM

Prepared by:

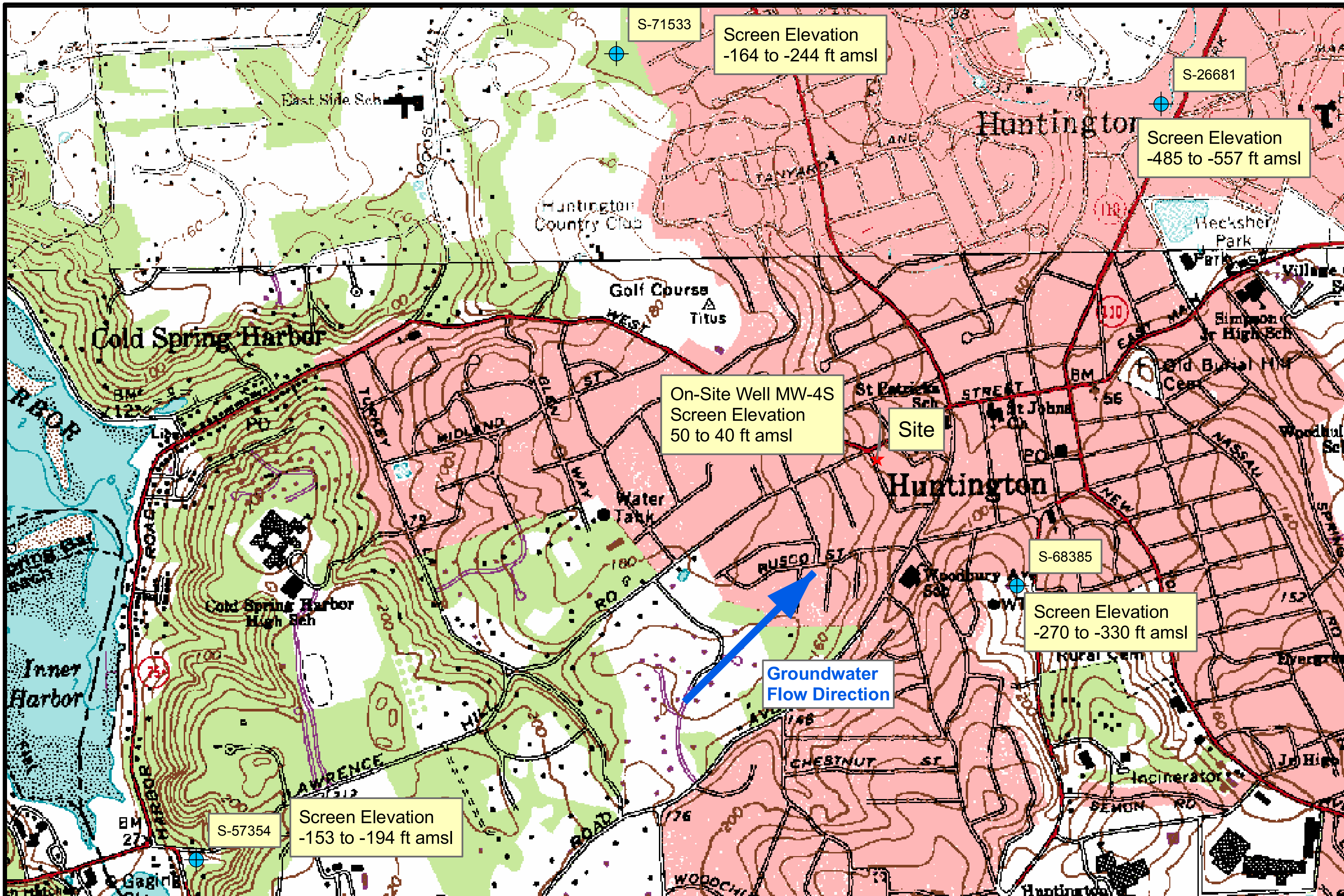
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Regional Groundwater Contours

Project No.: 60133623

Figure No: 5-3

August 19, 2010




**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 500 1,000 2,000 Feet

★ Site
Suffolk County Water Authority Potable Wells

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Suffolk County Water Authority Potable Well Locations

Project No: 60133623
Figure No: 5-4
July 29, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70 Feet

★ Site
Monitoring Well

Groundwater elevations were collected on May 27, 2010.

Prepared for: New York State Department of Environmental Conservation

Prepared by: AECOM

Groundwater Elevations - Shallow Wells

Project No: 60133623

Figure No: 5-5

Dec. 19, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70 Feet

★ Site
Monitoring Well

Groundwater elevations were collected on May 27, 2010.

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Groundwater Elevations - Deep Wells

Project No: 60133623

Figure No: 5-6

Dec. 19, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70 Feet

**PCE Concentration Contour (ug/L)**
- 100
- 200
- 300
- 400
- 500
- 600
- 700
- PCE NYS Class GA Groundwater Criterion 5 ug/L
- Extrapolation of 5 ug/L
- Shallow Wells
- Site

Labels show the assumed lowest elevation of the PCE plume (ft amsl).

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

PCE Concentration Contours - Shallow Wells

Project No: 60133623
Figure No: 6-1
July 29, 2010

Table 2-1

Direct Push Sample Intervals and Permanent Well Screening Intervals

| | MIP Location (ft bgs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Interval | 02 | 04 | 05 | 12 | 16 | 28 | 33 | 36 | 39 | 40 | 41 |
| A | Soil 15-16 | Soil 57-58 | Soil 22-23 | GW 47-50 (D) | Soil 15-16 | Soil 11-12 | Soil 17-18 | No Samples | Soil 13-14 | Soil 9-10 | Soil 10-11 |
| B | Soil 27-28 | **GW 62-65** | GW 47-50 | GW 67-70 | GW 70-72 | Soil 23-24 | Soil 25-26 | | Soil 33-34 (D) | GW 80-83 | Soil 20-21 |
| C | Soil 32-33 | GW 82-85 | GW 67-70 | GW 75-77 | GW 80-82 | Soil 51-52 | Soil 33-34 | | GW 54-56 | GW 100-103 | GW 47-50 |
| D | Soil 35-36 (D) | GW 100-103 | GW 80-83 | | | | Soil 38-40 | | GW 73-75 | | GW 65-68 |
| E | **GW 54-57 (D)** | | | | | | Soil 50-51 | | GW 90-92 (D) | | **GW 80-83** |
| F | **GW 72-75** | | | | | | **GW 52-55** | | | | |
| G | GW 97-100 | | | | | | **GW 72-75** | | | | |
| H | | | | | | | **GW 87-90** | | | | |
| I | | | | | | | **GW 100-103** | | | | |
| MIP Depth ft bgs | 100 | 110 | 88 | 88 | 117 | 118 | 103 | 60 | 96 | 129 | 88 |
| | Permanent Well Screen (ft bgs) | | | | | | | | | | |
| Well | MW-2 | MW-4 | MW-5 | --- | --- | MW-1 | MW-3 | MW-8 | MW-7 | MW-6 | --- |
| Shallow (S) | **40-60** | **60-70** | 40-50 | --- | --- | 65-75 | **50-60** | 40-50 | 50-60 | 74-84 | --- |
| Deep (D) | 84-94 | 94-104 | 60-70 | --- | --- | 97-107 | **84-94** | 75-85 | 85-95 | --- | --- |

(D) - Field duplicate collected.

Soil - Soil sample

GW - Groundwater sample

Elevated ECD Response

Low ECD Response

Below MIP Measurements

Attempted to screen MW-3D and MW-5D at lower depths, but moved screen up due to presence of a thick clay layer found throughout the study area.

No soil values exceed the NYS Residential SCO of 5.5 mg/kg for PCE.

Bold groundwater values exceed the NYS Class GA criterion of 5 ug/L for PCE.

Table 2-2
Monitoring Well Information

| Well ID | Well Depth (ft bgs) | Screen Interval Depth (ft bgs) | Screen Interval Elevation (ft amsl) | Elevation of Bottom Cap (ft amsl) | Depth to Water 5/27/10 | Groundwater Elevation 5/27/10 |
|---|---|---|---|---|---|---|
| MW-1S | 75 | 65-75 | 54.79-44.79 | 44.79 | 66.85 | 52.94 |
| MW-2 | 60 | 60-70 | 40.71-30.71 | 40.71 | 48.46 | 52.251 |
| MW-1D | 107 | 97-107 | 23.08-13.08 | 13.08 | 66.12 | 53.96 |
| MW-2D | 94 | 84-94 | 15.04-5.04 | 5.04 | 46.48 | 52.56 |
| MW-3D | 94 | 84-94 | 18.12-8.12 | 8.12 | 49.31 | 52.81 |
| MW-3S | 60 | 50-60 | 52.36-42.36 | 42.36 | 49.34 | 53.02 |
| MW-4D | 104 | 94-104 | 16.32-6.32 | 6.32 | 57.44 | 52.88 |
| MW-4S | 70 | 60-70 | 50.28-40.28 | 40.28 | 57.78 | 52.5 |
| MW-5D | 70 | 60-70 | 28.69-18.69 | 18.69 | 35.33 | 53.36 |
| MW-5S | 50 | 40-50 | 48.71-38.71 | 38.71 | 35.53 | 53.18 |
| MW-6S | 84 | 74-84 | 50.99-40.99 | 40.99 | 72.47 | 52.52 |
| MW-7D | 95 | 85-95 | 19.64-9.64 | 9.64 | 52.85 | 51.79 |
| MW-7S | 60 | 50-60 | 54.86-44.86 | 44.86 | 53.21 | 51.65 |
| MW-8D | 85 | 75-85 | 10.75-0.75 | 0.75 | 33.52 | 52.23 |
| MW-8S | 50 | 40-50 | 44.5-34.5 | 34.50 | 33.9 | 50.6 |

Note: MW-2 was installed in 1996.

Table 3-1
VOCs in Groundwater 2008 and 2009

| Station | NYS | HP-02E | HP-02E Dup | HP-02F | HP-02G | HP-04B | HP-04C | HP-04D | HP-05B | HP-05C |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (ft bgs) | Class GA | 54-57 | 54-57 | 72-75 | 97-100 | 62-65 | 82-85 | 100-103 | 47-50 | 67-70 |
| Sampling Date | | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/14/2008 | 9/14/2008 | 9/14/2008 | 9/5/2008 | 9/5/2008 |
| Units | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2,2-Tetrachloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichlorotrifluoroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1-Dichloroethane | 5 | 1 U | 1 U | 1 U | 1.1 | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1-Dichloroethene | 5 | 1 U | 1 U | 1 U | 0.76 J | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2,4-Trichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dibromo-3-Chloropropane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dibromoethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dichloroethane | 0.6 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dichloropropane | 1 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,3-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,4-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 2-Butanone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| 2-Hexanone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| 4-Methyl-2-Pentanone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Acetone | 50 | 17 | 16 | 5 U | 5 U | 13 | 5 U | 5 U | 5 U | 5 U |
| Benzene | 1 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromodichloromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1.2 |
| Bromoform | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromomethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Carbon Disulfide | 60 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Carbon Tetrachloride | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloroform | 7 | 1 U | 1 U | 1.9 | 1 U | 1 U | 1 U | 1 U | 1 U | 1.4 |
| Chloromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| cis-1,2-Dichloroethene | 5 | **31** | **33** | 1 U | 1 U | **41** | 1 U | 1 U | 1 U | 1 U |
| cis-1,3-Dichloropropene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Cyclohexane | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Dibromochloromethane | 5 | 1 U | 1 U | 0.54 J | 1 U | 1 U | 1 U | 1 U | 1 U | 2.2 |
| Dichlorodifluoromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Ethyl Benzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Isopropylbenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| m/p-Xylenes | 5 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |

Table 3-1
VOCs in Groundwater 2008 and 2009

| Station | NYS | HP-02E | HP-02E Dup | HP-02F | HP-02G | HP-04B | HP-04C | HP-04D | HP-05B | HP-05C |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (ft bgs) | Class GA | 54-57 | 54-57 | 72-75 | 97-100 | 62-65 | 82-85 | 100-103 | 47-50 | 67-70 |
| Sampling Date | | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/14/2008 | 9/14/2008 | 9/14/2008 | 9/5/2008 | 9/5/2008 |
| Units | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| Methyl Acetate | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Methyl tert-butyl Ether | 10 | 2.8 | 3.1 | 1 U | 1 U | 0.5 J | 1 U | 1.3 | 1 U | 1 U |
| Methylcyclohexane | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Methylene Chloride | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| o-Xylene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Styrene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| t-1,3-Dichloropropene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Tetrachloroethene | 5 | **1300** D | **1700** D | **11** | 1 U | **1200** D | 2.6 | 2.3 | **16** | 4.8 |
| Toluene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| trans-1,2-Dichloroethene | 5 | 1 U | 1 U | 1 U | 1 U | 0.73 J | 1 U | 1 U | 1 U | 1 U |
| Trichloroethene | 5 | **29** | **32** | 2.3 | 1 U | **29** | 1 U | 1 U | **36** | 2.8 |
| Trichlorofluoromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Vinyl Chloride | 2 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |

**Notes:**

Q - Qualifier

U - Not Detected

J - Estimated Value

D - Value from dilution

Exceedances are bolded and highlighted.

Table 3-1
VOCs in Groundwater 2008 and 2009

| Station | NYS | HP-05D | HP-12A | HP-12A (Dup) | HP-12B | HP-12C | HP-16B | HP-16C | HP-33F | HP-33G |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (ft bgs) | Class GA | 80-83 | 47-50 | 47-50 | 67-70 | 75-77 | 70-72 | 80-82 | 52-55 | 72-75 |
| Sampling Date | | 9/5/2008 | 9/17/2008 | 9/17/2008 | 9/17/2008 | 9/17/2008 | 2/9/2009 | 2/9/2009 | 9/16/2008 | 9/16/2008 |
| Units | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2,2-Tetrachloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1,2-Trichlorotrifluoroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1-Dichloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,1-Dichloroethene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2,4-Trichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dibromo-3-Chloropropane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dibromoethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dichloroethane | 0.6 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,2-Dichloropropane | 1 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,3-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 1,4-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| 2-Butanone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 4.8 J | 5 U | 5 U |
| 2-Hexanone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| 4-Methyl-2-Pentanone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U |
| Acetone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 8.4 | 19 | 5 U | 5 U |
| Benzene | 1 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.71 J | 1 U | 1 U |
| Bromodichloromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromoform | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Bromomethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Carbon Disulfide | 60 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Carbon Tetrachloride | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Chloroform | 7 | 1.2 | 1 U | 1 U | 1.5 | 2.3 | 1 U | 1 U | 1 U | 2 |
| Chloromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| cis-1,2-Dichloroethene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | **13** | 0.53 J |
| cis-1,3-Dichloropropene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Cyclohexane | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Dibromochloromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Dichlorodifluoromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Ethyl Benzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Isopropylbenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| m/p-Xylenes | 5 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |

Table 3-1
VOCs in Groundwater 2008 and 2009

| Station | NYS | HP-05D | HP-12A | HP-12A (Dup) | HP-12B | HP-12C | HP-16B | HP-16C | HP-33F | HP-33G |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (ft bgs) | Class GA | 80-83 | 47-50 | 47-50 | 67-70 | 75-77 | 70-72 | 80-82 | 52-55 | 72-75 |
| Sampling Date | | 9/5/2008 | 9/17/2008 | 9/17/2008 | 9/17/2008 | 9/17/2008 | 2/9/2009 | 2/9/2009 | 9/16/2008 | 9/16/2008 |
| Units | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| Methyl Acetate | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Methyl tert-butyl Ether | 10 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Methylcyclohexane | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Methylene Chloride | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| o-Xylene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Styrene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| t-1,3-Dichloropropene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Tetrachloroethene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.58 J | **270** D | **34** |
| Toluene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1.3 | 1 U | 1 U |
| trans-1,2-Dichloroethene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Trichloroethene | 5 | 0.71 J | 1 U | 1 U | 2.2 | 1.1 | 1 U | 1 U | **9.8** | 1.6 |
| Trichlorofluoromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Vinyl Chloride | 2 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |

**Notes:**

Q - Qualifier

U - Not Detected

J - Estimated Value

D - Value from dilution

Exceedances are bolded and highlighted.

Table 3-1
VOCs in Groundwater 2008 and 2009

| Station | NYS | HP-33H | HP-33I | HP-39C | HP-39D | HP-39E | HP-39E Dup | HP-40B | HP-40C | HP-41C |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (ft bgs) | Class GA | 87-90 | 100-103 | 54-56 | 73-75 | 90-92 | 90-92 | 80-83 | 100-103 | 47-50 |
| Sampling Date | | 9/16/2008 | 9/16/2008 | 2/9/2009 | 2/9/2009 | 2/9/2009 | 2/9/2009 | 9/4/2008 | 9/4/2008 | 9/3/2008 |
| Units | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,1,2,2-Tetrachloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,1,2-Trichloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,1,2-Trichlorotrifluoroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,1-Dichloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,1-Dichloroethene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,2,4-Trichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,2-Dibromo-3-Chloropropane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,2-Dibromoethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,2-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,2-Dichloroethane | 0.6 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,2-Dichloropropane | 1 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,3-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 1,4-Dichlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| 2-Butanone | 50 | 5 U | 5 U | 5 U | 5 | 3.8 J | 4.5 J | 5 U | 5 U | 25 U |
| 2-Hexanone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 25 U |
| 4-Methyl-2-Pentanone | 50 | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 25 U |
| Acetone | 50 | 5 U | 5 U | 7.4 | 24 | 11 | 12 | 5 U | 5 U | 13 J |
| Benzene | 1 | 1 U | 1 U | 1 U | 0.67 J | 0.7 J | 0.92 J | 1 U | 1 U | 5 U |
| Bromodichloromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Bromoform | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Bromomethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Carbon Disulfide | 60 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Carbon Tetrachloride | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Chlorobenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Chloroethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Chloroform | 7 | 1.2 | 1 U | 1 U | 0.56 J | 1.4 | 1 U | 1 U | 1 U | 5 U |
| Chloromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| cis-1,2-Dichloroethene | 5 | 1.3 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| cis-1,3-Dichloropropene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Cyclohexane | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Dibromochloromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Dichlorodifluoromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Ethyl Benzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Isopropylbenzene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| m/p-Xylenes | 5 | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 10 U |

Table 3-1
VOCs in Groundwater 2008 and 2009

| Station | NYS | HP-33H | HP-33I | HP-39C | HP-39D | HP-39E | HP-39E Dup | HP-40B | HP-40C | HP-41C |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (ft bgs) | Class GA | 87-90 | 100-103 | 54-56 | 73-75 | 90-92 | 90-92 | 80-83 | 100-103 | 47-50 |
| Sampling Date | | 9/16/2008 | 9/16/2008 | 2/9/2009 | 2/9/2009 | 2/9/2009 | 2/9/2009 | 9/4/2008 | 9/4/2008 | 9/3/2008 |
| Units | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| Methyl Acetate | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Methyl tert-butyl Ether | 10 | 1 U | 1.4 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Methylcyclohexane | NA | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Methylene Chloride | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| o-Xylene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Styrene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| t-1,3-Dichloropropene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Tetrachloroethene | 5 | **92** D | **14** | 1 U | 1.7 | 1.2 | 1.6 | 1 U | 1 U | 3.5 J |
| Toluene | 5 | 1 U | 1 U | 1 U | 1.1 | 0.99 J | 1.2 | 1 U | 1 U | 5 U |
| trans-1,2-Dichloroethene | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Trichloroethene | 5 | 2.1 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Trichlorofluoromethane | 5 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |
| Vinyl Chloride | 2 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 5 U |

**Notes:**

Q - Qualifier

U - Not Detected

J - Estimated Value

D - Value from dilution

Exceedances are bolded and highlighted.

Table 3-1
VOCs in Groundwater 2008 and 2009

| Station | NYS | HP-41D | HP-41E |
|---|---|---|---|
| Sample Depth (ft bgs) | Class GA | 65-68 | 80-83 |
| Sampling Date | | 9/3/2008 | 9/3/2008 |
| Units | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 5 | 5 U | 5 U |
| 1,1,2,2-Tetrachloroethane | 5 | 5 U | 5 U |
| 1,1,2-Trichloroethane | 5 | 5 U | 5 U |
| 1,1,2-Trichlorotrifluoroethane | 5 | 5 U | 5 U |
| 1,1-Dichloroethane | 5 | 5 U | 5 U |
| 1,1-Dichloroethene | 5 | 5 U | 5 U |
| 1,2,4-Trichlorobenzene | 5 | 5 U | 5 U |
| 1,2-Dibromo-3-Chloropropane | 5 | 5 U | 5 U |
| 1,2-Dibromoethane | 5 | 5 U | 5 U |
| 1,2-Dichlorobenzene | 5 | 5 U | 5 U |
| 1,2-Dichloroethane | 0.6 | 5 U | 5 U |
| 1,2-Dichloropropane | 1 | 5 U | 5 U |
| 1,3-Dichlorobenzene | 5 | 5 U | 5 U |
| 1,4-Dichlorobenzene | 5 | 5 U | 5 U |
| 2-Butanone | 50 | 25 U | 25 U |
| 2-Hexanone | 50 | 25 U | 25 U |
| 4-Methyl-2-Pentanone | 50 | 25 U | 25 U |
| Acetone | 50 | 25 U | 25 U |
| Benzene | 1 | 5 U | 5 U |
| Bromodichloromethane | 5 | 5 U | 5 U |
| Bromoform | 5 | 5 U | 5 U |
| Bromomethane | 5 | 5 U | 5 U |
| Carbon Disulfide | 60 | 5 U | 5 U |
| Carbon Tetrachloride | 5 | 5 U | 5 U |
| Chlorobenzene | 5 | 5 U | 5 U |
| Chloroethane | 5 | 5 U | 5 U |
| Chloroform | 7 | 5 U | 1.3 J |
| Chloromethane | 5 | 5 U | 5 U |
| cis-1,2-Dichloroethene | 5 | 5 U | 5 U |
| cis-1,3-Dichloropropene | 5 | 5 U | 5 U |
| Cyclohexane | NA | 5 U | 5 U |
| Dibromochloromethane | 5 | 5 U | 5 U |
| Dichlorodifluoromethane | 5 | 5 U | 5 U |
| Ethyl Benzene | 5 | 5 U | 5 U |
| Isopropylbenzene | 5 | 5 U | 5 U |
| m/p-Xylenes | 5 | 10 U | 10 U |

Table 3-1
VOCs in Groundwater 2008 and 2009

| Station | NYS | HP-41D | HP-41E |
|---|---|---|---|
| Sample Depth (ft bgs) | Class GA | 65-68 | 80-83 |
| Sampling Date | | 9/3/2008 | 9/3/2008 |
| Units | ug/L | ug/L | ug/L |
| Methyl Acetate | NA | 5 U | 5 U |
| Methyl tert-butyl Ether | 10 | 5 U | 5 U |
| Methylcyclohexane | NA | 5 U | 5 U |
| Methylene Chloride | 5 | 5 U | 5 U |
| o-Xylene | 5 | 5 U | 5 U |
| Styrene | 5 | 5 U | 5 U |
| t-1,3-Dichloropropene | 5 | 5 U | 5 U |
| Tetrachloroethene | 5 | 1.8 J | **22** |
| Toluene | 5 | 5 U | 5 U |
| trans-1,2-Dichloroethene | 5 | 5 U | 5 U |
| Trichloroethene | 5 | 5 U | 5 U |
| Trichlorofluoromethane | 5 | 5 U | 5 U |
| Vinyl Chloride | 2 | 5 U | 5 U |

**Notes:**

Q - Qualifier

U - Not Detected

J - Estimated Value

D - Value from dilution

Exceedances are bolded and highlighted.

Table 3-2
VOCs in Soil Samples 2008 and 2009

| Station | NYS | SS-02A | SS-02B | SS-02C | SS-02D | SS-02D Dup | SS-04A | SS-05A | SB-16A | SS-28A |
|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample Number | Residential | Z4567-07 | Z4567-08 | Z4567-09 | Z4567-10 | Z4567-11 | Z4567-01 | Z4447-01 | A1459-06 | Z4619-01 |
| Sampling Date | Residential | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/14/2008 | 9/5/2008 | 2/9/2009 | 9/19/2008 |
| Sample Depth (ft) | | 15-16 | 27-28 | 32-33 | 35-36 | 35-36 | 57-58 | 22-23 | 15-16 | 11-12 |
| Units | mg/kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg |
| 1,1,1-Trichloroethane | 100 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,1,2,2-Tetrachloroethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,1,2-Trichloroethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,1,2-Trichlorotrifluoroethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,1-Dichloroethane | 19 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,1-Dichloroethene | 100 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,2,4-Trichlorobenzene | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,2-Dibromo-3-Chloropropane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,2-Dibromoethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,2-Dichlorobenzene | 100 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,2-Dichloroethane | 2.3 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,2-Dichloropropane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,3-Dichlorobenzene | 17 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 1,4-Dichlorobenzene | 9.8 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| 2-Butanone | 100 | 0.029 U | 0.032 U | 0.026 U | 0.025 U | 0.025 U | 0.026 U | 0.026 U | 0.027 U | 0.026 U |
| 2-Hexanone | NA | 0.029 U | 0.032 U | 0.026 U | 0.025 U | 0.025 U | 0.026 U | 0.026 U | 0.027 U | 0.026 U |
| 4-Methyl-2-Pentanone | NA | 0.029 U | 0.032 U | 0.026 U | 0.025 U | 0.025 U | 0.026 U | 0.026 U | 0.027 U | 0.026 U |
| Acetone | 100 | 0.029 U | 0.032 U | 0.026 U | 0.025 U | 0.025 U | 0.026 U | 0.026 U | 0.027 U | 0.026 U |
| Benzene | 2.9 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Bromodichloromethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Bromoform | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Bromomethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Carbon Disulfide | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Carbon Tetrachloride | 1.4 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Chlorobenzene | 100 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Chloroethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Chloroform | 10 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Chloromethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| cis-1,2-Dichloroethene | 59 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| cis-1,3-Dichloropropene | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Cyclohexane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Dibromochloromethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Dichlorodifluoromethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Ethyl Benzene | 30 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Isopropylbenzene | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |

Table 3-2
VOCs in Soil Samples 2008 and 2009

| Station | NYS | SS-02A | SS-02B | SS-02C | SS-02D | SS-02D Dup | SS-04A | SS-05A | SB-16A | SS-28A |
|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample Number | Residential | Z4567-07 | Z4567-08 | Z4567-09 | Z4567-10 | Z4567-11 | Z4567-01 | Z4447-01 | A1459-06 | Z4619-01 |
| Sampling Date | Residential | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/15/2008 | 9/14/2008 | 9/5/2008 | 2/9/2009 | 9/19/2008 |
| Sample Depth (ft) | | 15-16 | 27-28 | 32-33 | 35-36 | 35-36 | 57-58 | 22-23 | 15-16 | 11-12 |
| Units | mg/kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg |
| m/p-Xylenes | NA | 0.012 U | 0.013 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.011 U | 0.01 U |
| Methyl Acetate | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Methyl tert-butyl Ether | 62 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Methylcyclohexane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Methylene Chloride | 51 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| o-Xylene | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Styrene | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| t-1,3-Dichloropropene | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Tetrachloroethene | 5.5 | 0.004 J | 0.12 | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Toluene | 100 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| trans-1,2-Dichloroethene | 100 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Trichloroethene | 10 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Trichlorofluoromethane | NA | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |
| Vinyl Chloride | 0.21 | 0.0058 U | 0.0064 U | 0.0051 U | 0.0051 U | 0.0051 U | 0.0052 U | 0.0051 U | 0.0055 U | 0.0052 U |

**Notes:**

Q - Qualifier

U - Not Detected

J - Estimated Value

D - Value with Secondary Analysis with a Diluted Factor

Table 3-2
VOCs in Soil Samples 2008 and 2009

| Station | NYS | SS-28B | SS-28C | SS-33A | SS-33B | SS-33C | SS-33D | SS-33E | SB-39A | SB-39B |
|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample Number | Residential | Z4619-02 | Z4619-03 | Z4572-01 | Z4572-02 | Z4572-03 | Z4572-04 | Z4572-05 | A1459-01 | A1459-05 |
| Sampling Date | Residential | 9/19/2008 | 9/19/2008 | 9/16/2008 | 9/16/2008 | 9/16/2008 | 9/16/2008 | 9/16/2008 | 2/9/2009 | 2/9/2009 |
| Sample Depth (ft) | | 23-24 | 51-52 | 17-18 | 25-26 | 33-34 | 38-40 | 50-51 | 13-14 | 33-34 |
| Units | mg/kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg |
| 1,1,1-Trichloroethane | 100 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,1,2,2-Tetrachloroethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,1,2-Trichloroethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,1,2-Trichlorotrifluoroethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,1-Dichloroethane | 19 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,1-Dichloroethene | 100 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,2,4-Trichlorobenzene | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,2-Dibromo-3-Chloropropane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,2-Dibromoethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,2-Dichlorobenzene | 100 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,2-Dichloroethane | 2.3 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,2-Dichloropropane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,3-Dichlorobenzene | 17 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 1,4-Dichlorobenzene | 9.8 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| 2-Butanone | 100 | 0.026 U | 0.026 U | 0.026 U | 0.026 U | 0.031 U | 0.026 U | 0.027 U | 0.029 U | 0.031 U |
| 2-Hexanone | NA | 0.026 U | 0.026 U | 0.026 U | 0.026 U | 0.031 U | 0.026 U | 0.027 U | 0.029 U | 0.031 U |
| 4-Methyl-2-Pentanone | NA | 0.026 U | 0.026 U | 0.026 U | 0.026 U | 0.031 U | 0.026 U | 0.027 U | 0.029 U | 0.031 U |
| Acetone | 100 | 0.026 U | 0.026 U | 0.026 U | 0.026 U | 0.031 U | 0.026 U | 0.027 U | 0.029 U | 0.031 U |
| Benzene | 2.9 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Bromodichloromethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Bromoform | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Bromomethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Carbon Disulfide | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Carbon Tetrachloride | 1.4 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Chlorobenzene | 100 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Chloroethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Chloroform | 10 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Chloromethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| cis-1,2-Dichloroethene | 59 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.014 | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| cis-1,3-Dichloropropene | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Cyclohexane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Dibromochloromethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Dichlorodifluoromethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Ethyl Benzene | 30 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Isopropylbenzene | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |

Table 3-2
VOCs in Soil Samples 2008 and 2009

| Station | NYS | SS-28B | SS-28C | SS-33A | SS-33B | SS-33C | SS-33D | SS-33E | SB-39A | SB-39B |
|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample Number | Residential | Z4619-02 | Z4619-03 | Z4572-01 | Z4572-02 | Z4572-03 | Z4572-04 | Z4572-05 | A1459-01 | A1459-05 |
| Sampling Date | Residential | 9/19/2008 | 9/19/2008 | 9/16/2008 | 9/16/2008 | 9/16/2008 | 9/16/2008 | 9/16/2008 | 2/9/2009 | 2/9/2009 |
| Sample Depth (ft) | | 23-24 | 51-52 | 17-18 | 25-26 | 33-34 | 38-40 | 50-51 | 13-14 | 33-34 |
| Units | mg/kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg |
| m/p-Xylenes | NA | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.012 U | 0.01 U | 0.011 U | 0.012 U | 0.012 U |
| Methyl Acetate | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Methyl tert-butyl Ether | 62 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Methylcyclohexane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Methylene Chloride | 51 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| o-Xylene | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Styrene | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| t-1,3-Dichloropropene | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Tetrachloroethene | 5.5 | 0.0052 U | 0.0058 | 0.0052 U | 0.012 | 2.5 D | 0.0052 U | 0.0068 | 0.0058 U | 0.0062 U |
| Toluene | 100 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| trans-1,2-Dichloroethene | 100 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Trichloroethene | 10 | 0.0052 U | 0.012 | 0.0052 U | 0.0052 U | 0.012 | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Trichlorofluoromethane | NA | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |
| Vinyl Chloride | 0.21 | 0.0052 U | 0.0051 U | 0.0052 U | 0.0052 U | 0.0062 U | 0.0052 U | 0.0054 U | 0.0058 U | 0.0062 U |

**Notes:**

Q - Qualifier

U - Not Detected

J - Estimated Value

D - Value with Secondary Analysis with a Diluted Facto

Table 3-2
VOCs in Soil Samples 2008 and 2009

| Station | NYS | SB-39B Dup | SS-40A | SS-41A | SS-41B |
|---|---|---|---|---|---|
| Lab Sample Number | Residential | A1459-04 | Z4429-01 | Z4406-01 | Z4406-02 |
| Sampling Date | Residential | 2/9/2009 | 9/4/2008 | 9/3/2008 | 9/3/2008 |
| Sample Depth (ft) | | 33-34 | 9-10 | 10-11 | 20-21 |
| Units | mg/kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg |
| 1,1,1-Trichloroethane | 100 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,1,2,2-Tetrachloroethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,1,2-Trichloroethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,1,2-Trichlorotrifluoroethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,1-Dichloroethane | 19 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,1-Dichloroethene | 100 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,2,4-Trichlorobenzene | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,2-Dibromo-3-Chloropropane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,2-Dibromoethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,2-Dichlorobenzene | 100 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,2-Dichloroethane | 2.3 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,2-Dichloropropane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,3-Dichlorobenzene | 17 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 1,4-Dichlorobenzene | 9.8 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| 2-Butanone | 100 | 0.031 U | 0.026 U | 0.026 U | 0.026 U |
| 2-Hexanone | NA | 0.031 U | 0.026 U | 0.026 U | 0.026 U |
| 4-Methyl-2-Pentanone | NA | 0.031 U | 0.026 U | 0.026 U | 0.026 U |
| Acetone | 100 | 0.031 U | 0.026 U | 0.026 U | 0.026 U |
| Benzene | 2.9 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Bromodichloromethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Bromoform | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Bromomethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Carbon Disulfide | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Carbon Tetrachloride | 1.4 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Chlorobenzene | 100 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Chloroethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Chloroform | 10 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Chloromethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| cis-1,2-Dichloroethene | 59 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| cis-1,3-Dichloropropene | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Cyclohexane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Dibromochloromethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Dichlorodifluoromethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Ethyl Benzene | 30 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Isopropylbenzene | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |

Table 3-2
VOCs in Soil Samples 2008 and 2009

| Station | NYS | SB-39B Dup | SS-40A | SS-41A | SS-41B |
|---|---|---|---|---|---|
| Lab Sample Number | Residential | A1459-04 | Z4429-01 | Z4406-01 | Z4406-02 |
| Sampling Date | Residential | 2/9/2009 | 9/4/2008 | 9/3/2008 | 9/3/2008 |
| Sample Depth (ft) | | 33-34 | 9-10 | 10-11 | 20-21 |
| Units | mg/kg | mg/Kg | mg/Kg | mg/Kg | mg/Kg |
| m/p-Xylenes | NA | 0.012 U | 0.01 U | 0.01 U | 0.011 U |
| Methyl Acetate | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Methyl tert-butyl Ether | 62 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Methylcyclohexane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Methylene Chloride | 51 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| o-Xylene | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Styrene | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| t-1,3-Dichloropropene | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Tetrachloroethene | 5.5 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0026 J |
| Toluene | 100 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| trans-1,2-Dichloroethene | 100 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Trichloroethene | 10 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Trichlorofluoromethane | NA | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |
| Vinyl Chloride | 0.21 | 0.0062 U | 0.0052 U | 0.0051 U | 0.0053 U |

**Notes:**

Q - Qualifier

U - Not Detected

J - Estimated Value

D - Value with Secondary Analysis with a Diluted Facto

Table 3-3
VOCs in Groundwater 2010

| WELL ID | NYS | MW-1S | | MW-1D | | MW-2S | | MW-2D | | MW-3S | | MW-3S (Dup) | | MW-3D | | MW-4S | | MW-4D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | Class GA | 1/30/2010 | | 1/30/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | |
| SAMPLE MATRIX | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | |
| 1,1,1-Trichloroethane | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,1,2,2-Tetrachloroethane | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 5 | 5 | U | 5 | U | 25 | U | 5 | U | 25 | U | 25 | U | 5 | U | 25 | U | 5 | U |
| 1,1,2-Trichloroethane | 1 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,1-Dichloroethane | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,1-Dichloroethene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,2,3-Trichloropropane | 0.04 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,2,4-Trimethylbenzene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,2-Dichlorobenzene | 3 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,2-Dichloroethane | 0.6 | 0.5 | UJ | 0.5 | UJ | 2.5 | U | 0.5 | U | 2.5 | U | 2.5 | U | 0.5 | UJ | 2.5 | U | 0.5 | UJ |
| 1,2-Dichloropropane | 1 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,3,5-Trimethylbenzene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,3-Dichlorobenzene | 3 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,3-Dichloropropane | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,4-Dichlorobenzene | 3 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 1,4-Dioxane | NA | | R | | R | | R | | R | | R | | R | | R | | R | | R |
| 2-Butanone | 50 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 2-Chloroethylvinylether | NA | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 2-Hexanone | 50 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 4-Isopropyltoluene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| 4-Methyl-2-pentanone | 50 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Acetone | 50 | 5 | U | 5 | U | 25 | U | 5 | U | 25 | U | 25 | U | 5 | U | 25 | U | 5 | U |
| Acrolein | 5 | 5 | U | 5 | U | 25 | UJ | 5 | UJ | 25 | UJ | 25 | UJ | 5 | U | 25 | UJ | 5 | U |
| Acrylonitrile | 5 | 2 | U | 2 | U | 10 | U | 2 | U | 10 | U | 10 | U | 2 | U | 10 | U | 2 | U |
| Benzene | 1 | 0.5 | U | 0.5 | U | 2.5 | U | 0.5 | U | 2.5 | U | 2.5 | U | 0.5 | U | 2.5 | U | 0.5 | U |
| Bromodichloromethane | 50 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Bromoform | 50 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Bromomethane | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Carbon disulfide | 60 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Carbon tetrachloride | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Chlorobenzene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Chloroethane | 5 | 1 | UJ | 1 | UJ | 5 | U | 1 | U | 5 | U | 5 | U | 1 | UJ | 5 | U | 1 | UJ |
| Chloroform | 7 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |

Table 3-3
VOCs in Groundwater 2010

| WELL ID | NYS | MW-1S | | MW-1D | | MW-2S | | MW-2D | | MW-3S | | MW-3S (Dup) | | MW-3D | | MW-4S | | MW-4D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | Class GA | 1/30/2010 | | 1/30/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | | 1/31/2010 | |
| SAMPLE MATRIX | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | |
| Chloromethane | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| cis-1,2-Dichloroethene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | **9.3** | | 1 | U |
| cis-1,3-Dichloropropene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Dibromochloromethane | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Dichlorodifluoromethane | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Ethylbenzene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Isopropylbenzene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| m&p-Xylenes | 5 | 1 | UJ | 1 | UJ | 5 | U | 1 | U | 5 | U | 5 | U | 1 | UJ | 5 | U | 1 | UJ |
| Methylene chloride | 5 | 1 | U | 1 | U | 5 | UJ | 1 | UJ | 5 | UJ | 5 | UJ | 1 | U | 5 | UJ | 1 | U |
| Methyl-t-butyl ether | 10 | 0.5 | U | 0.51 | | 2.5 | U | 0.5 | U | 2.5 | U | 2.5 | U | 0.5 | U | 2.5 | U | 0.58 | |
| n-Butylbenzene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| n-Propylbenzene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| o-Xylene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| sec-Butylbenzene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Styrene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| t-Butyl Alcohol | NA | | R | | R | | R | | R | | R | | R | | R | | R | | R |
| t-Butylbenzene | 5 | 1 | U | 1 | U | 5 | UJ | 1 | UJ | 5 | UJ | 5 | UJ | 1 | U | 5 | UJ | 1 | U |
| Tetrachloroethene | 5 | 1 | U | 1 | U | **630** | | 1 | U | **560** | | **530** | | 1 | U | **680** | | 1 | U |
| Toluene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| trans-1,2-Dichloroethene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| trans-1,3-Dichloropropene | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Trichloroethene | 5 | 1 | U | 1 | U | **8** | | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Trichlorofluoromethane | 5 | 1 | UJ | 1 | UJ | 5 | U | 1 | U | 5 | U | 5 | U | 1 | UJ | 5 | U | 1 | UJ |
| Vinyl chloride | 2 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |
| Xylenes (Total) | 5 | 1 | U | 1 | U | 5 | U | 1 | U | 5 | U | 5 | U | 1 | U | 5 | U | 1 | U |

**Notes:**

All units are in ug/L

ND - Not Detected

NA - Not Available

Exceedances are bolded

Table 3-3
VOCs in Groundwater 2010

| WELL ID | NYS | MW-5S | | MW-5D | | MW-6S | | MW-7S | | MW-7D | | MW-8S | | MW-8D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | Class GA | 1/30/2010 | | 1/30/2010 | | 2/1/2010 | | 1/29/2010 | | 1/29/2010 | | 2/1/2010 | | 2/1/2010 | |
| SAMPLE MATRIX | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | |
| 1,1,1-Trichloroethane | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,1,2,2-Tetrachloroethane | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 5 | 5 | U | 5 | U | 5 | U | 5 | U | 5 | U | 5 | U | 5 | U |
| 1,1,2-Trichloroethane | 1 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,1-Dichloroethane | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,1-Dichloroethene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,2,3-Trichloropropane | 0.04 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,2,4-Trimethylbenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,2-Dichlorobenzene | 3 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,2-Dichloroethane | 0.6 | 0.5 | UJ | 0.5 | UJ | 0.5 | UJ | 0.5 | UJ | 0.5 | UJ | 0.5 | UJ | 0.5 | U |
| 1,2-Dichloropropane | 1 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,3,5-Trimethylbenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,3-Dichlorobenzene | 3 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,3-Dichloropropane | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,4-Dichlorobenzene | 3 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 1,4-Dioxane | NA | | R | | R | | R | | R | | R | | R | | R |
| 2-Butanone | 50 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 2-Chloroethylvinylether | NA | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 2-Hexanone | 50 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 4-Isopropyltoluene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| 4-Methyl-2-pentanone | 50 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Acetone | 50 | 5 | U | 5 | U | 5 | U | 5 | U | 5 | U | 5 | U | 5 | U |
| Acrolein | 5 | 5 | U | 5 | U | 5 | U | 5 | U | 5 | U | 5 | U | 5 | UJ |
| Acrylonitrile | 5 | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U |
| Benzene | 1 | 0.5 | U | 0.5 | U | 0.5 | U | 0.5 | U | 0.5 | U | 0.5 | U | 0.5 | U |
| Bromodichloromethane | 50 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Bromoform | 50 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Bromomethane | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Carbon disulfide | 60 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Carbon tetrachloride | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Chlorobenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Chloroethane | 5 | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | U |
| Chloroform | 7 | 1 | U | 1 | U | 1 | U | 3.3 | | 1 | U | 1 | U | 1 | U |

Table 3-3
VOCs in Groundwater 2010

| WELL ID | NYS | MW-5S | | MW-5D | | MW-6S | | MW-7S | | MW-7D | | MW-8S | | MW-8D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | Class GA | 1/30/2010 | | 1/30/2010 | | 2/1/2010 | | 1/29/2010 | | 1/29/2010 | | 2/1/2010 | | 2/1/2010 | |
| SAMPLE MATRIX | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | |
| Chloromethane | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| cis-1,2-Dichloroethene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| cis-1,3-Dichloropropene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Dibromochloromethane | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Dichlorodifluoromethane | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Ethylbenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Isopropylbenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| m&p-Xylenes | 5 | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | U |
| Methylene chloride | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | UJ |
| Methyl-t-butyl ether | 10 | 0.5 | U | 0.5 | U | 0.5 | U | 0.5 | U | 0.5 | U | 0.5 | U | 0.5 | U |
| n-Butylbenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| n-Propylbenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| o-Xylene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| sec-Butylbenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Styrene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| t-Butyl Alcohol | NA | | R | | R | | R | | R | | R | | R | | R |
| t-Butylbenzene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | UJ |
| Tetrachloroethene | 5 | 1.1 | | 1 | U | 1 | U | **42** | | 1 | U | **21** | | 1 | U |
| Toluene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| trans-1,2-Dichloroethene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| trans-1,3-Dichloropropene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Trichloroethene | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Trichlorofluoromethane | 5 | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | UJ | 1 | U |
| Vinyl chloride | 2 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |
| Xylenes (Total) | 5 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U |

**Notes:**

All units are in ug/L

ND - Not Detected

NA - Not Available

Exceedances are bolded

Table 3-4
Metals and Other Parameters in Groundwater 2010

| WELL ID | NYS | Units | MW-2S | MW-2S | MW-3S | MW-3S (Dup) | MW-3S | MW-3S (Dup) | MW-8S | MW-8S |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | Class GA | | 1/31/2010 | 1/31/2010 | 1/31/2010 | 1/31/2010 | 1/31/2010 | 1/31/2010 | 2/1/2010 | 2/1/2010 |
| SAMPLE MATRIX | Criteria | | Whole Water | Filtered | Whole Water | Whole Water | Filtered | Filtered | Whole Water | Filtered |
| Iron | 300 | ug/L | **500** | 150 U | **340** | **430** | 150 U | 150 U | 200 | 150 U |
| Manganese | 300 | ug/L | 25 U | 25 U | 25 U | 28 | 25 U | 25 U | 25 U | 25 U |
| Ethane | NA | ug/L | 0.025 U | NS | 0.006 J | 0.006 J | NS | NS | 0.006 J | NS |
| Ethene | NA | ug/L | 0.025 J | NS | 0.019 J | 0.031 | NS | NS | 0.026 | NS |
| Methane | NA | ug/L | 0.110 | NS | 0.660 | 0.340 | NS | NS | 0.220 | NS |
| Alkalinity | NA | mg CaCO3/l | 31 | NS | 28 | 31 | NS | NS | 28 | NS |
| Ammonia | 2000 | mg/l | 0.27 | NS | 0.41 | 0.28 | NS | NS | 0.31 | NS |
| Biochemical Oxygen Demand, 5 Day | NA | mg/L | 2 U | NS | 2 U | 2 U | NS | NS | 2 U | NS |
| Chloride | 250000 | mg/L | 40 | NS | 36 | 36 | NS | NS | 45 | NS |
| Chemical Oxygen Demand | NA | mg/l | 5 U | NS | 5 U | 5 U | NS | NS | 5 U | NS |
| Nitrate | 10000 | mg/L | 3.3 | NS | 3.6 | 3.7 | NS | NS | 3.7 | NS |
| Phosphorus (Total) | NA | mg/l | 0.11 | NS | 0.065 | 0.098 | NS | NS | 0.074 | NS |
| Sulfate | 250000 | mg/L | 30 | NS | 23 | 23 | NS | NS | 36 | NS |
| Sulfide (Total) | 50 | mg/l | 2 U | NS | 2 U | 2 | NS | NS | 2 U | NS |
| Total Organic Carbon | NA | mg/l | 1 U | NS | 1 U | 1.1 | NS | NS | 1 U | NS |

**Notes:**

All units are in ug/L

NA - Not Available

NS - No Sample

Dup - Field Duplicate

Exceedances are bolded

Table 3-5
TOC and Particle Size - Soil 2009 to 2010

| WELL ID | MW-2D | MW-4S |
|---|---|---|
| SAMPLING DATE | 12/16/2009 | 1/4/2010 |
| SAMPLE DEPTH (ft) | 54-56 | 60-62 |
| % Solids | 86 | 92 |
| Total Organic Carbon (mg/kg) | ND | 2,000 |
| % Gravel | 13.7 | 26.9 |
| % Sand | 78.7 | 67.3 |
| %Coarse Sand | 6.3 | 11.3 |
| % Medium Sand | 22.6 | 28.4 |
| % Fine Sand | 49.8 | 27.6 |
| % Fines | 7.6 | 5.8 |
| **Sieve #** | | |
| 1-1/2" | 100 | |
| **3/4"** | 95.7 | 100 |
| 3/8" | 91.4 | 85.4 |
| 4 | 86.3 | 73.1 |
| 10 | 80 | 61.8 |
| 20 | 73.1 | 51.1 |
| 40 | 57.4 | 33.4 |
| 60 | 35.4 | 19.3 |
| 100 | 16.9 | 10.2 |
| 200 | 7.6 | 5.8 |
| USCS | SP-SM | SP-SM |
| Description | Brown, Poorly-graded Sand with Silt | Brown, Poorly-graded Sand with Silt and Gravel |

Table 7-1
Properties of PCE

| CAS No. | Chemical | Org. Car. partition coefficient $K_{oc}$ ($cm^3/g$) | Log $K_{oc}$ (unitless) | Diffusivity in air $D_a$ ($cm^2/s$) | Diffusivity in water $D_w$ ($cm^2/s$) | Pure component water sol S (mg/L) | Henry's Law Constant H' (unitless) | Normal boiling point (bp) $T_B$ ($^oC$) | Density (Specific Gravity) $\rho$ ($g/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|
| 127184 | Tetrachloroethene (PCE) | 1.55E+02 | 2.19E+00 | 7.20E-02 | 8.20E-06 | 2.00E+02 | 7.53E-01 | 121.3 | 1.624 |

Table adapted from NJDEP (2007; Table G-2)

**NOTES**

[d]Calculated using USEPA (2001b)

[e]From Hazardous Substances Databank (2004)

Table 7-2
Groundwater Flow and Contaminant Migration

| CONTAMINANT | EFFECTIVE POROSITY | PARTITON $K_{oc}$ | CARBON $f_{oc}$ | DENSITY $P_b$ | RETARDATION Rd | CONTAM. TRANSPORT FT/DAY | FT/YEAR | DISTANCE FT | TIME[2] (YRS) |
|---|---|---|---|---|---|---|---|---|---|
| **Assuming USGS (1964) Groundwater Flow Velocity for Pleistocene Deposits** | | | | | | | | | |
| PCE - Groundwater Flow 1.1 ft/day | 0.060 | 155 | 0.002 | 1.7 | 9.78 | 0.11 | 41.0 | 4865 | 119 |
| PCE - Groundwater Flow 0.8 ft/day | 0.060 | 155 | 0.002 | 1.7 | 9.78 | 0.08 | 29.8 | 4865 | 163 |

1. Distance to the nearest Suffolk County Water Authority production well S-26681.
2. Estimated time required for the contaminant to reach well S-26681.
3. Fraction organic carbon (Foc) in sample collected during installation of MW-4S at 60-62 ft bgs.
4. The Koc value was obtained from www.state.nj.us/dep/srp/vaporintrusion.htm.
5. The effective porosity assumes the aquifer is predominantly fine sand.

Table 7-3
Degradation Processes

| Degradation Process | Compound | | | |
|---|---|---|---|---|
| | **PCE** | **TCE** | **DCE** | **VC** |
| Aerobic Oxidation | N | N | P | Y |
| Aerobic Co-metabolism | N | Y | Y | Y |
| Anaerobic Oxidation | N | N | P | Y |
| Anaerobic Reductive Dechlorination | Y | Y | Y | Y |
| Co-metabolic Anaerobic Reduction | Y | Y | Y | Y |

PCE = tetrachloroethene, TCE = trichloroethene, DCE = 1,2-dichloroethene, VC = vinyl chloride
N = Not documented in the literature.
Y = Documented in the literature.
P = Potential for reaction to occur but not well documented in the literature.
Adapted from ITRC, 1999

Table 8-1
Shallow Wells - Groundwater Concentration Summary Statistics

| Parameter | CAS | Detection Frequency | Detection Limit Range | Minimum Detected Value | Maximum Detected Value | Maximum Detected Sample | NYSDEC Class GA Groundwater Criteria | Number of Exceed-ances | NYS MCL | Number of Exceed-ances | EPA MCL | Number of Exceed-ances |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Shallow Wells** | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | |
| Chloroform | 67-66-3 | 1 / 8 | 1 - 5 | 3.3 | 3.3 | MW-7S | 7 | 0 | 50 | 0 | 80 | 0 |
| cis-1,2-Dichloroethene | 156-59-2 | 1 / 8 | 1 - 5 | 9.3 | 9.3 | MW-4S | 5 | **1** | 5 | **1** | 70 | 0 |
| Tetrachloroethene (PCE) | 127-18-4 | 6 / 8 | 1 - 5 | 1.1 | 680 | MW-4S | 5 | **5** | 5 | **5** | 5 | **5** |
| Trichloroethene (TCE) | 79-01-6 | 1 / 8 | 1 - 5 | 8 | 8 | MW-2S | 5 | **1** | 5 | **1** | 5 | **1** |
| **Inorganics-Total (ug/L)** | | | | | | | | | | | | |
| Iron | 7439-89-6 | 3 / 3 | 150 - 150 | 200 | 500 | MW-2S | 300 | **2** | 300 | **2** | NL | -- |
| Manganese | 7439-96-5 | 0 / 3 | 25 - 25 | -- | -- | -- | 300 | 0 | 300 | 0 | NL | 0 |
| **Inorganics-Filtered (ug/L)** | | | | | | | | | | | | |
| Iron | 7439-89-6 | 0 / 3 | 150 - 150 | -- | -- | -- | 300 | 0 | 300 | 0 | NL | 0 |
| Manganese | 7439-96-5 | 0 / 3 | 25 - 25 | -- | -- | -- | 300 | 0 | 300 | 0 | NL | 0 |
| **Shallow Hydropunch Samples** | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | |
| 2-Butanone | 78-93-3 | 1 / 10 | 5 - 25 | 4.8 | 4.8 | HP-16C | 50 | 0 | 50 | 0 | NL | -- |
| Acetone | 67-64-1 | 6 / 10 | 5 - 25 | 7.4 | 19 | HP-16C | 50 | 0 | 50 | 0 | NL | -- |
| Benzene | 71-43-2 | 1 / 10 | 1 - 5 | 0.71 | 0.71 | HP-16C | 1 | 0 | 5 | 0 | 5 | 0 |
| cis-1,2-Dichloroethene | 156-59-2 | 3 / 10 | 1 - 5 | 13 | 41 | HP-04B | 5 | **3** | 5 | **3** | 70 | 0 |
| Methyl tert-butyl Ether | 1634-04-4 | 2 / 10 | 1 - 5 | 0.5 | 2.95 | HP-02E | NL | -- | 10 | 0 | NL | -- |
| Tetrachloroethene (PCE) | 127-18-4 | 6 / 10 | 1 - 5 | 0.58 | 1,500 | HP-02E | 5 | **4** | 5 | **4** | 5 | **4** |
| Toluene | 108-88-3 | 1 / 10 | 1 - 5 | 1.3 | 1.3 | HP-16C | 5 | 0 | 5 | 0 | 1000 | 0 |
| trans-1,2-Dichloroethene | 156-60-5 | 1 / 10 | 1 - 5 | 0.73 | 0.73 | HP-04B | 5 | 0 | 5 | 0 | 100 | 0 |
| Trichloroethene (TCE) | 79-01-6 | 4 / 10 | 1 - 5 | 9.8 | 36 | HP-05B | 5 | **4** | 5 | **4** | 5 | **4** |

Table 8-2

Deep Wells - Groundwater Concentration Summary Statistics

| Parameter | CAS | Detection Frequency | Detection Limit Range | Minimum Detected Value | Maximum Detected Value | Maximum Detected Sample | NYSDEC Class GA Groundwater Criteria | Number of Exceed-ances | NYS MCL | Number of Exceed-ances | EPA MCL | Number of Exceed-ances |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deep Wells** | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | |
| Methyl tert-butyl Ether | 1634-04-4 | 2 / 7 | 0.5 - 0.5 | 0.51 | 0.58 | MW-4D | NL | -- | 10 | 0 | NL | -- |
| **Deep Hydropunch Samples** | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | |
| 1,1-Dichloroethane | 75-34-3 | 1 / 16 | 1 - 5 | 1.1 | 1.1 | HP-02G | 5 | 0 | 5 | 0 | NL | -- |
| 1,1-Dichloroethene | 75-35-4 | 1 / 16 | 1 - 5 | 0.76 | 0.76 | HP-02G | 5 | 0 | 5 | 0 | 7 | 0 |
| 2-Butanone | 78-93-3 | 2 / 16 | 5 - 25 | 4.15 | 5 | HP-39D | 50 | 0 | 50 | 0 | NL | -- |
| Acetone | 67-64-1 | 2 / 16 | 5 - 25 | 11.5 | 24 | HP-39D | 50 | 0 | 50 | 0 | NL | -- |
| Benzene | 71-43-2 | 2 / 16 | 1 - 5 | 0.67 | 0.81 | HP-39E | 1 | 0 | 5 | 0 | 5 | 0 |
| Bromodichloromethane | 75-27-4 | 1 / 16 | 1 - 5 | 1.2 | 1.2 | HP-05C | 50 | 0 | 50 | 0 | 80 | 0 |
| Chloroform | 67-66-3 | 10 / 16 | 1 - 5 | 0.56 | 2.3 | HP-12C | 7 | 0 | 50 | 0 | 80 | 0 |
| cis-1,2-Dichloroethene | 156-59-2 | 2 / 16 | 1 - 5 | 0.53 | 1.3 | HP-33H | 5 | 0 | 5 | 0 | 70 | 0 |
| Dibromochloromethane | 124-48-1 | 2 / 16 | 1 - 5 | 0.54 | 2.2 | HP-05C | 50 | 0 | 50 | 0 | 80 | 0 |
| Methyl tert-butyl Ether | 1634-04-4 | 2 / 16 | 1 - 5 | 1.3 | 1.4 | HP-33I | NL | -- | 10 | 0 | NL | -- |
| Tetrachloroethene (PCE) | 127-18-4 | 11 / 16 | 1 - 5 | 1.4 | 92 | HP-33H | 5 | **5** | 5 | **5** | 5 | **5** |
| Toluene | 108-88-3 | 2 / 16 | 1 - 5 | 1.095 | 1.1 | HP-39D | 5 | 0 | 5 | 0 | 1000 | 0 |
| Trichloroethene (TCE) | 79-01-6 | 7 / 16 | 1 - 5 | 0.71 | 2.8 | HP-05C | 5 | 0 | 5 | 0 | 5 | 0 |

Table 8-3
Soil Concentration Summary Statistics

| Parameter | CAS | Detection Frequency | Detection Limit Range | Minimum Detected Value | Maximum Detected Value | Maximum Detected Sample | NYS Restricted-Residential Use SCO | Number of Exceedances |
|---|---|---|---|---|---|---|---|---|
| **VOCs (ug/kg)** | | | | | | | | |
| cis-1,2-Dichloroethene | 156-59-2 | 1 / 20 | 5.1 - 6.4 | 14 | 14 | SS-33C | 100,000 | 0 |
| Tetrachloroethene (PCE) | 127-18-4 | 7 / 20 | 5.1 - 6.4 | 3 | 2,500 | SS-33C | 19,000 | 0 |
| Trichloroethene (TCE) | 79-01-6 | 2 / 20 | 5.1 - 6.4 | 12 | 12 | SS-33C | 21,000 | 0 |

Note:
1. Screening levels are NYSDEC Part 375-6.8 Soil Cleanup Objectives Protection of Public Health Restricted-Residential

# Appendix A
# Photo Log

**MIP Investigation 2008**


Geophysical Survey by Enviroscan at Getty Service Center


Geoprobe and MIP Equipment (Zebra Environmental)
at St. Patrick's Roman Catholic Church

**Permanent Well Installation 2009-2010**

Geophysical Survey by AGS at MW-6S

Aztech Technologies HSA Rig and Support Vehicle at MW-1S

Well Development at MW-4S

Groundwater Elevation Survey May 2010 at Getty Service Center

**IDW Disposal 2010**

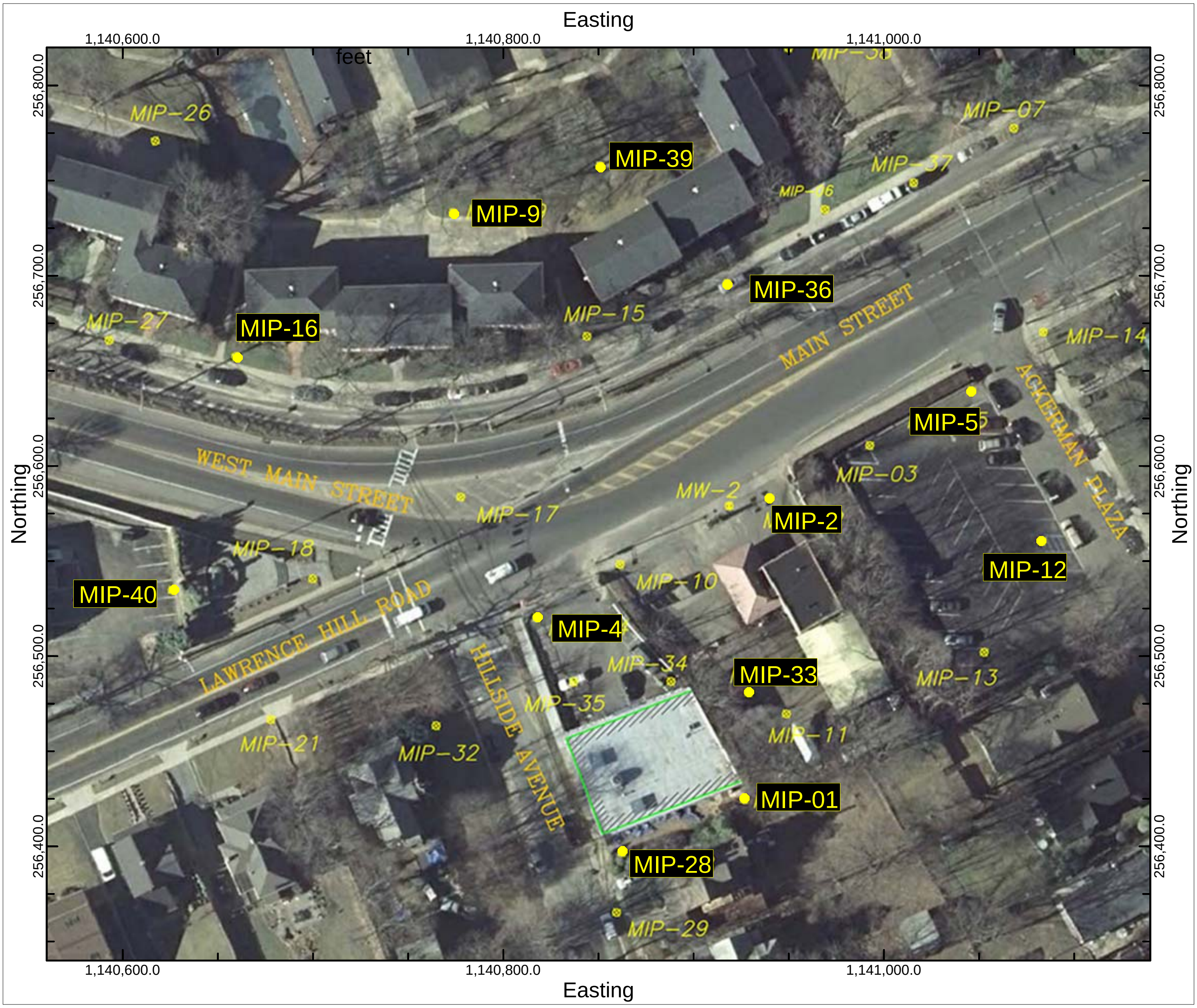
Drummed IDW behind St. Patrick's Roman Catholic Church

Drum Removal by CleanVenture/CycleChem February 9, 2010

# Appendix B
# MIP Investigation

**Earth Tech, Inc.**
**Country Cleaners**
**410 W. Main Street, Huntington, NY**

# MIP Borehole Map



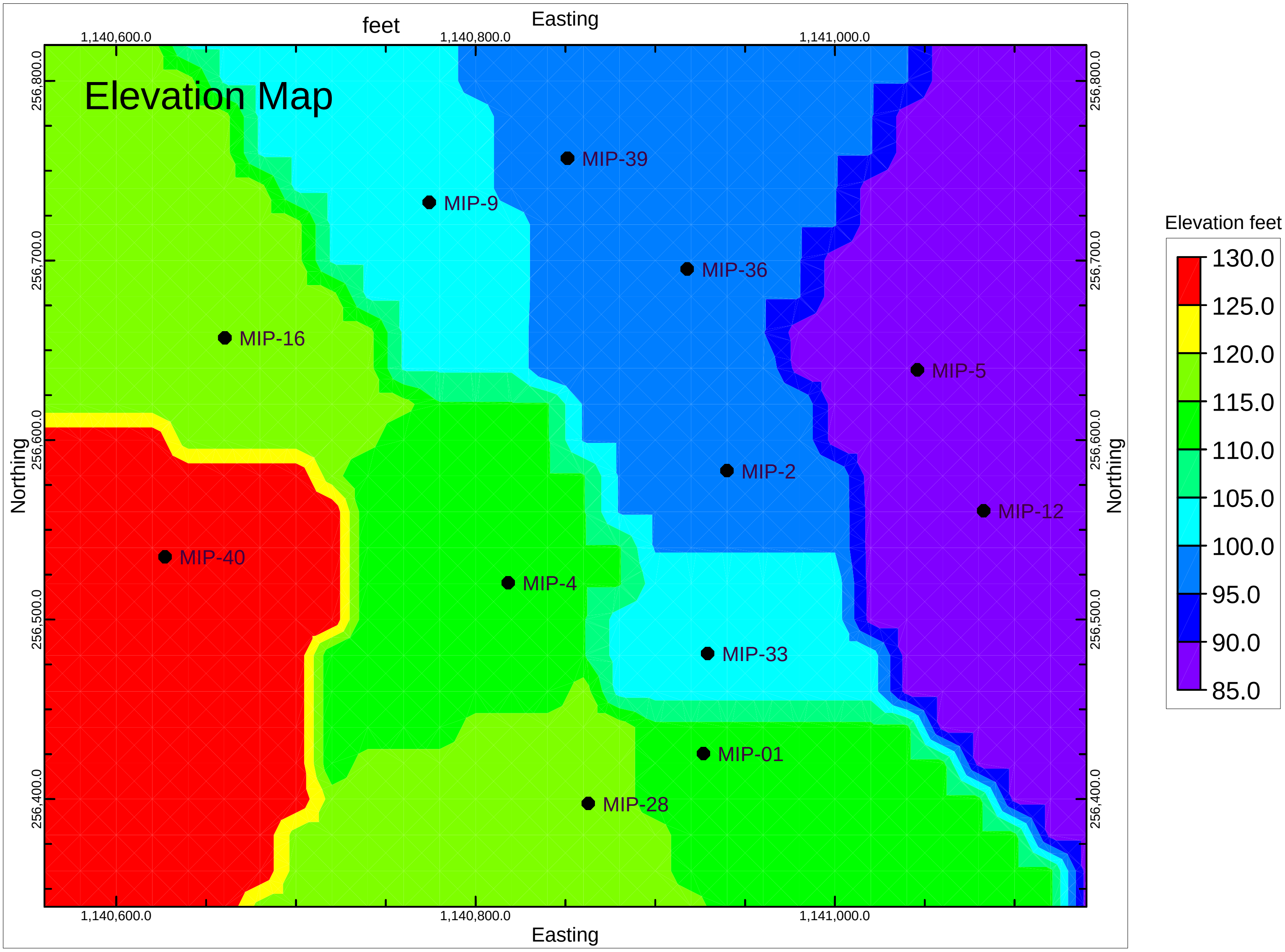

EARTH TECH | AECOM

LEGEND

Distance units = Feet (ft)
Depth Units = Feet (ft)
All locations are adjusted for elevation

**Earth Tech, Inc.**
**Country Cleaners**
**410 W. Main Street, Huntington, NY**

# Elevation Map

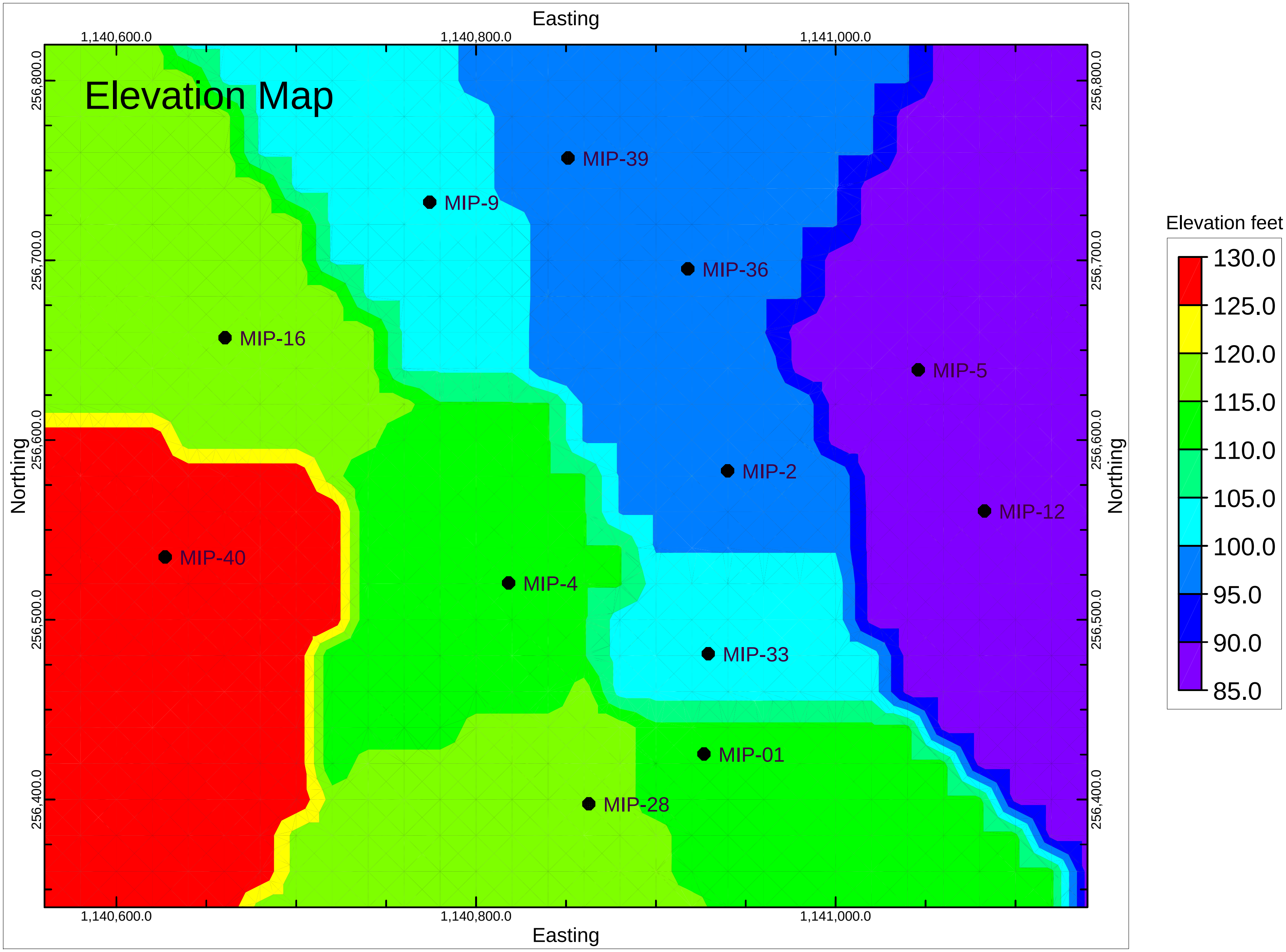



EARTH TECH | AECOM

LEGEND

Distance units = Feet (ft)
Depth Units = Feet (ft)
All locations are adjusted for elevation

Prepared by ZEBRA ENVIRONMENTAL Subsurface Sampling, Injection and Data Collection For Environmental Professionals

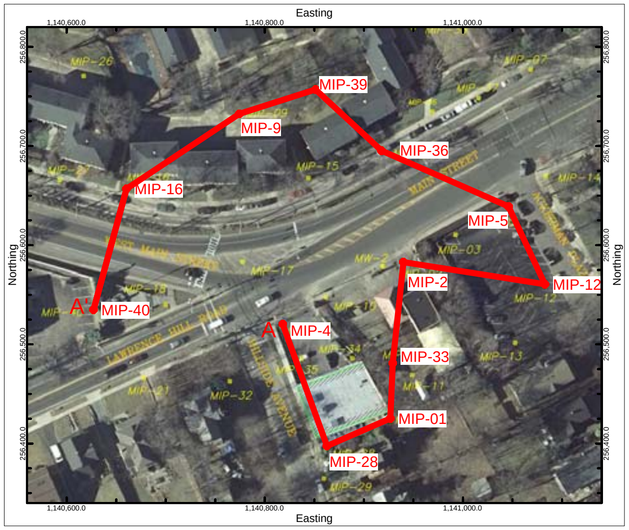


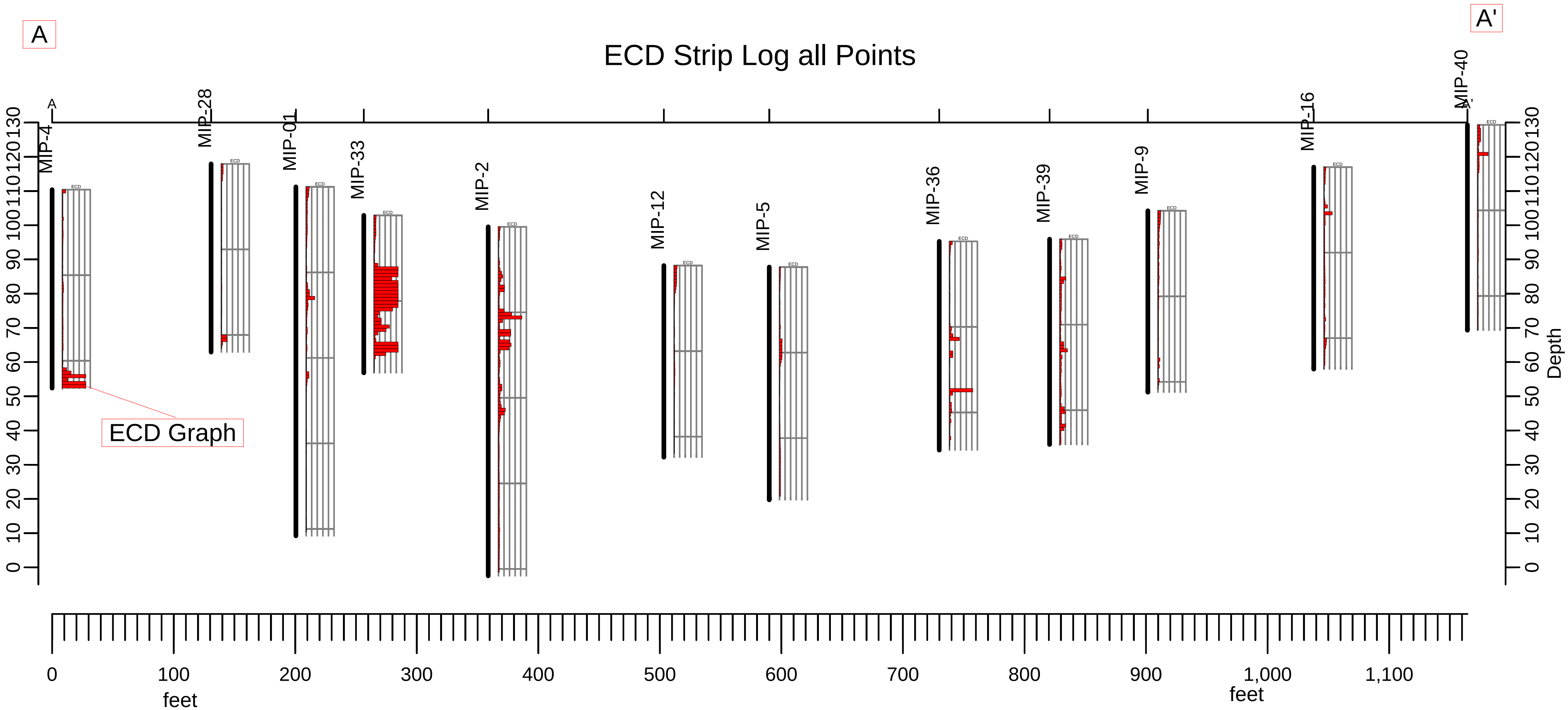

Prepared by ZEBRA ENVIRONMENTAL Subsurface Sampling, Injection and Data Collection For Environmental Professionals

# Earth Tech, Inc.
# Country Cleaners
# 410 W. Main Street, Huntington, NY

EARTH TECH | AECOM

## ECD Strip Log




Prepared by ZEBRA ENVIRONMENTAL Subsurface Sampling, Injection and Data Collection For Environmental Professionals

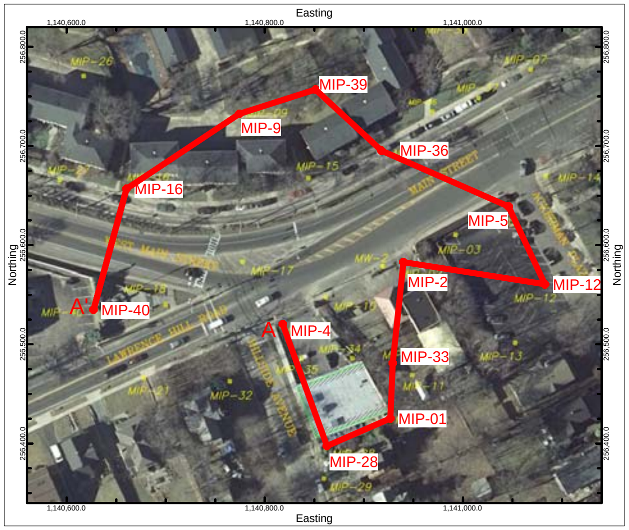
# Earth Tech, Inc.
# Country Cleaners
# 410 W. Main Street, Huntington, NY

EARTH TECH | AECOM

## ECD Cross-Section

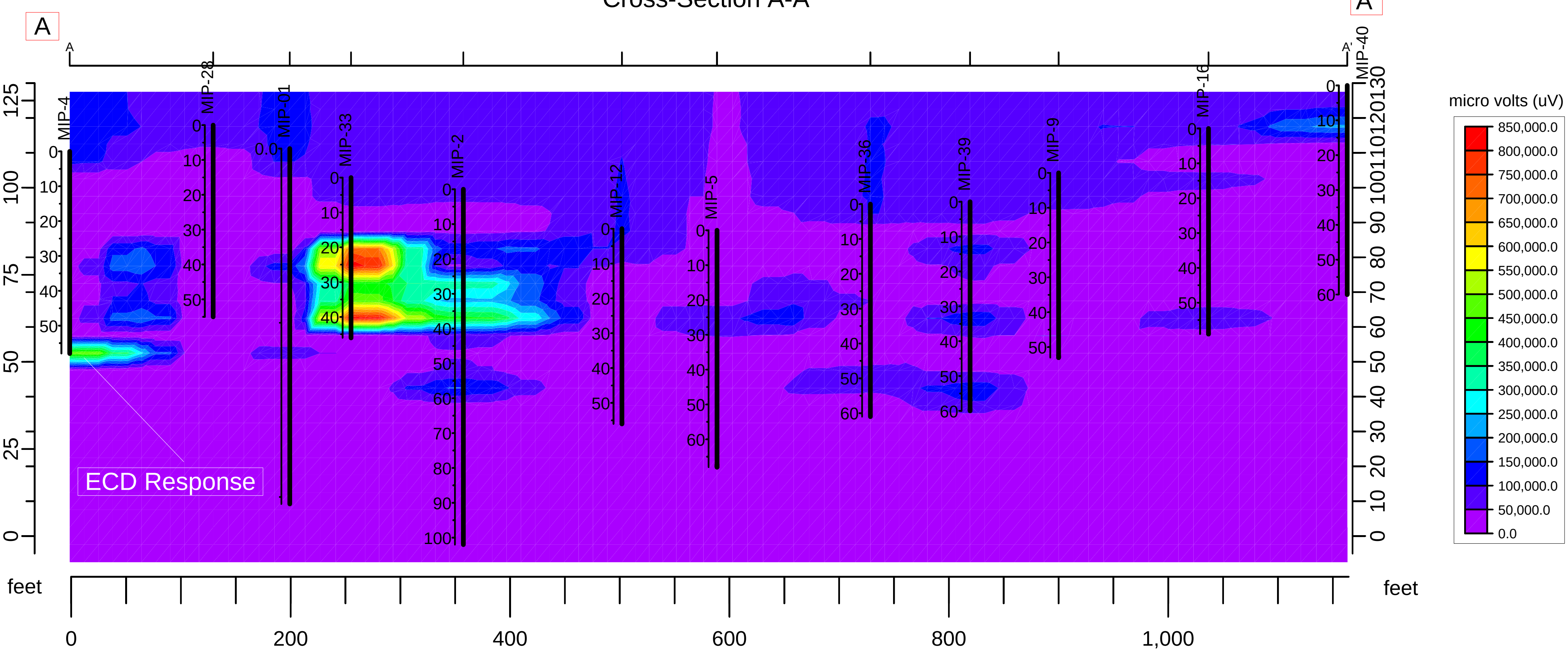
LEGEND

ECD = Electron Capture Device
ECD Units = Micro Volts (UV)
Distance units = Feet (ft)
Depth Units = Feet (ft)
All locations are adjusted for elevation

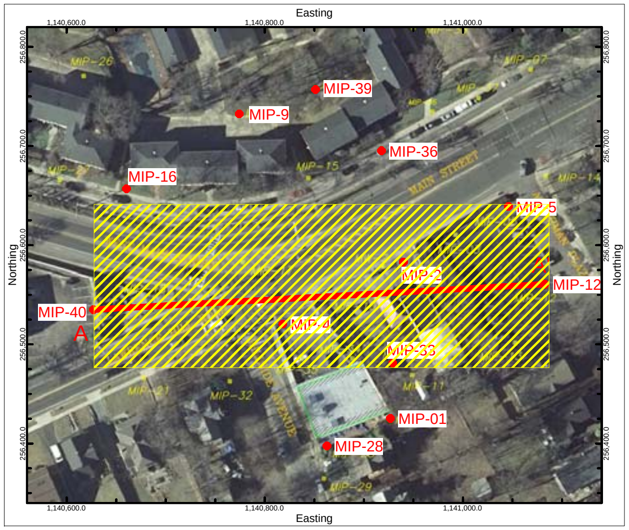


Plan View

Cross-Section A-A'




Prepared by ZEBRA ENVIRONMENTAL Subsurface Sampling, Injection and Data Collection For Environmental Professionals




# Earth Tech, Inc.
# Country Cleaners
# 410 W. Main Street, Huntington, NY

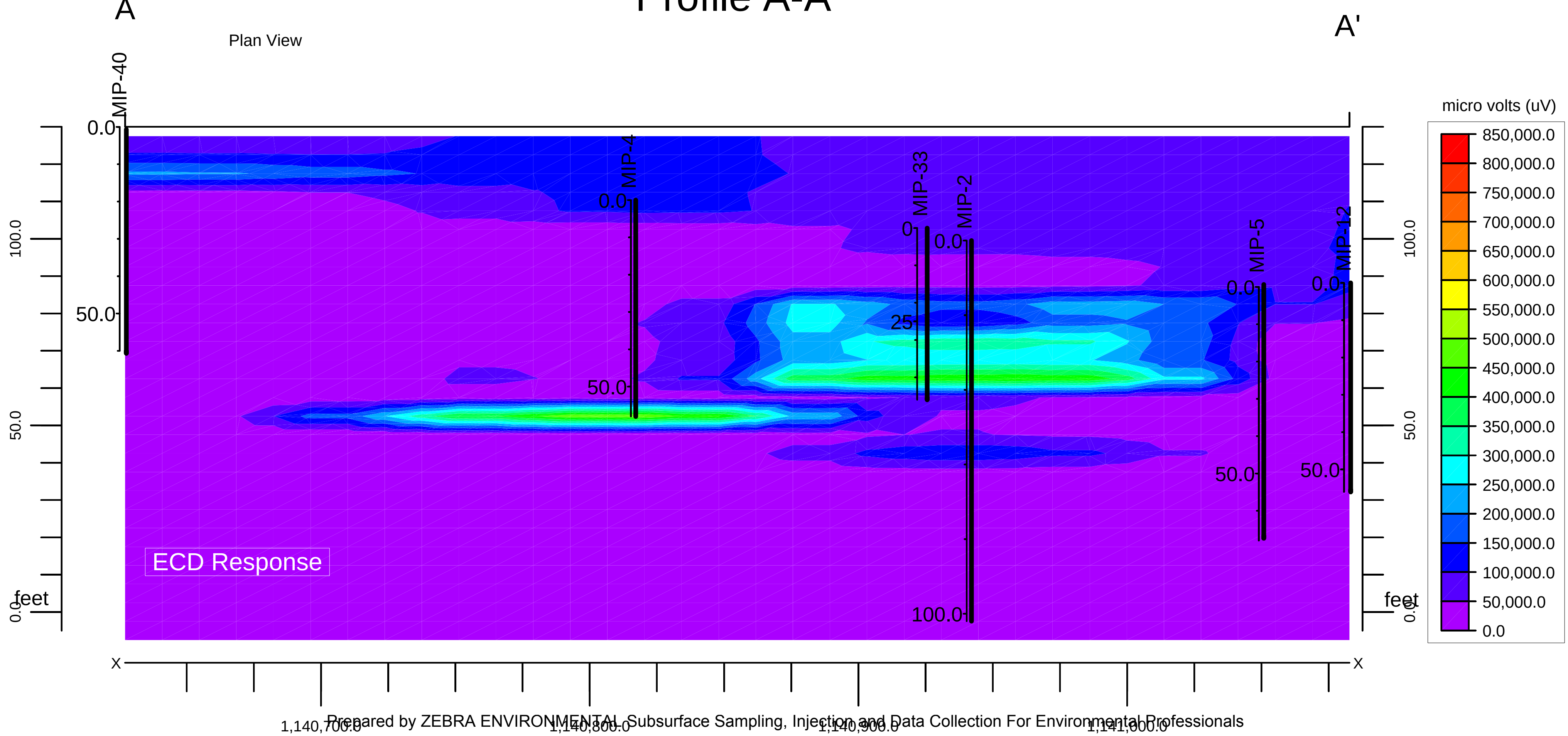
EARTH TECH | AECOM

## ECD Profile

LEGEND

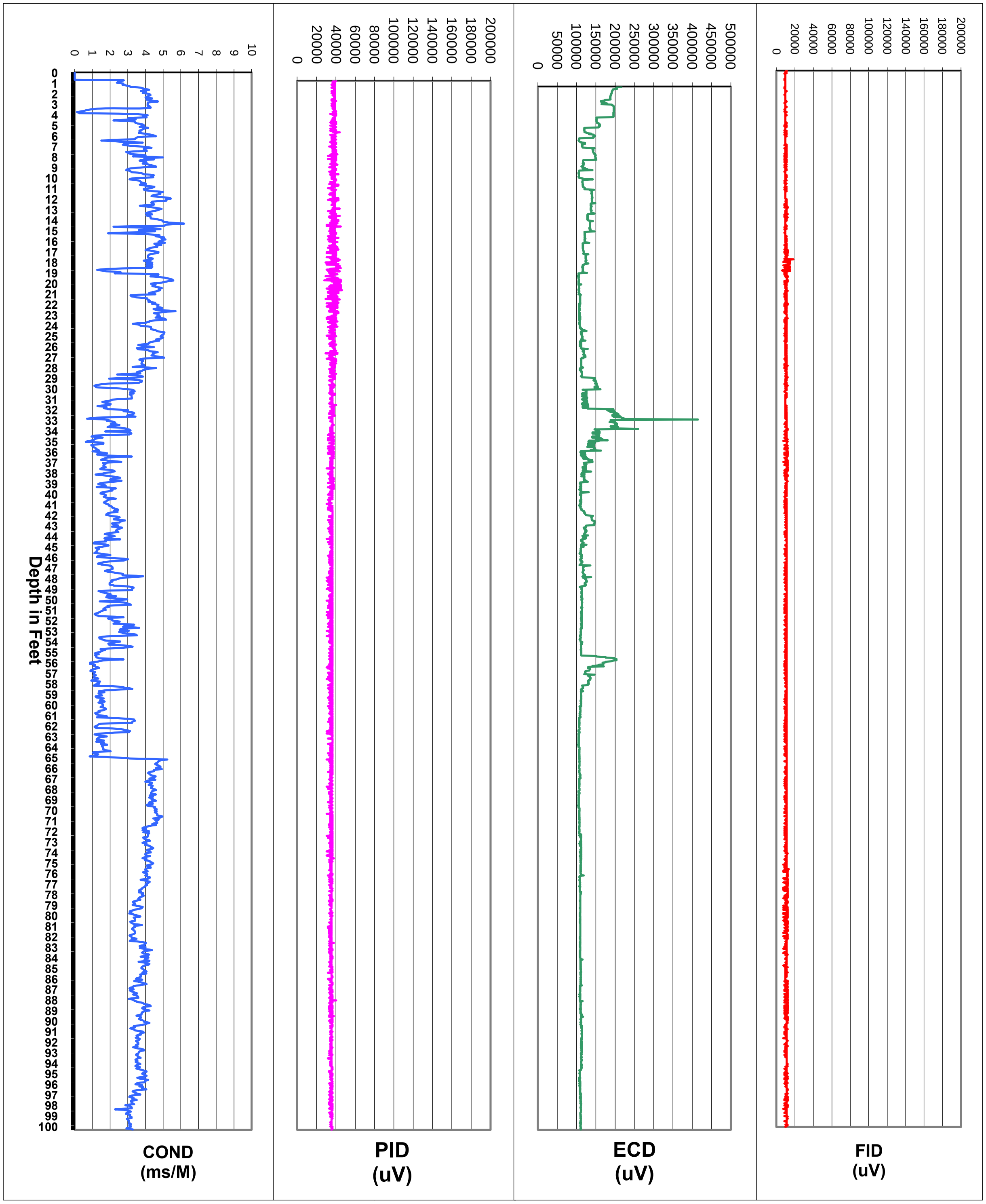
ECD = Electron Capture Device
ECD Units = Micro Volts (UV)
Distance units = Feet (ft)
Depth Units = Feet (ft)
All locations are adjusted for elevation

## Profile A-A'




Prepared by ZEBRA ENVIRONMENTAL Subsurface Sampling, Injection and Data Collection For Environmental Professionals

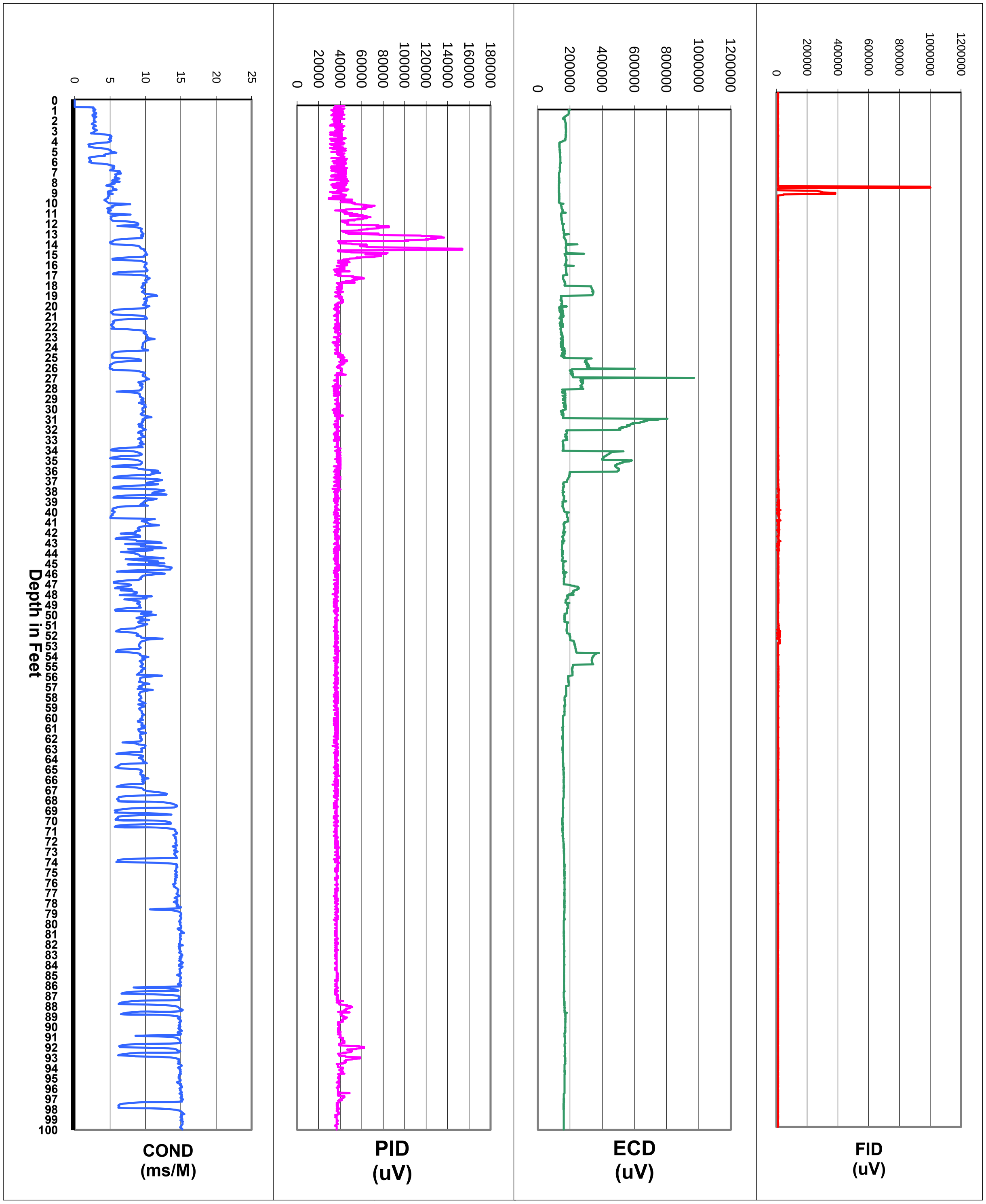
# ZEBRA EC/MIP Summary Log, Point ETMIP1




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 7/9/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 2 of 0

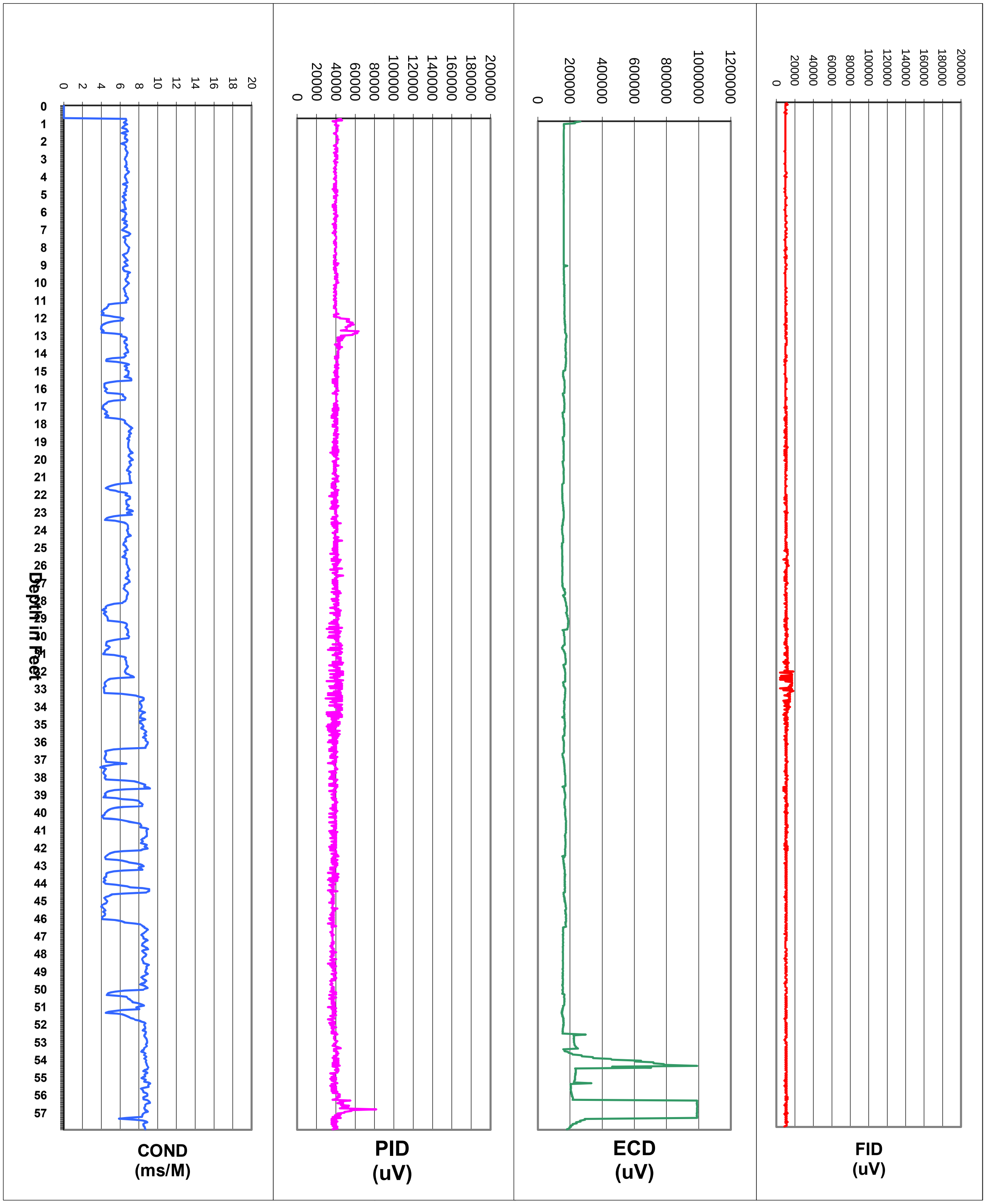
# ZEBRA EC/MIP Summary Log, Point ETMIP2




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 7/9/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 1 of 1

# ZEBRA EC/MIP Summary Log, Point ETMIP4

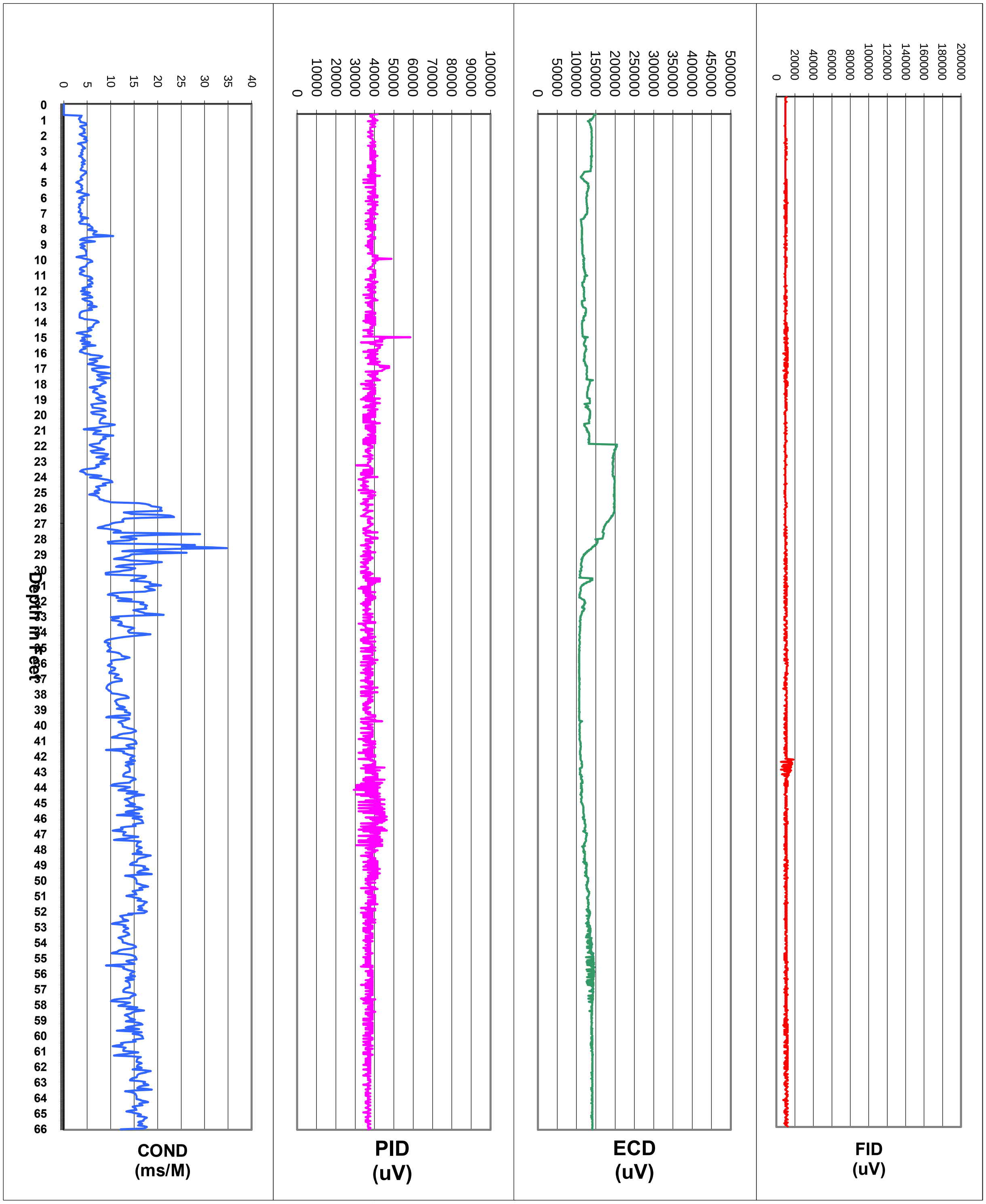




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300


Date: 7/14/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 4 of 0

# ZEBRA EC/MIP Summary Log, Point ETMIP5

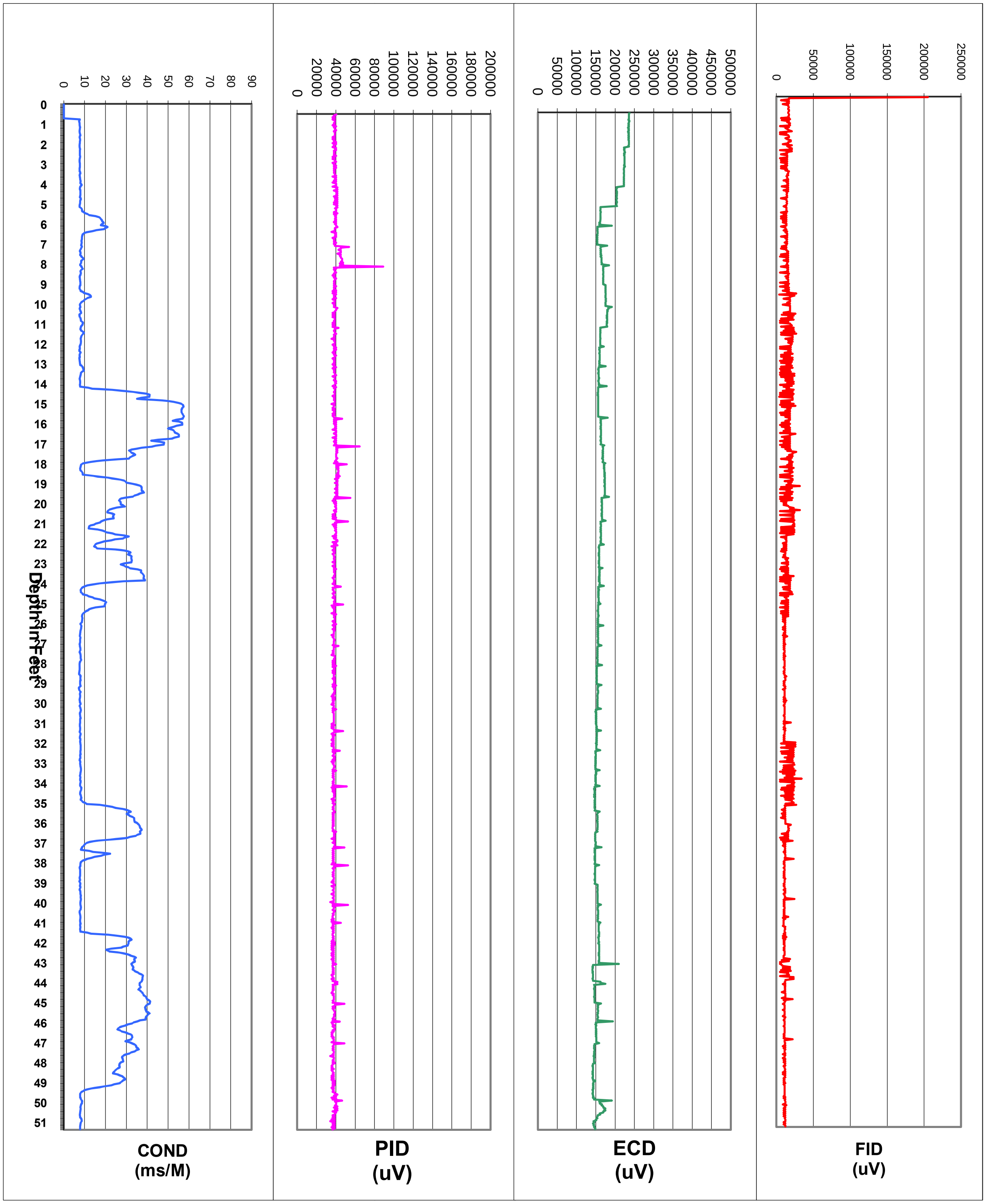




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300


Date: 7/15/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 6 of 0

# ZEBRA EC/MIP Summary Log, Point ETMIP9

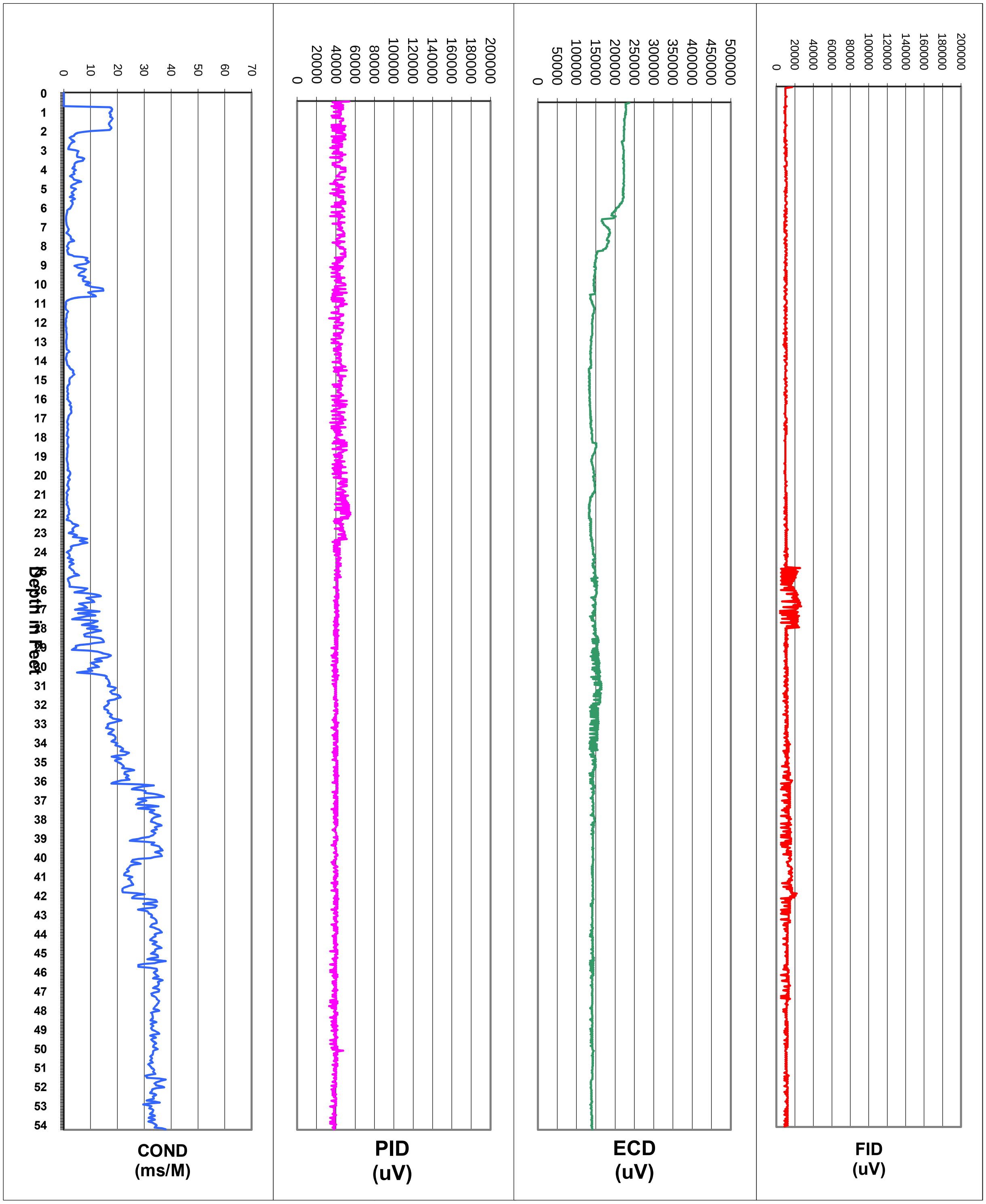




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300


Date: 7/16/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 9 of 0

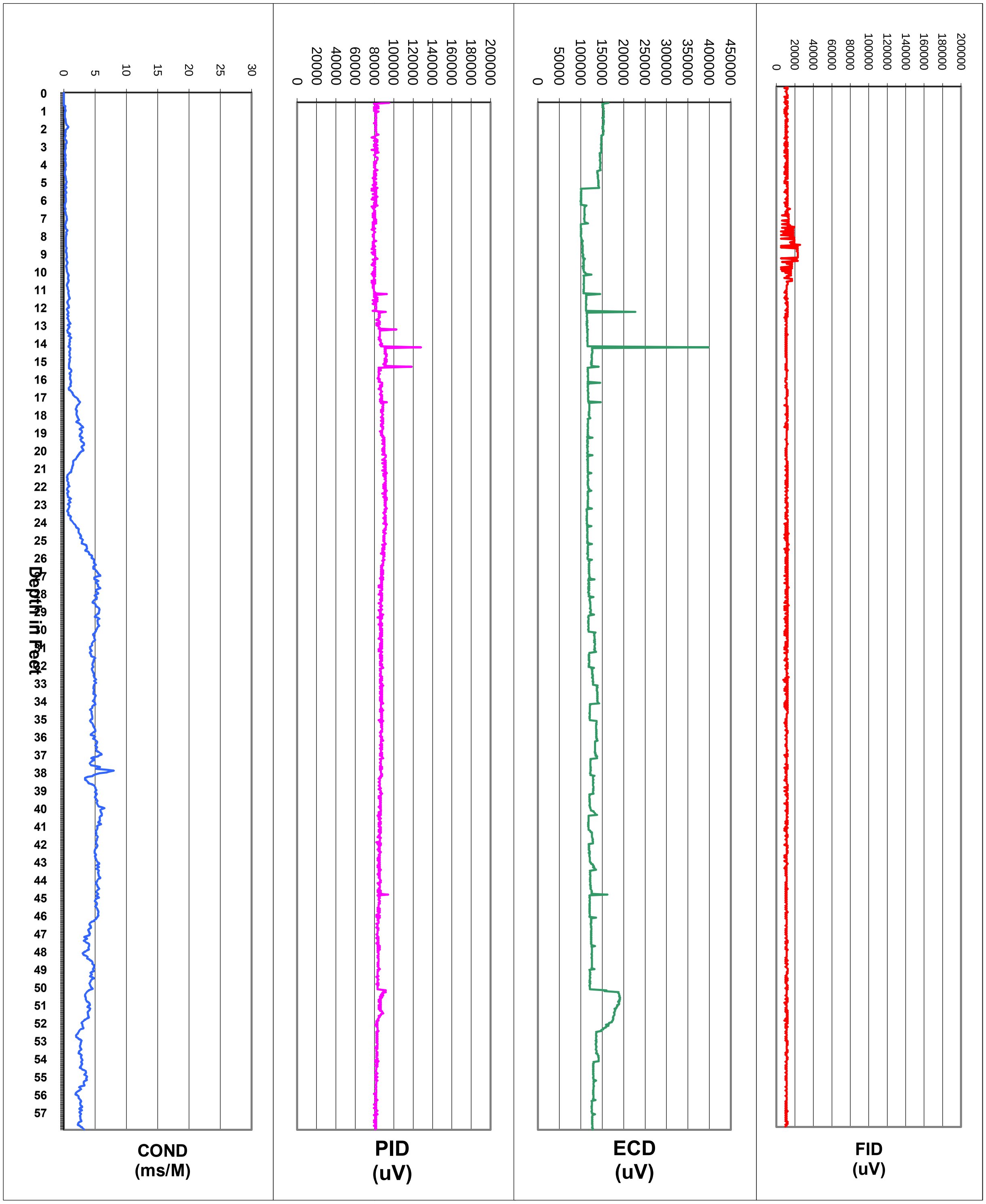
# ZEBRA EC/MIP Summary Log, Point ETMIP12




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 7/14/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 5 of 0

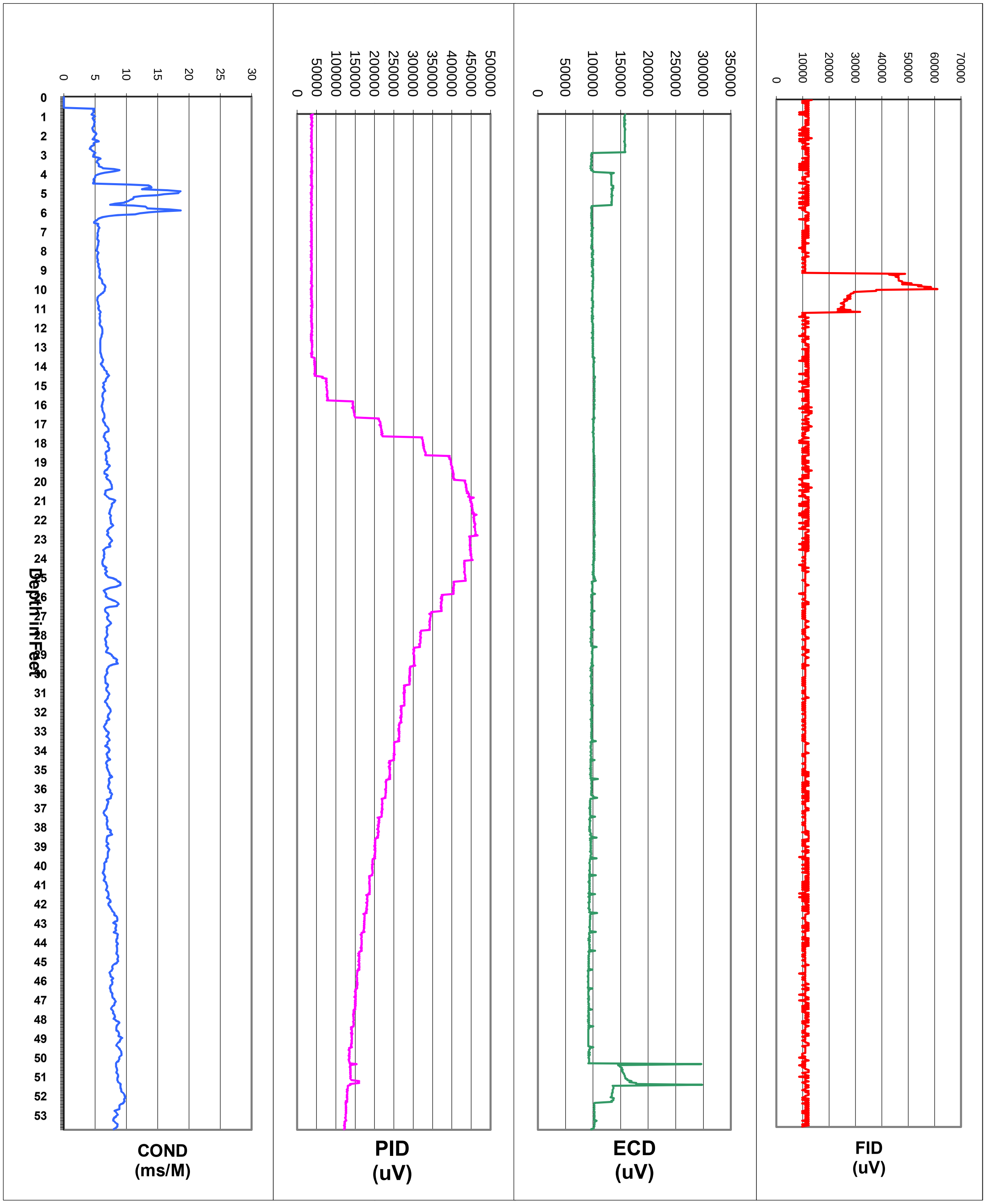
# ZEBRA EC/MIP Summary Log, Point ETMIP16

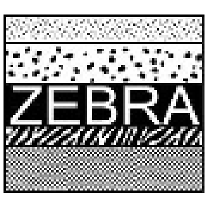



for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 7/17/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 12 of 0

# ZEBRA EC/MIP Summary Log, Point ETMIP28

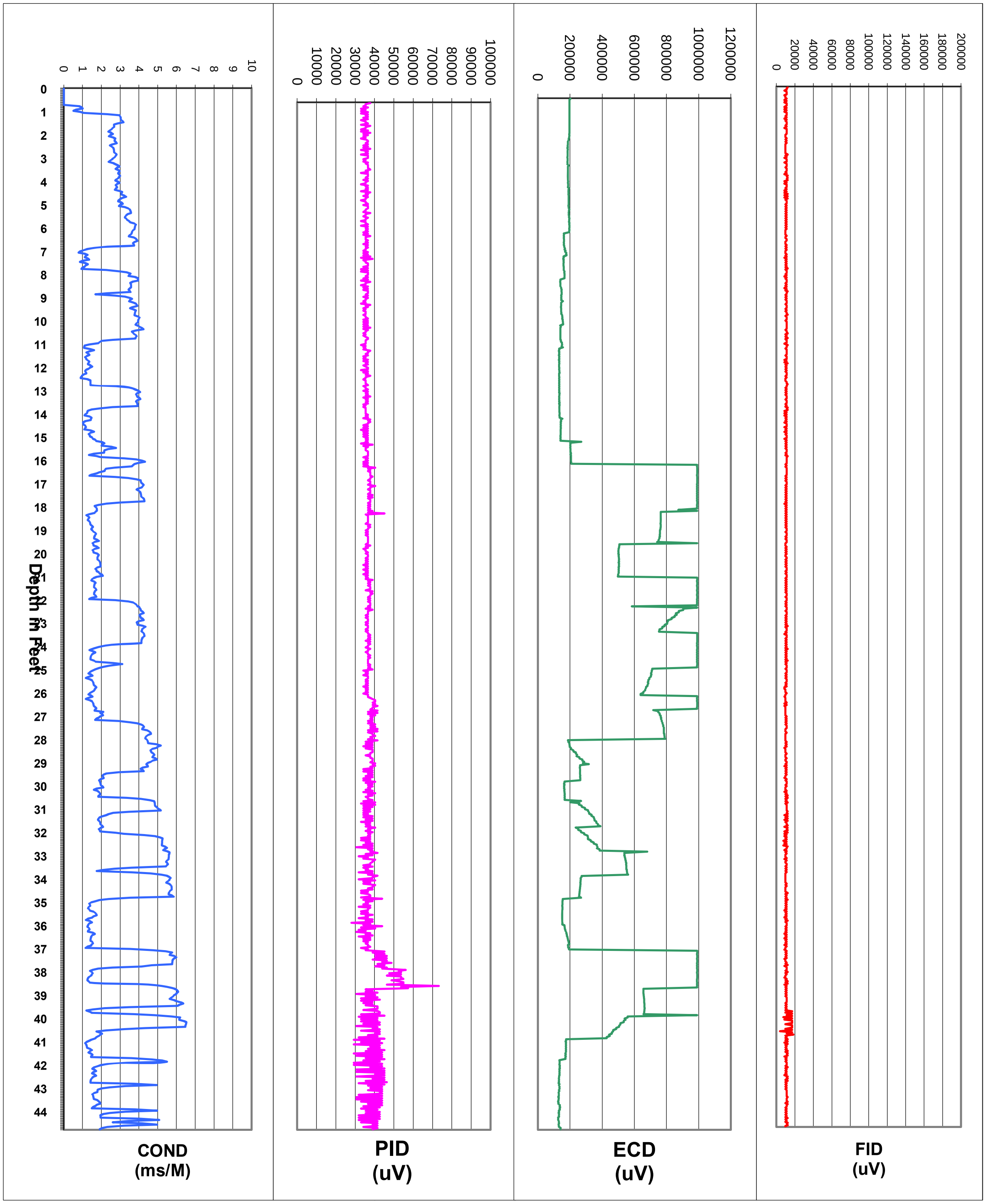


for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 7/17/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 11 of 0

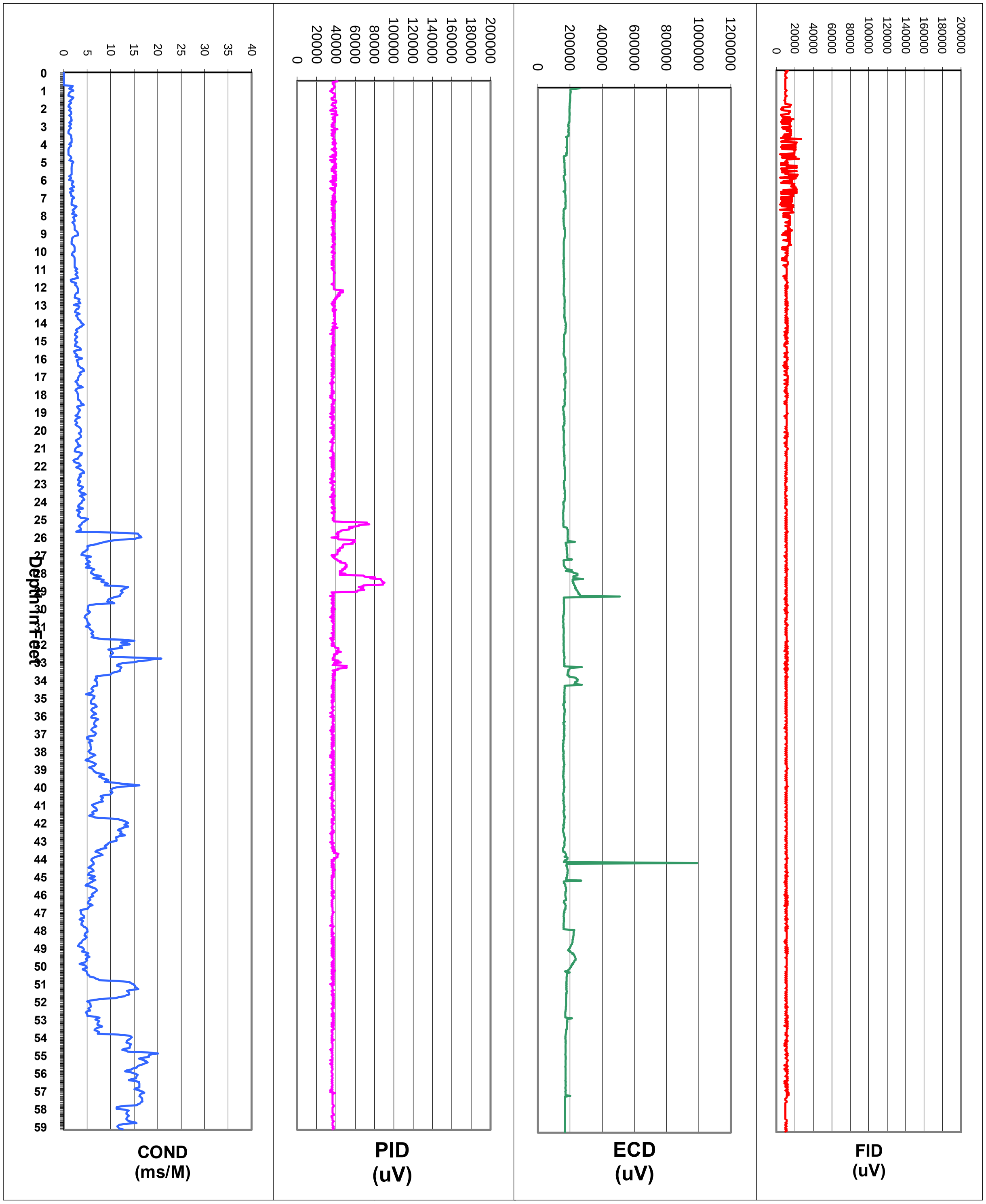
# ZEBRA EC/MIP Summary Log, Point ETMIP33




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 7/10/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 3 of 0

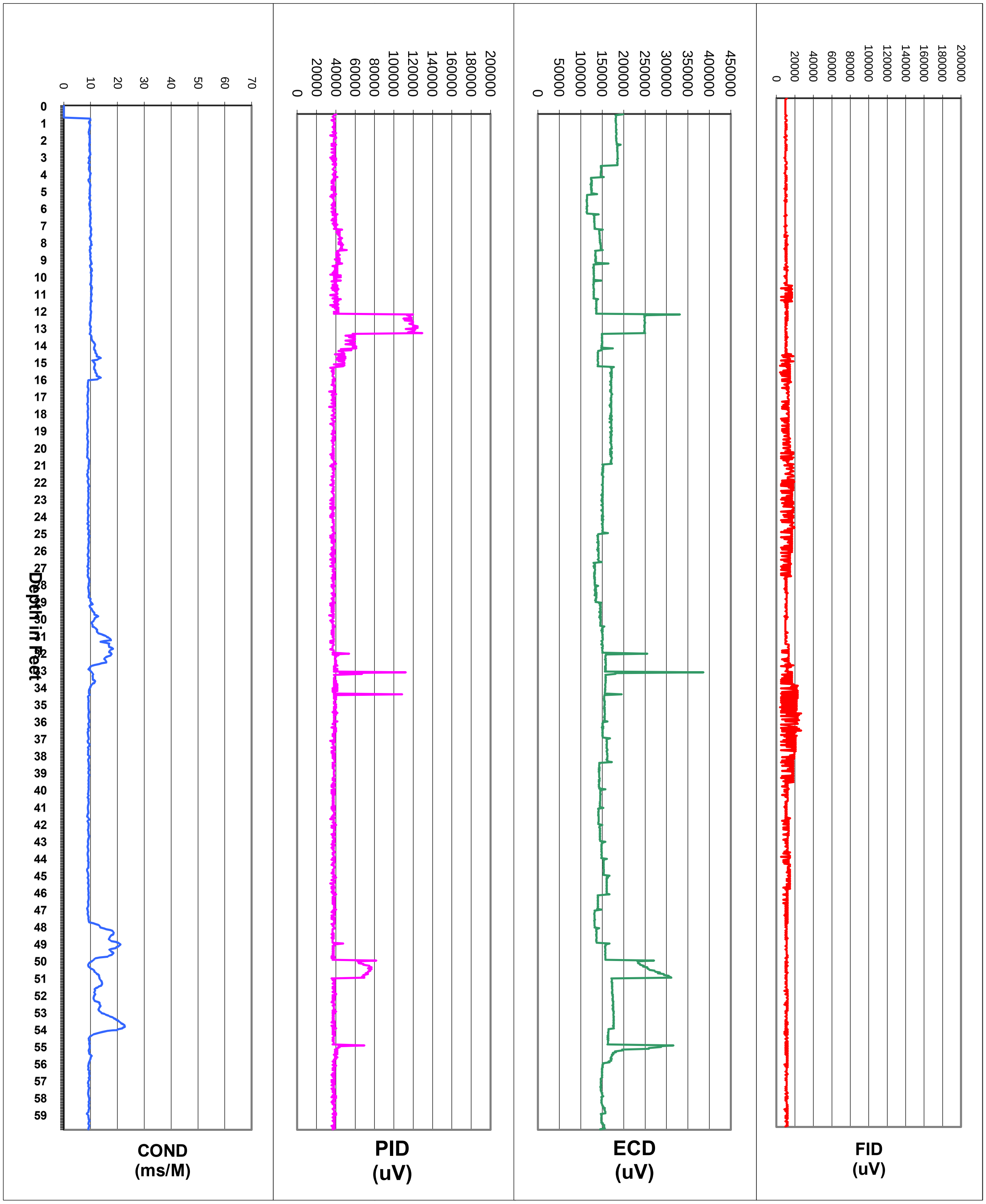
# ZEBRA EC/MIP Summary Log, Point ETMIP36




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 7/15/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 7 of 0

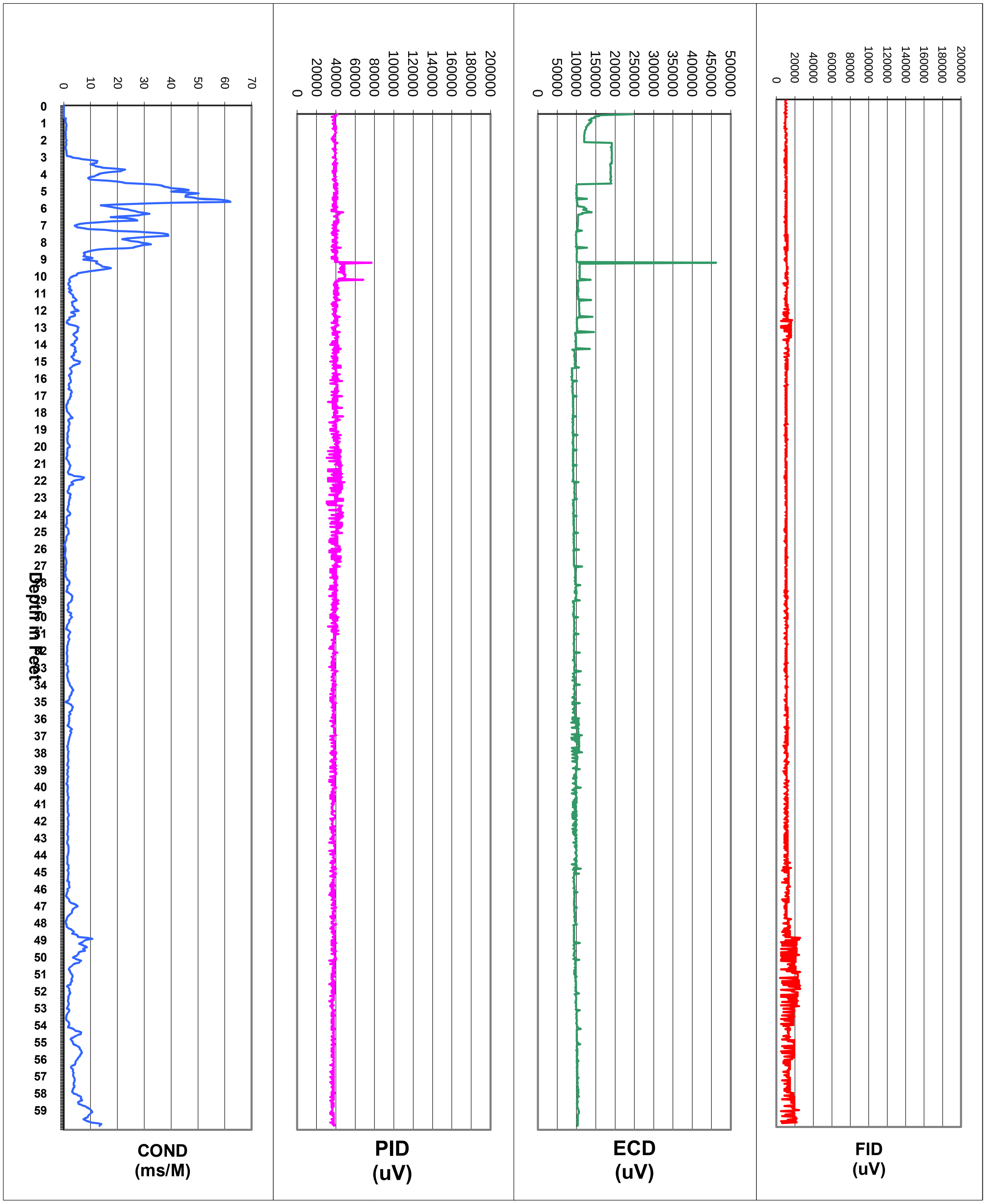
# ZEBRA EC/MIP Summary Log, Point ETMIP39




for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300

Date: 7/16/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 8 of 0

# ZEBRA EC/MIP Summary Log, Point ETMIP40





for: Earth Tech
by: Zebra Environmental
30 No. Prospect Avenue
Lynbrook, NY 11563
(516) 596-6300


Date: 7/17/2008
Proj. Name: Huntington, NY
Proj. #: DS13586
Operators: Will M
Point 10 of 0

# Appendix C
# Field Forms

AECOM

# BORING LOG

**Boring No.: MIP-2**

| | | | |
|---|---|---|---|
| PROJECT: Country Cleaners | | PAGE 1 OF | 7 |
| PROJECT No.: | 60133623 | CONTRACTOR: Zebra Environmental | DATE: 9/15/2007 |
| LOCATION: Huntington, NY | | DRILLERS NAME: Will | AECOM REP.: Chokshi, M. |
| DESIGNATION OF DRILL RIG: | | Geo Probe 6600 series | |
| DEPTH OF BOREHOLE (FT): | | 98 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Asphalt and base |
| 1 | | | | Light brown, medium to coarse sand, gravel |
| | | | 20.0 | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | | | | " |
| | | | | " |
| 10 | | | | " |
| | | | | " |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | | | | " |
| | | | | " |
| 14 | | | | " |
| | | | | " |

AECOM

# BORING LOG

**Boring No.: MIP-2**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 14 | | | | Light brown, medium to coarse sand, gravel |
| | | | | " |
| 15 | | | | " |
| | S1 | 8\|12\|14\|15 | | Dark brown, medium to coarse sand, gravel; Sample SS-02A (15-16') |
| 16 | 10:00 | 0.5 | 0.0 | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | | | | " |
| 21 | | | | " |
| | | | | " |
| 22 | | | | " |
| | | | | " |
| 23 | | | | " |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | S2 | 5\|6\|6\|7 | | Light brown fine to medium sand with trace fines, gravel, wet |
| 28 | 10:30 | 1.5 | 0.0 | Perched water Sample SS-02B (27-28') |
| | | | | |

**AECOM** | **BORING LOG** | **Boring No.: MIP-2**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Light brown fine to medium sand with trace fines, gravel, wet |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | | | | " |
| 31 | | | | " |
| | | | | " |
| 32 | | | | " |
| | S3 | 9\|19\|27\|34 | | Dark brown fine to medium sand with trace fines, gravel |
| 33 | 10:45 | 1.0 | 0.0 | Sample SS-02C (32-33') |
| | | | | |
| 34 | | | | |
| | | | | |
| 35 | | | | |
| | S4 | 9\|19\|27\|34 | | Dark brown fine to medium sand with trace fines, gravel |
| 36 | 11:10 | 1.3 | 0.0 | Sample SS-02D (35-36') |
| | | | | Sample SS-05D (35-36') |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | | | | " |
| 39 | | | | " |
| | | | | " |
| 40 | | | | " |
| | | | | " |
| 41 | | | | " |
| | | | | " |
| 42 | | | | " |
| | | | | |

AECOM

**BORING LOG** | **Boring No.: MIP-2**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Dark brown fine to medium sand with trace fines, gravel |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | | | | " |
| 46 | | | | " |
| | | | | " |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | | | | " |
| 51 | | | | " |
| | | | | " |
| 52 | | | | " |
| | | | | " |
| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | 11:30 | | | Collected HP-02E (54-57') |
| 55 | 11:45 | | | Collected HP-52E (54-57') |
| | | | | Dark brown fine to medium sand with trace fines, gravel |
| 56 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-2**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Dark brown fine to medium sand with trace fines, gravel |
| 56 | | | | " |
| | | | | " |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | Dark brown fine to medium sand with fines, wet |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | " |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | | | | " |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | |

AECOM **BORING LOG** **Boring No.: MIP-2**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | | | | Dark brown fine to medium sand with fines, wet |
| 71 | | | | " |
| | | | | " |
| 72 | | | | " |
| | 12:40 | | | Collected HP-02F (72-75') |
| 73 | | | | Dark brown fine to medium sand with fines, wet |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | | | | " |
| 76 | | | | " |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | " |
| | | | | " |
| 81 | | | | " |
| | | | | " |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | " |
| 84 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-2**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 84 | | | | |
| | | | | Dark brown fine to medium sand with fines, wet |
| 85 | | | | " |
| | | | | " |
| 86 | | | | " |
| | | | | " |
| 87 | | | | " |
| | | | | " |
| 88 | | | | " |
| | | | | " |
| 89 | | | | " |
| | | | | " |
| 90 | | | | " |
| | | | | " |
| 91 | | | | " |
| | | | | " |
| 92 | | | | " |
| | | | | " |
| 93 | | | | " |
| | | | | " |
| 94 | | | | " |
| | | | | " |
| 95 | | | | " |
| | | | | " |
| 96 | | | | " |
| | | | | " |
| 97 | | | | " |
| | 14:00 | | | Collected HP-02G (97-98') |
| 98 | | | | Light Brown fines with fine sand and trace gravel |
| | | | | End of boring: 98 ft bgs |

AECOM

# BORING LOG

**Boring No.: MIP-4**

| | | | |
|---|---|---|---|
| PROJECT: Country Cleaners | | PAGE 1 OF | 8 |
| PROJECT No.: 60133623 | CONTRACTOR: Zebra Environmental | DATE: | 9/14/2007 |
| LOCATION: Huntington, NY | DRILLERS NAME: Will | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | Geo Probe 6600 series | | |
| DEPTH OF BOREHOLE (FT): | 105 | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Asphalt and base |
| 1 | | | | Light brown medium to coarse sand with some gravel |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
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| 9 | | | | " |
| | | | | " |
| 10 | | | | " |
| | | | | " |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | | | | " |
| | | | | " |
| 14 | | | | " |
| | | | | |

**BORING LOG** | **Boring No.:** **MIP-4**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 14 | | | | |
| | | | | Light brown medium to coarse sand with some gravel |
| 15 | | | | " |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | | 5\|7\|10\|9 | 5.0 | Light brown fine sand with fines |
| 21 | | 1.8 | | " |
| | | | | " |
| 22 | | | | " |
| | | | | " |
| 23 | | | | " |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | " |

AECOM

# BORING LOG

**Boring No.: MIP-4**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Light brown fine sand with fines |
| | | | | " |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | | | | " |
| 31 | | | | " |
| | | | | " |
| 32 | | | | " |
| | | | | " |
| 33 | | | | " |
| | | | | " |
| 34 | | | | " |
| | | | | " |
| 35 | | | | " |
| | | | | " |
| 36 | | | | " |
| | | | | " |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | | | | " |
| 39 | | | | " |
| | | | | " |
| 40 | | | | |
| | | 6\|7\|8\|8 | 0.0 | Light brown fine sand, trace fines, trace gravel |
| 41 | | 2.0 | | " |
| | | | | " |
| 42 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-4**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Light brown fine sand, trace fines, trace gravel |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | | | | " |
| 46 | | | | " |
| | | | | " |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
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| 50 | | | | " |
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| 51 | | | | " |
| | | | | " |
| 52 | | | | " |
| | | | | " |
| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | | | | " |
| 55 | | | | " |
| | | | | " |
| 56 | | | | " |

AECOM

# BORING LOG

**Boring No.: MIP-4**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 56 | | | | |
| | | 1\|27\|33\|39 | | Gravel with medium to coarse sand, light brown |
| 57 | 10:00 | 0.5 | | Sample SS-04A (57-58') |
| | | | | Dark grey fine to medium sand with silt and gravel |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | 9\|17\|29\|33 | | | Light brown medium to coarse sand with gravel, wet |
| 61 | | 1.0 | 0.0 | " |
| | | | | " |
| 62 | | | | " |
| | 11:45 | | | Collected HP-04B (62-65') |
| 63 | | | | Light brown medium to coarse sand with gravel, wet |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | " |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | | | | " |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-4**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | | | | Light brown medium to coarse sand with gravel, wet |
| | | | | " |
| 71 | | | | " |
| | | | | " |
| 72 | | | | " |
| | | | | " |
| 73 | | | | " |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | | | | " |
| 76 | | | | " |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | |
| | 13:30 | | | Collected HP-04C (82-85') |
| 81 | | | | Dark grey fine to medium sand with fines, saturated |
| | | | | " |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | " |
| 84 | | | | " |
| | | | | " |

| AECOM | | | BORING LOG | Boring No.: | MIP-4 |
|---|---|---|---|---|---|

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 84 | | | | |
| | | | | Dark grey fine to medium sand with fines, saturated |
| 85 | | | | " |
| | | | | " |
| 86 | | | | " |
| | | | | " |
| 87 | | | | " |
| | | | | " |
| 88 | | | | " |
| | | | | " |
| 89 | | | | " |
| | | | | " |
| 90 | | | | " |
| | | | | " |
| 91 | | | | " |
| | | | | " |
| 92 | | | | " |
| | | | | " |
| 93 | | | | " |
| | | | | " |
| 94 | | | | " |
| | | | | " |
| 95 | | | | " |
| | | | | " |
| 96 | | | | " |
| | | | | " |
| 97 | | | | " |
| | | | | " |
| 98 | | | | " |
| | | | | |

AECOM **BORING LOG** **Boring No.: MIP-4**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 98 | | | | |
| | | | | Dark grey fine to medium sand with fines, saturated |
| 99 | | | | " |
| 100 | | | | |
| | 14:10 | | | Collected HP-04D (100-103') |
| 101 | | | | |
| 102 | | | | |
| 103 | | | | |
| 104 | | | | |
| 105 | | | | |
| 106 | | | | |
| 107 | | | | |
| 108 | | | | |
| 109 | | | | |
| 110 | | | | |
| 111 | | | | |
| 112 | | | | |

| AECOM | | BORING LOG | | Boring No.: | MIP-5 |
|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | PAGE 1 OF | 7 |
| PROJECT No.: | 60133623 | CONTRACTOR: Zebra Environmental | | DATE: | 9/5/2007 |
| LOCATION: Huntington, NY | | DRILLERS NAME: Will | | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | | Geo Probe 6600 series | | | |
| DEPTH OF BOREHOLE (FT): | | 85 | | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Asphalt and base |
| | | | | Light brown coarse sand with gravel |
| 1 | | | | " |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | | | | " |
| | | | | " |
| 10 | | | | " |
| | | | | " |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | | | | " |
| | | | | " |
| 14 | | | | |

**AECOM** **BORING LOG** **Boring No.: MIP-5**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 14 | | | | |
| | | | | Light brown coarse sand with gravel |
| 15 | | | | " |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | | | | " |
| 21 | | | | " |
| | | | | " |
| 22 | | | | " |
| | | 11\|17\|22\|31 | | Sample SS-05A (22-23') |
| 23 | 09:30 | 1.7 | 0.0 | Light brown coarse sand with gravel |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | " |
| | | | | |

# BORING LOG

**Boring No.: MIP-5**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Light brown coarse sand with gravel |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | | | | " |
| 31 | | | | " |
| | | | | " |
| 32 | | | | " |
| | | | | " |
| 33 | | | | " |
| | | | | " |
| 34 | | | | " |
| | | | | " |
| 35 | | | | " |
| | | | | " |
| 36 | | | | " |
| | | | | " |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | | | | " |
| 39 | | | | " |
| | | | | " |
| 40 | | | | " |
| | | 7\|13\|16\|22 | 0.0 | Light brown fine to medium sand with trace gravel, saturated |
| 41 | | 1.7 | | " |
| | | | | " |
| 42 | | | | " |
| | | | | |

| AECOM | | | BORING LOG | Boring No.: | MIP-5 |
|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | | |
| PROJECT No.: | 60133623 | | | PAGE 4 OF | 7 |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Light brown fine to medium sand with trace gravel, saturated |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | 10:10 | | | Collected HP-05B (47-50') |
| 46 | | | | Light brown fine to medium sand with trace gravel, saturated |
| | | | | " |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | | | | " |
| 51 | | | | " |
| | | | | " |
| 52 | | | | " |
| | | | | " |
| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | | | | " |
| 55 | | | | " |
| | | | | " |
| 56 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-5**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | |
| 56 | | | | Light brown fine to medium sand with trace gravel, saturated |
| | | | | " |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | " |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | 11:30 | | 0.0 | Collected HP-05C (67-70') |
| | | | | Light brown fine sand with fines, saturated |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | |

| AECOM | | | BORING LOG | | Boring No.: MIP-5 |
|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | | |
| PROJECT No.: | 60133623 | | | | PAGE 6 OF 7 |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | |
| 70 | | | | Light brown fine sand with fines, saturated |
| | | | | " |
| 71 | | | | " |
| | | | | " |
| 72 | | | | " |
| | | | | " |
| 73 | | | | " |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | | | | " |
| 76 | | | | " |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | 12:45 | | | Collected HP-05D (80-83') |
| | | | | Light brown fines with fine sand |
| 81 | | | | " |
| | | | | " |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | " |
| 84 | | | | |

**BORING LOG** — **Boring No.: MIP-5**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 84 | | | | Light brown fines with fine sand |
| 85 | | | | End of boring: 85 ft bgs |
| 86 | | | | |
| 87 | | | | |
| 88 | | | | |
| 89 | | | | |
| 90 | | | | |
| 91 | | | | |
| 92 | | | | |
| 93 | | | | |
| 94 | | | | |
| 95 | | | | |
| 96 | | | | |
| 97 | | | | |
| 98 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-12**

| | | | |
|---|---|---|---|
| PROJECT: Country Cleaners | | PAGE 1 OF | 7 |
| PROJECT No.: 60133623 | CONTRACTOR: Zebra Environmental | DATE: | 9/17/2007 |
| LOCATION: Huntington, NY | DRILLERS NAME: Will | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | Geo Probe 6600 series | | |
| DEPTH OF BOREHOLE (FT): | 85 | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Asphalt and base |
| | | | | Light brown medium to coarse sand with gravel |
| 1 | | | | " |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | | | | " |
| | | | | " |
| 10 | | | | " |
| | | | | " |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | | | | " |
| | | | | " |
| 14 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-12**

PROJECT: Country Cleaners

PROJECT No.: 60133623

PAGE 2 OF 7

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 14 | | | | |
| | | | | Light brown medium to coarse sand with gravel |
| 15 | | | | " |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | | | | " |
| 21 | | | | " |
| | | | | " |
| 22 | | | | " |
| | | | | " |
| 23 | | | | " |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | " |
| | | | | |

AECOM **BORING LOG** **Boring No.: MIP-12**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Light brown medium to coarse sand with gravel |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | | | | " |
| 31 | | | | " |
| | | | | " |
| 32 | | | | " |
| | | | | " |
| 33 | | | | " |
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| 34 | | | | " |
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| 35 | | | | " |
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| 36 | | | | " |
| | | | | " |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | | | | " |
| 39 | | | | " |
| | | | | " |
| 40 | | | | " |
| | | | | " |
| 41 | | | | " |
| | | | | " |
| 42 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-12**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Light brown medium to coarse sand with gravel |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | 09:50 | | | Collected HP-12A (47-50') |
| 46 | 09:35 | | | Collected HP-12A MS/MSD (47-50') |
| | | | | Light brown medium to coarse sand with gravel |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | | | | " |
| 51 | | | | " |
| | | | | " |
| 52 | | | | " |
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| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | | | | " |
| 55 | | | | " |
| | | | | " |
| 56 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-12**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 56 | | | | |
| | | | | Light brown medium to coarse sand with gravel |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | " |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | 11:00 | | | Collected HP-12B (67-70') |
| 68 | | | | Dark brown fines with some fine sand |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | " |
| | | | | |

| AECOM | | | | BORING LOG | Boring No.: | MIP-12 |
|---|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | | | |
| PROJECT No.: | 60133623 | | | | PAGE 6 OF | 7 |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | | | | Dark brown fines with some fine sand |
| 71 | | | | " |
| | | | | " |
| 72 | | | | " |
| | | | | " |
| 73 | | | | " |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | 13:00 | | | Collected HP-12C (75-77') |
| 76 | | | | Dark brown fines with some fine sand |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | " |
| | | | | " |
| 81 | | | | " |
| | | | | " |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | " |
| 84 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-12**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 84 | | | | Dark brown fines with some fine sand |
| | | | | " |
| 85 | | | | End of boring: 85 ft bgs |
| 86 | | | | |
| 87 | | | | |
| 88 | | | | |
| 89 | | | | |
| 90 | | | | |
| 91 | | | | |
| 92 | | | | |
| 93 | | | | |
| 94 | | | | |
| 95 | | | | |
| 96 | | | | |
| 97 | | | | |
| 98 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-16**

| | | | |
|---|---|---|---|
| PROJECT: Country Cleaners | | PAGE 1 OF | 6 |
| PROJECT No.: 60133623 | CONTRACTOR: Zebra Environmental | DATE: | 2/9/2009 |
| LOCATION: Huntington, NY | DRILLERS NAME: Will | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | Geo Probe 6600 series | | |
| DEPTH OF BOREHOLE (FT): | 82 | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | |
| 1 | | | | Light brown, medium to coarse sand, gravel |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | | | | " |
| | | | | " |
| 10 | | | | " |
| | | | | " |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | 9:40 | | | " |
| | | | | " |
| 14 | | | | " |
| | | | | " |

AECOM **BORING LOG** **Boring No.: MIP-16**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Light brown, medium to coarse sand, gravel |
| 14 | | | | " |
| | | | | " |
| 15 | | | | SS-16A (15-16') |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | | | | " |
| 21 | | | | " |
| | | | | " |
| 22 | | | | " |
| | | | | " |
| 23 | | | | " |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-16**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Light brown, medium to coarse sand, gravel |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | | | | " |
| 31 | | | | " |
| | | | | " |
| 32 | | | | " |
| | | | | " |
| 33 | | | | " |
| | | | | " |
| 34 | | | | " |
| | | | | " |
| 35 | | | | " |
| | | | | " |
| 36 | | | | " |
| | | | | " |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | | | | " |
| 39 | | | | " |
| | | | | " |
| 40 | | | | " |
| | | | | " |
| 41 | | | | " |
| | | | | " |
| 42 | | | | " |
| | | | | |

| AECOM | BORING LOG | Boring No.: | MIP-16 |
|---|---|---|---|

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Light brown, medium to coarse sand, gravel |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | | | | " |
| 46 | | | | " |
| | | | | " |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | | | | " |
| 51 | | | | " |
| | | | | " |
| 52 | | | | " |
| | | | | " |
| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | | | | " |
| 55 | | | | " |
| | | | | " |
| 56 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-16**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 56 | | | | |
| | | | | Light brown, medium to coarse sand, gravel |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | " |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | | | | " |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | " |

AECOM

# BORING LOG

**Boring No.: MIP-16**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | | | | Collected HP-16B (70-72') |
| 71 | | | | Light brown, medium to coarse sand, gravel |
| | | | | " |
| 72 | | | | " |
| | | | | " |
| 73 | | | | " |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | | | | " |
| 76 | | | | " |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | " |
| | | | | Collected HP-16C (80-82') |
| 81 | | | | Light brown, medium to coarse sand, gravel |
| | | | | " |
| 82 | | | | End of boring: 82 ft bgs |
| | | | | |
| 83 | | | | |
| | | | | |
| 84 | | | | |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-28**

| | | | |
|---|---|---|---|
| PROJECT: Country Cleaners | | PAGE 1 OF | 7 |
| PROJECT No.: 60133623 | CONTRACTOR: Zebra Environmental | DATE: | 9/19/2007 |
| LOCATION: Huntington, NY | DRILLERS NAME: Will | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | Geo Probe 6600 series | | |
| DEPTH OF BOREHOLE (FT): | 94 | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Light brown medium to coarse sand with trace gravel |
| | | | | " |
| 1 | | | | " |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | | | | " |
| | | | | " |
| 10 | 09:30 | 3.0 | 158.0 | SS-28A (11-12 ft bgs) fuel oil odor |
| | | | | Light brown medium to coarse sand with trace gravel |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | | | | " |
| | | | | " |
| 14 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-28**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 14 | | | | |
| | | | | Light brown medium to coarse sand with trace gravel |
| 15 | | | | " |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | | | | " |
| 21 | | | | " |
| | | | | " |
| 22 | | | | " |
| | 09:45 | 3.0 | 10.0 | SS-28B (23-24 ft bgs) |
| 23 | | | | Greyish brown clay with fine sand, moist |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | " |
| | | | | |

**BORING LOG** Boring No.: **MIP-28**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Greyish brown clay with fine sand, moist |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | | | | " |
| 31 | | | | " |
| | | | | " |
| 32 | | | | " |
| | | | | " |
| 33 | | | | " |
| | | | | " |
| 34 | | | | " |
| | | | | " |
| 35 | | | | " |
| | | | | " |
| 36 | | | | " |
| | | | | " |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | | | | " |
| 39 | | | | " |
| | | | | " |
| 40 | | | | " |
| | | | | " |
| 41 | | | | " |
| | | | | " |
| 42 | | | | " |

AECOM

# BORING LOG

**Boring No.: MIP-28**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Greyish brown clay with fine sand, moist |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | | | | " |
| 46 | | | | " |
| | | | | " |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | 10:45 | 3.0 | 10.0 | SS-28C (51-52 ft bgs) |
| 51 | | | | Light brown fine to medium sand with fines, moist |
| | | | | " |
| 52 | | | | " |
| | | | | " |
| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | | | | " |
| 55 | | | | " |
| | | | | " |
| 56 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-28**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 56 | | | | |
| | | | | Light brown fine to medium sand with fines, moist |
| | | | | " |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | Attempted to collect groundwater sample - dry (65-70') |
| | | | | Possible clay layer |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | | | | " |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | |

AECOM

# BORING LOG

Boring No.: **MIP-28**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | | | | Possible clay layer |
| 71 | | | | " |
| | | | | " |
| 72 | | | | " |
| | | | | " |
| 73 | | | | " |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | | | | " |
| 76 | | | | " |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | " |
| | | | | Attempted to collect groundwater sample - dry (80-84') |
| 81 | | | | Possible clay layer |
| | | | | " |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | " |
| 84 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-28**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 84 | | | | |
| | | | | Possible clay layer |
| 85 | | | | " |
| | | | | " |
| 86 | | | | " |
| | | | | " |
| 87 | | | | " |
| | | | | " |
| 88 | | | | " |
| | | | | " |
| 89 | | | | " |
| | | | | " |
| 90 | | | | " |
| | | | | Attempted to collect groundwater sample - dry (90-94') |
| 91 | | | | Possible clay layer |
| | | | | " |
| 92 | | | | " |
| | | | | " |
| 93 | | | | " |
| | | | | " |
| 94 | | | | End of boring: 94 ft bgs |
| 95 | | | | |
| 96 | | | | |
| 97 | | | | |
| 98 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-33**

| | | | |
|---|---|---|---|
| PROJECT: Country Cleaners | | PAGE 1 OF | 8 |
| PROJECT No.: 60133623 | CONTRACTOR: Zebra Environmental | DATE: | 9/16/2007 |
| LOCATION: Huntington, NY | DRILLERS NAME: Will | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | Geo Probe 6600 series | | |
| DEPTH OF BOREHOLE (FT): | 105 | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Asphalt and base |
| | | | | Light brown medium to coarse sand with gravel |
| 1 | | | | " |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | | | | " |
| | | | | " |
| 10 | | | | " |
| | | | | " |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | | | | " |
| | | | | " |
| 14 | | | | |

**AECOM** **BORING LOG** **Boring No.: MIP-33**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 14 | | | | |
| | | | | Light brown medium to coarse sand with gravel |
| 15 | | | | " |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | 09:50 | 7\|9\|10\|13 | 0.0 | SS-33A (17-18') |
| 18 | | 1.0 | | Light brown medium to coarse sand with fines |
| | | | | " |
| 19 | | | | Perched water |
| | | | | Light brown medium to coarse sand with fines |
| 20 | | | | " |
| | | | | " |
| 21 | | | | " |
| | | | | " |
| 22 | | | | " |
| | | | | " |
| 23 | | | | " |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | 10:05 | 8\|8\|9\|11 | 5.0 | SS-33B (25-26') |
| 26 | | 1.8 | | Light brown medium to coarse sand with gravel |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | " |
| | | | | |

AECOM **BORING LOG** **Boring No.: MIP-33**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Light brown medium to coarse sand with gravel |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | | | | " |
| 31 | | | | " |
| | | | | " |
| 32 | | | | " |
| | | | | " |
| 33 | | | | " |
| | 10:15 | 4\|4\|5\|7 | 0.0 | SS-33C (33-34') |
| 34 | | 2.0 | | Brown fines with fine sand |
| | | | | " |
| 35 | | | | " |
| | | | | " |
| 36 | | | | " |
| | | | | " |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | 10:30 | 0\|13\|14\|2 | 0.0 | SS-33D (38-40') |
| 39 | | 1.3 | | Brown fines with fine sand |
| | | | | " |
| 40 | | | | " |
| | | | | " |
| 41 | | | | " |
| | | | | " |
| 42 | | | | " |
| | | | | |

AECOM **BORING LOG** **Boring No.: MIP-33**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Brown fines with fine sand |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | | | | " |
| 46 | | | | " |
| | | | | " |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | 10:50 | 1.4 | 0.0 | SS-33E (50-51') |
| 51 | | | | Light brown medium to coarse sand with gravel, moist |
| | | | | " |
| 52 | | | | " |
| | 11:30 | | | HP-33F (52-55') |
| 53 | | | | Light brown medium to coarse sand with gravel, moist |
| | | | | " |
| 54 | | | | " |
| | | | | " |
| 55 | | | | " |
| | | | | " |
| 56 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-33**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 56 | | | | |
| | | | | Light brown medium to coarse sand with gravel, moist |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | " |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | | | | " |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | " |

AECOM

# BORING LOG

**Boring No.: MIP-33**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | | | | Light brown medium to coarse sand with gravel, moist |
| 71 | | | | " |
| | | | | " |
| 72 | | | | " |
| | | | | " |
| 73 | | | | " |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | 12:40 | | | HP-33G (72-75') |
| 76 | | | | Light brown medium to coarse sand with gravel, moist |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | " |
| | | | | " |
| 81 | | | | " |
| | | | | " |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | " |
| 84 | | | | " |
| | | | | |

| AECOM | | | BORING LOG | Boring No.: | MIP-33 |
|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | | |
| PROJECT No.: | 60133623 | | | PAGE 7 OF | 8 |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 84 | | | | |
| | | | | Light brown medium to coarse sand with gravel, moist |
| 85 | | | | " |
| | | | | " |
| 86 | | | | " |
| | | | | " |
| 87 | | | | " |
| | 14:00 | | | HP-33H (87-90') |
| 88 | | | | Light brown medium to coarse sand with gravel, moist |
| | | | | " |
| 89 | | | | " |
| | | | | " |
| 90 | | | | " |
| | | | | " |
| 91 | | | | " |
| | | | | " |
| 92 | | | | " |
| | | | | " |
| 93 | | | | " |
| | | | | " |
| 94 | | | | " |
| | | | | " |
| 95 | | | | " |
| | | | | " |
| 96 | | | | " |
| | | | | " |
| 97 | | | | " |
| | | | | " |
| 98 | | | | " |
| | | | | |

**BORING LOG** **Boring No.: MIP-33**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 98 | | | | |
| | | | | Light brown medium to coarse sand with gravel, moist |
| 99 | | | | " |
| | | | | " |
| | | | | " |
| 100 | 14:45 | | | HP-33I (100-103') |
| 101 | | | | Light brown medium to coarse sand with gravel, moist |
| | | | | " |
| 102 | | | | " |
| | | | | " |
| 103 | | | | " |
| | | | | " |
| 104 | | | | " |
| | | | | " |
| 105 | | | | End of boring: 105 ft bgs |
| 106 | | | | |
| 107 | | | | |
| 108 | | | | |
| 109 | | | | |
| 110 | | | | |
| 111 | | | | |
| 112 | | | | |

| AECOM | | BORING LOG | | Boring No.: | MIP-39 |
|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | PAGE 1 OF | 7 |
| PROJECT No.: | 60133623 | CONTRACTOR: Zebra Environmental | | DATE: | 2/9/2009 |
| LOCATION: Huntington, NY | | DRILLERS NAME: Will | | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | | Geo Probe 6600 series | | | |
| DEPTH OF BOREHOLE (FT): | | 92 | | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Grass and top soil |
| | | | | |
| 1 | | | | " |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | | | | " |
| | | | | " |
| 10 | | | | " |
| | | | | " |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | 9:40 | | | SS-39A (13-14') |
| 13 | | | | Light brown, medium to coarse sand, gravel |
| | | | | " |
| 14 | | | | " |

AECOM **BORING LOG** **Boring No.: MIP-39**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Light brown, medium to coarse sand, gravel |
| 14 | | | | " |
| | | | | " |
| 15 | | | | " |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | | | | " |
| 21 | | | | " |
| | | | | " |
| 22 | | | | " |
| | | | | " |
| 23 | | | | " |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | |

**BORING LOG** Boring No.: **MIP-39**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Light brown, medium to coarse sand, gravel |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | | | | " |
| 31 | | | | " |
| | | | | " |
| 32 | | | | " |
| | | | | " |
| 33 | 09:40 | | | SS-39B (33-34') |
| | 10:05 | | | SS-39B Field Duplicate (33-34') |
| 34 | 09:40 | | | SS-39B MS/MSD (33-34') |
| | | | | Light brown, medium to coarse sand, gravel |
| 35 | | | | " |
| | | | | " |
| 36 | | | | " |
| | | | | " |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | | | | " |
| 39 | | | | " |
| | | | | " |
| 40 | | | | " |
| | | | | " |
| 41 | | | | " |
| | | | | " |
| 42 | | | | " |
| | | | | |

## BORING LOG

**Boring No.: MIP-39**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Light brown, medium to coarse sand, gravel |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | | | | " |
| 46 | | | | " |
| | | | | " |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | | | | " |
| 51 | | | | " |
| | | | | " |
| 52 | | | | " |
| | | | | " |
| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | 12:20 | | | Collected HP-39C (54-56') |
| 55 | | | | Light brown, medium to coarse sand, gravel |
| | | | | " |
| 56 | | | | " |
| | | | | |

**AECOM**

# BORING LOG

**Boring No.: MIP-39**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 56 | | | | Light brown, medium to coarse sand, gravel |
| | | | | " |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | " |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | | | | " |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | " |
| | | | | |

| AECOM | | | BORING LOG | | Boring No.: | MIP-39 |
|---|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | | | |
| PROJECT No.: | 60133623 | | | | PAGE 6 OF | 7 |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | | | | Light brown, medium to coarse sand, gravel |
| 71 | | | | " |
| | | | | " |
| 72 | | | | " |
| | 11:55 | | | Collected HP-39D (73-75') |
| 73 | | | | Light brown, medium to coarse sand, gravel |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | | | | " |
| 76 | | | | " |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | " |
| | | | | " |
| 81 | | | | " |
| | | | | " |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | " |
| 84 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-39**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 84 | | | | Light brown, medium to coarse sand, gravel |
| 85 | | | | " |
| | | | | " |
| 86 | | | | " |
| | | | | " |
| 87 | | | | " |
| | | | | " |
| 88 | | | | " |
| | | | | " |
| 89 | | | | " |
| | | | | " |
| 90 | | | | " |
| | 11:35 | | | Collected HP-39E (90-92') |
| 91 | 11:40 | | | Collected HP-39E field duplicate (90-92') |
| | | | | " |
| 92 | | | | End of boring: 92 ft bgs |
| 93 | | | | |
| 94 | | | | |
| 95 | | | | |
| 96 | | | | |
| 97 | | | | |
| 98 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-40**

| | | | | |
|---|---|---|---|---|
| PROJECT: Country Cleaners | | | PAGE 1 OF | 8 |
| PROJECT No.: 60133623 | | CONTRACTOR: Zebra Environmental | DATE: | 9/4/2007 |
| LOCATION: Huntington, NY | | DRILLERS NAME: Will | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | | Geo Probe 6600 series | | |
| DEPTH OF BOREHOLE (FT): | | 105 | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Asphalt and base |
| | | | | Light brown medium to coarse sand with some gravel |
| 1 | | | | " |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | 08:20 | 5\|6\|6\|5 | 0.0 | SS-40A (9-10'), MS/MSD |
| 10 | | 0.5 | | Light brown medium to coarse sand with some gravel |
| | | | | " |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | | | | " |
| | | | | " |
| 14 | | | | " |
| | | | | |

**BORING LOG** | **Boring No.: MIP-40**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 14 | | | | |
| | | | | Light brown medium to coarse sand with some gravel |
| 15 | | | | " |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | | | | " |
| 21 | | | | " |
| | | | | " |
| 22 | | | | " |
| | | | | " |
| 23 | | | | " |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | " |

AECOM

# BORING LOG

**Boring No.: MIP-40**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 28 | | | | |
| | | | | Light brown medium to coarse sand with some gravel |
| 29 | | | | " |
| | | | | " |
| 30 | | | | " |
| | 9:00 | 8\|10\|12\|16 | 0.0 | Light brown fine to medium sand with gravel |
| 31 | | 1.5 | | " |
| | | | | " |
| 32 | | | | " |
| | | | | " |
| 33 | | | | " |
| | | | | " |
| 34 | | | | " |
| | | | | " |
| 35 | | | | " |
| | | | | " |
| 36 | | | | " |
| | | | | " |
| 37 | | | | " |
| | | | | " |
| 38 | | | | " |
| | | | | " |
| 39 | | | | " |
| | | | | " |
| 40 | | | | " |
| | | | | " |
| 41 | | | | " |
| | | | | " |
| 42 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-40**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Light brown fine to medium sand with gravel |
| 43 | | | | " |
| | | | | " |
| 44 | | | | " |
| | | | | " |
| 45 | | | | " |
| | | | | " |
| 46 | | | | " |
| | | | | " |
| 47 | | | | " |
| | | | | " |
| 48 | | | | " |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | 9:20 | 7\|8\|11\|13 | 0.0 | Light brown fine to medium sand with trace fines and trace gravel |
| 51 | | 2.0 | | " |
| | | | | " |
| 52 | | | | " |
| | | | | " |
| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | | | | " |
| 55 | | | | " |
| | | | | " |
| 56 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-40**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 56 | | | | Light brown fine to medium sand with trace fines and trace gravel |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | " |
| 65 | | | | " |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | | | | " |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | " |
| 70 | | | | " |

| | | | | | |
|---|---|---|---|---|---|
| AECOM | | | | **BORING LOG** | **Boring No.:** **MIP-40** |
| PROJECT: Country Cleaners | | | | | |
| PROJECT No.: | 60133623 | | | | PAGE 6 OF 8 |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | 10:10 | 20\|31\|44\|52 | 0.0 | Light brown fine to medium sand with some gravel, moist |
| 71 | | 1.7 | | " |
| | | | | " |
| 72 | | | | " |
| | | | | " |
| 73 | | | | " |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | | | | " |
| 76 | | | | " |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | " |
| | 10:25 | 11\|14\|21\|30 | 0.0 | SS-401B (80-83') |
| 81 | | 2.0 | | SS-401B MS/MSD (80-83') |
| | | | | Light brown fine to coarse sand with some gravel, saturated |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | " |
| 84 | | | | " |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-40**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 84 | | | | Light brown fine to coarse sand with some gravel, saturated |
| | | | | " |
| 85 | | | | " |
| | | | | " |
| 86 | | | | " |
| | | | | " |
| 87 | | | | " |
| | | | | " |
| 88 | | | | " |
| | | | | " |
| 89 | | | | " |
| | | | | " |
| 90 | | | | " |
| | | | | " |
| 91 | | | | " |
| | | | | " |
| 92 | | | | " |
| | | | | " |
| 93 | | | | " |
| | | | | " |
| 94 | | | | " |
| | | | | " |
| 95 | | | | " |
| | | | | " |
| 96 | | | | " |
| | | | | " |
| 97 | | | | " |
| | | | | " |
| 98 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-40**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 98 | | | | |
| | | | | Light brown fine to coarse sand with some gravel, saturated |
| 99 | | | | " |
| | | | | " |
| 100 | | | | " |
| | 13:35 | | | Collected HP-40C (100-103') |
| 101 | | | | Light brown fine to coarse sand with some gravel, saturated |
| | | | | " |
| 102 | | | | " |
| | | | | " |
| 103 | | | | " |
| | | | | " |
| 104 | | | | " |
| | | | | " |
| 105 | | | | End of boring: 105 ft bgs |
| 106 | | | | |
| 107 | | | | |
| 108 | | | | |
| 109 | | | | |
| 110 | | | | |
| 111 | | | | |
| 112 | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-41**

| | | | |
|---|---|---|---|
| PROJECT: Country Cleaners | | PAGE 1 OF | 6 |
| PROJECT No.: 60133623 | CONTRACTOR: Zebra Environmental | DATE: | 9/3/2007 |
| LOCATION: Huntington, NY | DRILLERS NAME: Will | AECOM REP.: Chokshi, M. | |
| DESIGNATION OF DRILL RIG: | Geo Probe 6600 series | | |
| DEPTH OF BOREHOLE (FT): | 83 | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | Asphalt and base |
| | | | | Light brown medium to coarse sand with gravel |
| 1 | | | | " |
| | | | | " |
| 2 | | | | " |
| | | | | " |
| 3 | | | | " |
| | | | | " |
| 4 | | | | " |
| | | | | " |
| 5 | | | | " |
| | | | | " |
| 6 | | | | " |
| | | | | " |
| 7 | | | | " |
| | | | | " |
| 8 | | | | " |
| | | | | " |
| 9 | | | | " |
| | | | | " |
| 10 | 10:00 | 9\|8\|9\|11 | 0.0 | SS-41A (10-11') |
| | | 1.7 | | Light brown medium to coarse sand with gravel |
| 11 | | | | " |
| | | | | " |
| 12 | | | | " |
| | | | | " |
| 13 | | | | " |
| | | | | " |
| 14 | | | | |

**AECOM** | | **BORING LOG** | | **Boring No.:** | **MIP-41**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 14 | | | | |
| | | | | Light brown medium to coarse sand with gravel |
| 15 | | | | " |
| | | | | " |
| 16 | | | | " |
| | | | | " |
| 17 | | | | " |
| | | | | " |
| 18 | | | | " |
| | | | | " |
| 19 | | | | " |
| | | | | " |
| 20 | | | | " |
| | 10:10 | 5\|15\|23\|26 | 0.0 | SS-41B (20-21') |
| 21 | | 1.0 | | Light brown medium to coarse sand with gravel |
| | | | | " |
| 22 | | | | " |
| | | | | " |
| 23 | | | | " |
| | | | | " |
| 24 | | | | " |
| | | | | " |
| 25 | | | | " |
| | | | | " |
| 26 | | | | " |
| | | | | " |
| 27 | | | | " |
| | | | | " |
| 28 | | | | " |
| | | | | |

| AECOM | | | | BORING LOG | | Boring No.: | MIP-41 |
|---|---|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | | | | |
| PROJECT No.: | | 60133623 | | | | PAGE 2 OF | 6 |
| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES | | | |
| 28 | | | | | | | |
| | | | | Light brown medium to coarse sand with gravel | | | |
| 29 | | | | " | | | |
| | | | | " | | | |
| 30 | | | | " | | | |
| | 10:30 | 12\|9\|43\|54 | 0.0 | Light brown medium to coarse sand with gravel | | | |
| 31 | | 1.7 | | " | | | |
| | | | | " | | | |
| 32 | | | | " | | | |
| | | | | " | | | |
| 33 | | | | " | | | |
| | | | | " | | | |
| 34 | | | | " | | | |
| | | | | " | | | |
| 35 | | | | " | | | |
| | | | | " | | | |
| 36 | | | | " | | | |
| | | | | " | | | |
| 37 | | | | " | | | |
| | | | | " | | | |
| 38 | | | | " | | | |
| | | | | " | | | |
| 39 | | | | " | | | |
| | | | | " | | | |
| 40 | | | | " | | | |
| | | | | " | | | |
| 41 | | | | " | | | |
| | | | | " | | | |
| 42 | | | | " | | | |
| | | | | | | | |

AECOM

# BORING LOG

**Boring No.: MIP-41**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 42 | | | | |
| | | | | Light brown medium to coarse sand with gravel |
| 43 | | | | " |
| | 10:45 | 8\|16\|39\|59 | 22.0 | Light brown medium to coarse sand with trace fines, gravel |
| 44 | | 2.0 | | " |
| | | | | " |
| 45 | | | | " |
| | | | | " |
| 46 | | | | " |
| | | | | " |
| 47 | | | | " |
| | 11:30 | | | HP-41C (47-50') |
| 48 | | | | Light brown medium to coarse sand with trace fines, gravel |
| | | | | " |
| 49 | | | | " |
| | | | | " |
| 50 | | | | " |
| | | | | " |
| 51 | | | | " |
| | | | | " |
| 52 | | | | " |
| | | | | " |
| 53 | | | | " |
| | | | | " |
| 54 | | | | " |
| | | | | " |
| 55 | | | | " |
| | | | | " |
| 56 | | | | " |
| | | | | |

| AECOM | | | **BORING LOG** | **Boring No.:** | **MIP-41** |
|---|---|---|---|---|---|
| PROJECT: Country Cleaners | | | | | |
| PROJECT No.: | 60133623 | | | PAGE 5 OF | 6 |

| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 56 | | | | Light brown medium to coarse sand with trace fines, gravel |
| | | | | " |
| 57 | | | | " |
| | | | | " |
| 58 | | | | " |
| | | | | " |
| 59 | | | | " |
| | | | | " |
| 60 | | | | " |
| | | | | " |
| 61 | | | | " |
| | | | | " |
| 62 | | | | " |
| | | | | " |
| 63 | | | | " |
| | | | | " |
| 64 | | | | " |
| | | | | HP-41D (65-68') |
| 65 | | | | Light brown medium to coarse sand with trace fines, gravel |
| | | | | " |
| 66 | | | | " |
| | | | | " |
| 67 | | | | " |
| | | | | " |
| 68 | | | | " |
| | | | | " |
| 69 | | | | " |
| | | | | Light brown medium to coarse sand with trace fines |
| 70 | | | | |

**BORING LOG** Boring No.: **MIP-41**

PROJECT: Country Cleaners

PROJECT No.: 60133623



| Depth (ft) | Sample Number & Time | Rec. (feet) | HNu Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 70 | | | | |
| | | | | Light brown medium to coarse sand with trace fines |
| 71 | | | | " |
| | | | | " |
| 72 | | | | " |
| | | | | " |
| 73 | | | | " |
| | | | | " |
| 74 | | | | " |
| | | | | " |
| 75 | | | | " |
| | | | | " |
| 76 | | | | " |
| | | | | " |
| 77 | | | | " |
| | | | | " |
| 78 | | | | " |
| | | | | " |
| 79 | | | | " |
| | | | | " |
| 80 | | | | HP-41E (80-83') |
| | | | | Light brown medium to coarse sand with trace fines |
| 81 | | | | " |
| | | | | " |
| 82 | | | | " |
| | | | | " |
| 83 | | | | " |
| | | | | End of boring: 83 ft bgs |
| 84 | | | | |
| | | | | |

AECOM

# BORING LOG

**Boring No.: MW-1S**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 1/6-7/2010 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 75 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" grass and top soil<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | Perched water at 25 ft<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | 0.0 | "<br>" |
| 60 | | | 0.0 | "<br>" |
| 65 | | | 0.0 | "<br>" |
| 75 | | | 0.0 | "<br>End of boring: 75 ft bgs |
| 80 | | | | |
| 85 | | | | |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-1D**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 1/6/2010 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 110 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" grass and top soil<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | Wet soil at 30 feet.<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>Perched water at 45 ft |
| 55 | | | 0.0 | Light brown fine sand with fines, ~5% fine to coarse gravel.<br>" |
| 60 | | | 0.0 | "<br>" |
| 65 | | | 0.0 | "<br>" |
| 75 | | | 0.0 | "<br>" |
| 80 | | | 0.0 | "<br>" |
| 85 | | | 0.0 | "<br>" |
| 95 | | | 0.0 | "<br>" |
| 100 | | | 0.0 | "<br>" |
| 105 | 10:00 | 0.0 | 0.0<br>0.0 | 100-102' Split Spoon<br>Sand at 100' according to driller based on the feel of the rod. |
| 115 | | | | End of boring: 110 ft bgs |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-2D**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/16-17/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 94 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | 0-6" asphalt and base |
| | | | 0.0 | Light brown fine sand with fines, ~10% fine to coarse gravel. |
| 5 | | | | " |
| | | | 0.0 | " |
| 15 | | | | " |
| | | | 0.0 | " |
| 20 | | | | " |
| | | | 0.0 | " |
| 25 | | | | " |
| | | | 0.0 | " |
| 35 | | | | " |
| | | | 0.0 | " |
| 40 | | | | " |
| | 12/16/09 | | 0.0 | " |
| 45 | 14:20 | 0.0 | | 49-51' Split Spoon, 100 blows, no movement |
| | 14:40 | 2.0 | 0.0 | 54-56' Split Spoon, blow count: 3, 3, 3, 27 |
| 55 | | | | Light Brown fine sand, trace silt, 10% fine gravel |
| | | | 0.0 | Sample 152187 MW-2D 54-56 for TOC (top 6") and particle size |
| 60 | | | | Light brown fine sand with fines, ~10% fine to coarse gravel. |
| | | | 0.0 | " |
| 65 | | | | " |
| | | | 0.0 | " |
| 75 | | | | " |
| | | | 0.0 | " |
| 80 | 12/17/09 | | 0.0 | '84-86' Split Spoon, blow count: 23, 29, 58, 63 |
| | 08:15 | | 0.0 | 22" Light brown fine sand trace fines, no gravel; 2" fines |
| 85 | | | | Light brown fine sand with fines |
| | | | | End of boring: 94 ft bgs |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-3S**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/15/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 60 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" asphalt and base<br>Light brown fine sand with fines, ~10% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>Perched groundwater at 20 ft bgs |
| 25 | | | 0.0 | Light brown fine sand with fines, ~10% fine to coarse gravel.<br>" |
| 35 | | | 0.0 | "<br>" |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | 0.0 | "<br>" |
| 60 | | | 0.0 | "<br>End of boring: 60 ft bgs |
| 65 | | | | |
| 75 | | | | |
| 80 | | | | |
| 85 | | | | |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-3D**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/15/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 95 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" asphalt and base<br>Light brown fine sand with fines, ~5-15% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | Perched water at 30 ft<br>Light brown fine sand with fines, ~5-15% fine to coarse gravel. |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | 0.0 | "<br>" |
| 60 | | | 0.0 | "<br>" |
| 65 | | | 0.0 | "<br>" |
| 75 | | | 0.0 | "<br>" |
| 80 | | | 0.0 | "<br>" |
| 85 | | | 0.0 | "<br>" |
| 95 | | | 0.0 | "<br>" |
| 100 | 15:30 | 2.0 | 0.0<br>0.0 | 95-97' Split Spoon<br>Light brown clay with sand lenses |
| 105 | | | | End of boring: 95 ft bgs |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-4S**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 1/4/2010 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 70 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | 0-6" asphalt and base |
| 5 | | | 0.0 | Light brown fine sand with fines, 5% coarse sand, and |
| | | | | ~5% fine to coarse gravel. |
| 15 | | | 0.0 | " |
| | | | | " |
| 20 | | | 0.0 | " |
| | | | | " |
| 25 | | | 0.0 | Perched water |
| | | | | " |
| 35 | | | 0.0 | " |
| | | | | " |
| 40 | | | 0.0 | " |
| | | | | " |
| 45 | | | 0.0 | " |
| | | | | " |
| 55 | | | 0.0 | " |
| | | | | " |
| 60 | 10:20 | 1.58 | 0.0 | 60-62' Split Spoon: top 4" light brown fine sand, trace silt |
| | | | | remaining 15" light brown fine sand with 10% medium to coarse sand |
| 65 | | | 0.0 | Sample ID 152187MW-4S 60-62 for TOC and particle size |
| | | | | End of boring: 70 ft bgs |
| 75 | | | | |
| 80 | | | | |
| 85 | | | | |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-4D**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 1/4-5/2010 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 104 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | | 0-6" asphalt and base<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 15 | | | | "<br>" |
| 20 | | | | "<br>" |
| 25 | | | PID not functioning in cold | "<br>Perched water |
| 35 | | | | "<br>" |
| 40 | | | | "<br>" |
| 45 | | | | "<br>" |
| 55 | | | | "<br>" |
| 60 | | | | "<br>" |
| 65 | | | | "<br>" |
| 75 | | | | "<br>" |
| 80 | | | | "<br>" |
| 85 | | | | "<br>" |
| 95 | | | | "<br>" |
| 100 | 10:20 | 1.58 | | 95-97' Split Spoon: blow counts - 9, 12, 19, 23<br>top 9" light brown fine sand, trace silt |
| 105 | | | | remaining 10" light brown coarse sand, trace silt, and 25% fine gravel<br>103-104 ft - clay |
| 115 | | | | End of boring: 104 ft bgs |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.:** **MW-5S**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/9/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 50 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" asphalt and base<br>Light brown fine sand with fines, ~10% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | "<br>" |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | | End of boring: 50 ft bgs |
| 60 | | | | |
| 65 | | | | |
| 75 | | | | |
| 80 | | | | |
| 85 | | | | |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-5D**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/9-10/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 72 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| | | | | 0-6" asphalt and base |
| 5 | | | 0.0 | Light brown fine sand with fines, ~10% fine to coarse gravel. |
| | | | | " |
| 15 | | | 0.0 | " |
| | | | | " |
| 20 | | | 0.0 | " |
| | | | | " |
| 25 | | | 0.0 | " |
| | | | | " |
| 35 | | | 0.0 | " |
| | | | | " |
| 40 | | | 0.0 | " |
| | | | | " |
| 45 | | | 0.0 | " |
| | | | | " |
| 55 | | | 0.0 | " |
| | | | | " |
| 60 | | | 0.0 | " |
| | | | | " |
| 65 | | | 0.0 | " |
| | | | | " |
| 75 | 08:30 | 2.0 | 0.0 | 70-72' Split Spoon; blow counts - 3, 8, 12, 21 |
| | | | 0.0 | 18" Fine sand and silt |
| 80 | | | | 1" medium to coarse sand and fine gravel |
| | | | 0.0 | 5" compact fine sand and silt |
| 85 | | | | End of boring: 72 ft bgs |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-6S**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/11/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 85 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" asphalt and base<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | "<br>" |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | 0.0 | "<br>" |
| 60 | | | 0.0 | "<br>" |
| 65 | | | 0.0 | "<br>" |
| 75 | | | 0.0 | "<br>" |
| 80 | | | 0.0 | "<br>" |
| 85 | | | 0.0 | "<br>" |
| 95 | | | | End of boring: 85 ft bgs |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-7S**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/4/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 60 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" grass and top soil<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | "<br>" |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | 0.0 | "<br>" |
| 60 | | | 0.0 | "<br>End of boring: 60 ft bgs |
| 65 | | | | |
| 75 | | | | |
| 80 | | | | |
| 85 | | | | |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-7D**

| | | | | |
|---|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 | |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: | 12/7-8/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: | Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | | |
| DEPTH OF BOREHOLE (FT): | | 95 | | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" grass and top soil<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | "<br>" |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | 0.0 | "<br>" |
| 60 | | | 0.0 | "<br>" |
| 65 | | | 0.0 | "<br>" |
| 75 | | | 0.0 | "<br>" |
| 80 | | | 0.0 | "<br>" |
| 85 | 08:10 | 1.3 | 0.0 | "<br>85-87' Split Spoon; Blow Counts - 10, 19, 35, 47 |
| 95 | | | 0.0 | light brown medium sand, ~5% fine gravel, wet<br>End of boring: 95 ft bgs |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

# BORING LOG

AECOM

**Boring No.: MW-8S**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/2/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 50 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" asphalt and base<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | "<br>" |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | | End of boring: 50 ft bgs |
| 60 | | | | |
| 65 | | | | |
| 75 | | | | |
| 80 | | | | |
| 85 | | | | |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

# BORING LOG

**Boring No.: MW-8D**

| | | | |
|---|---|---|---|
| PROJECT: | Country Cleaners | | PAGE 1 OF 1 |
| PROJECT No.: | 60133623 | CONTRACTOR: Aztech Technologies, Inc. | DATE: 12/3/2009 |
| LOCATION: | Huntington, NY | DRILLERS NAME: Harrington, M. | AECOM REP.: Hunt, C. |
| DESIGNATION OF DRILL RIG: | | Hollow Stem Auger, 7.25" Augers | |
| DEPTH OF BOREHOLE (FT): | | 85 | |

| Depth (ft) | Sample Number & Time | Rec. (feet) | PID Readings (ppm) | SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES |
|---|---|---|---|---|
| 5 | | | 0.0 | 0-6" grass and top soil<br>Light brown fine sand with fines, ~5% fine to coarse gravel. |
| 15 | | | 0.0 | "<br>" |
| 20 | | | 0.0 | "<br>" |
| 25 | | | 0.0 | "<br>" |
| 35 | | | 0.0 | "<br>" |
| 40 | | | 0.0 | "<br>" |
| 45 | | | 0.0 | "<br>" |
| 55 | | | 0.0 | "<br>" |
| 60 | | | 0.0 | "<br>" |
| 65 | | | 0.0 | "<br>" |
| 75 | | | 0.0 | "<br>" |
| 80 | | | 0.0 | "<br>" |
| 85 | | | 0.0 | 80-85 ft bgs clay<br>End of boring: 85 ft bgs |
| 95 | | | | |
| 100 | | | | |
| 105 | | | | |
| 115 | | | | |
| 120 | | | | |
| 125 | | | | |
| 130 | | | | |

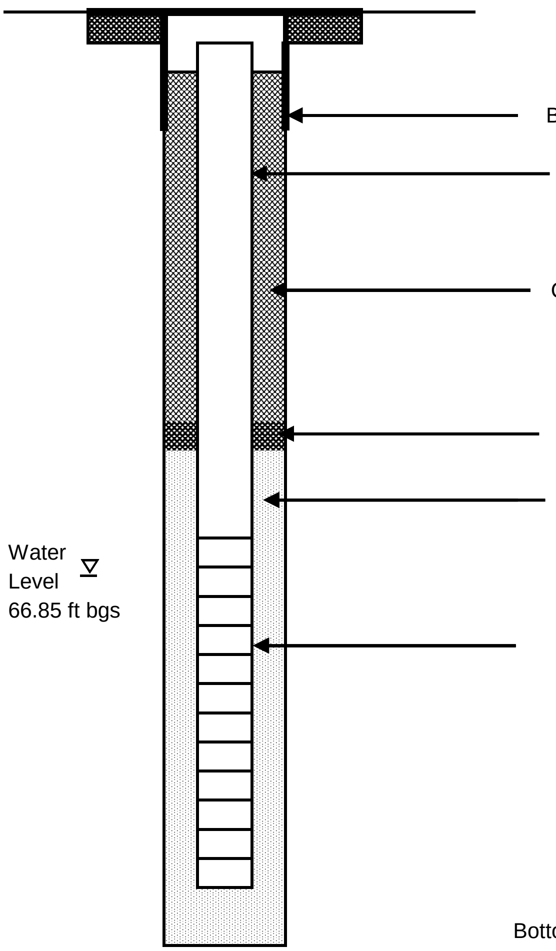
Soils characterized from soil cuttings.
PID readings taken on soil cuttings.

AECOM

**Well No. MW-1S**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 119.97 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 15:45 | 66.85 |
| Datum: NGVD 1988 | Date of Completion: 1/6/2010 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 65.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 40

Cement-bentonite grout from 60.0 ft to 1.0 ft

Bentonite Seal 63.0 ft to 60.0 ft

Filter pack from 75.0 ft to 63.0 ft

Sand Size Morie 00

Well screen from 75.0 ft to 65.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 75.0 ft

Bottom of Borehole at 75.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

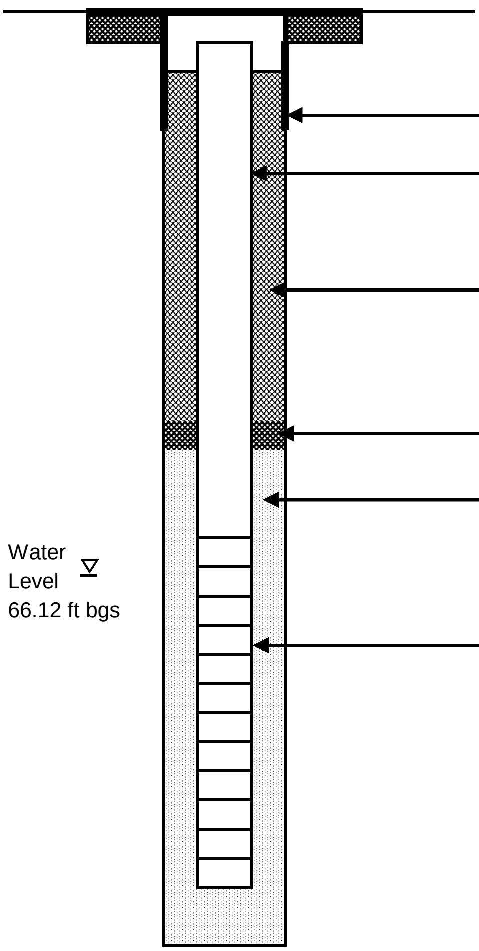
(NOT TO SCALE)

AECOM

**Well No. MW-1D**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 120.08 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 15:40 | 66.12 |
| Datum: NGVD 1988 | Date of Completion: 1/7/2010 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 97.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 80

Cement-bentonite grout from 92.0 ft to 1.0 ft

Bentonite Seal 95.0 ft to 92.0 ft

Filter pack from 107.0 ft to 95.0 ft

Sand Size Morie 00

Well screen from 107.0 ft to 97.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 107.0 ft

Bottom of Borehole at 110.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

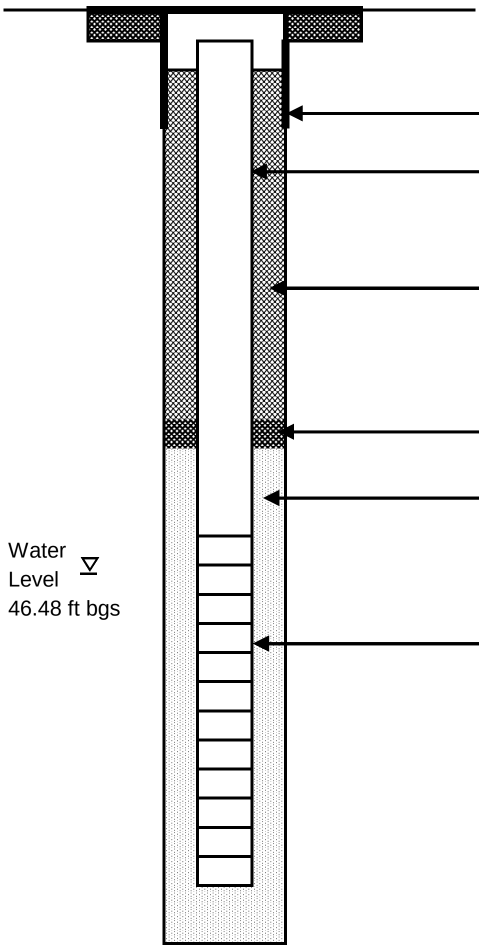
(NOT TO SCALE)

AECOM

**Well No. MW-2D**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 99.04 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 17:20 | 46.48 |
| Datum: NGVD 1988 | Date of Completion: 12/17/2009 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 84.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 80

Cement-bentonite grout from 79.0 ft to 1.0 ft

Bentonite Seal 82.0 ft to 79.0 ft

Filter pack from 94.0 ft to 82.0 ft

Sand Size Morie 00

Well screen from 94.0 ft to 84.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 94.0 ft

Bottom of Borehole at 94.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

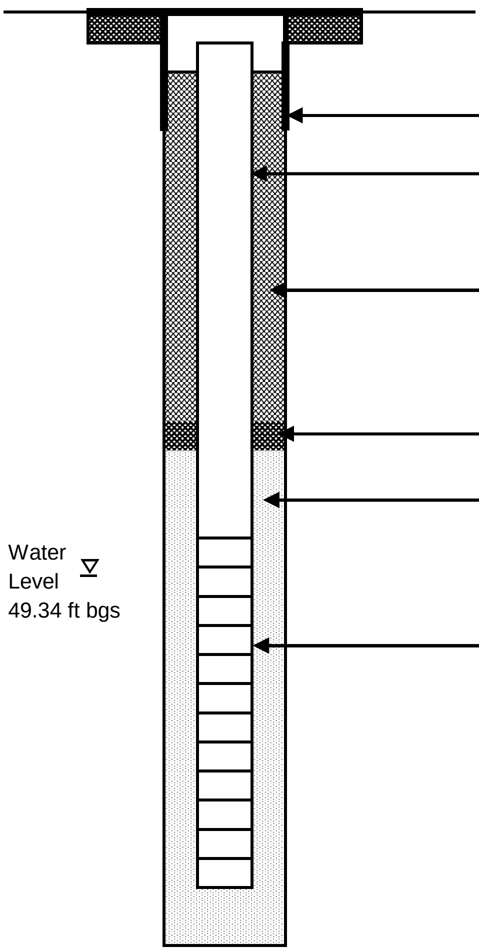
(NOT TO SCALE)

AECOM

**Well No. MW-3S**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 102.36 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 16:50 | 49.34 |
| Datum: NGVD 1988 | Date of Completion: 12/15/2009 | | | |

Locking protective flushmount (8") with concrete pad



Water Level 49.34 ft bgs

Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 45.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 40

Cement-bentonite grout from 45.0 ft to 1.0 ft

Bentonite Seal 48.0 ft to 45.0 ft

Filter pack from 60.0 ft to 48.0 ft

Sand Size Morie 00

Well screen from 60.0 ft to 50.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 60.0 ft

Bottom of Borehole at 60.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

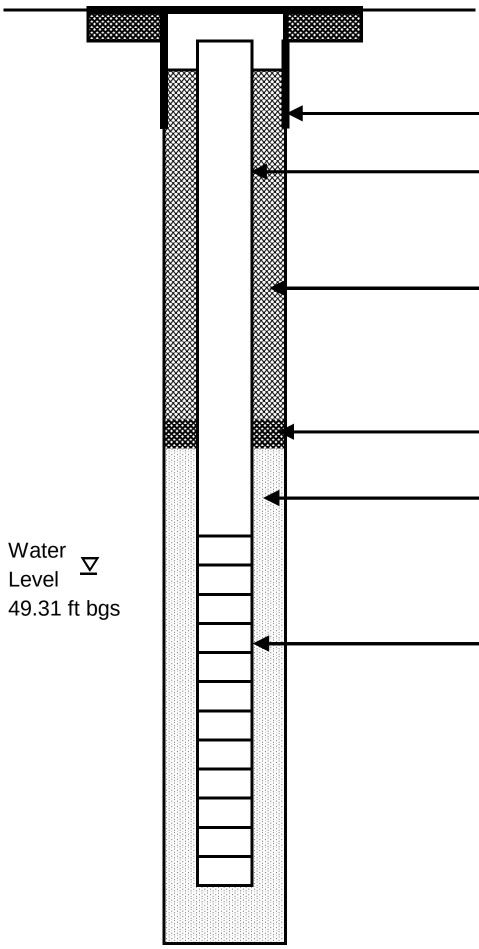
(NOT TO SCALE)

AECOM

**Well No. MW-3D**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 102.12 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 16:57 | 49.31 |
| Datum: NGVD 1988 | Date of Completion: 12/16/2009 | | | |

Locking protective flushmount (8") with concrete pad



Water Level 49.31 ft bgs

Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 84.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 80

Cement-bentonite grout from 79.0 ft to 1.0 ft

Bentonite Seal 82.0 ft to 79.0 ft

Filter pack from 94.0 ft to 82.0 ft

Sand Size Morie 00

Well screen from 94.0 ft to 84.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 94.0 ft

Bottom of Borehole at 95.0 ft

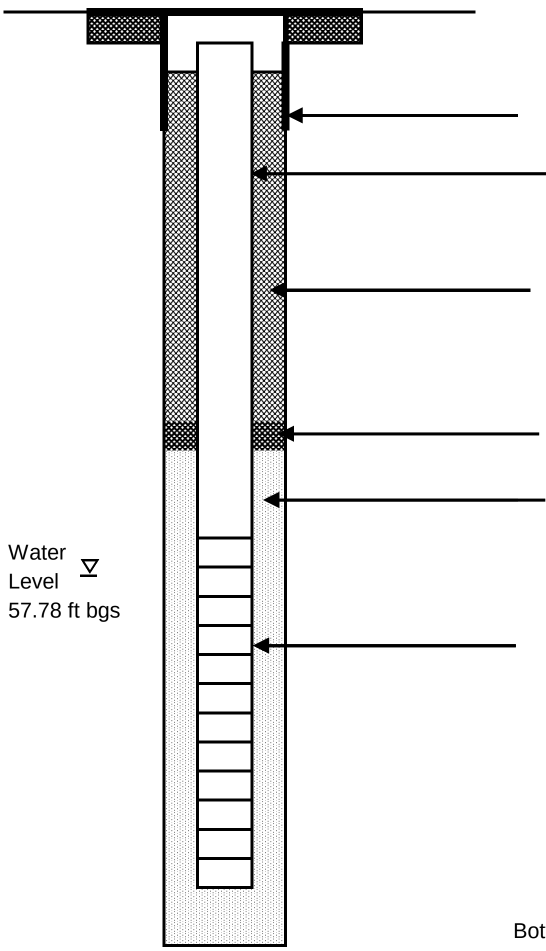
Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

(NOT TO SCALE)

**Well No. MW-4S**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 110.28 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 15:55 | 57.78 |
| Datum: NGVD 1988 | Date of Completion: 1/4/2010 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 55.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 40

Cement-bentonite
grout from 55.0 ft to 1.0 ft

Bentonite Seal 58.0 ft to 55.0 ft

Filter pack from 70.0 ft to 58.0 ft

Sand Size Morie 00

Well screen from 70.0 ft to 60.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 70.0 ft

Bottom of Borehole at 70.0 ft

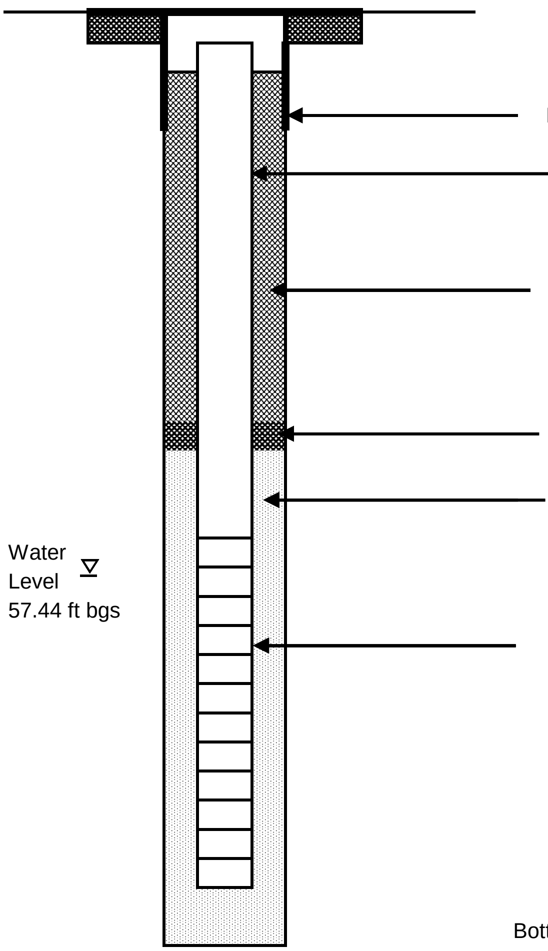
Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

(NOT TO SCALE)

**Well No. MW-4D**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 110.32 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 16:03 | 57.44 |
| Datum: NGVD 1988 | Date of Completion: 1/5/2010 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 94.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 80

Cement-bentonite grout from 89.0 ft to 1.0 ft

Bentonite Seal 92.0 ft to 89.0 ft

Filter pack from 104.0 ft to 92.0 ft

Sand Size Morie 00

Well screen from 104.0 ft to 94.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 104.0 ft

Bottom of Borehole at 104.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

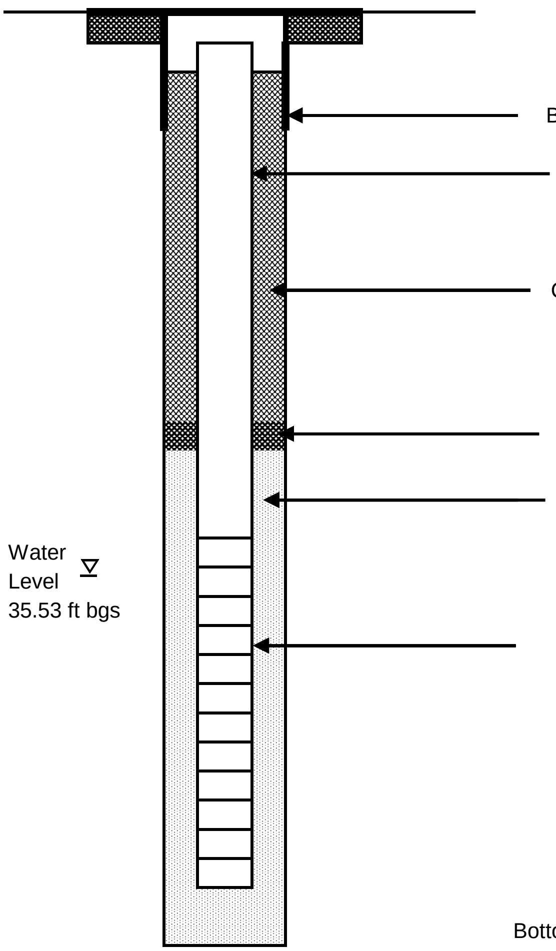
(NOT TO SCALE)

AECOM

**Well No. MW-5S**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 88.71 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 16:20 | 35.53 |
| Datum: NGVD 1988 | Date of Completion: 12/9/2009 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 35.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 40

Cement-bentonite grout from 35.0 ft to 1.0 ft

Bentonite Seal 38.0 ft to 35.0 ft

Filter pack from 50.0 ft to 38.0 ft

Sand Size Morie 00

Well screen from 50.0 ft to 40.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 50.0 ft

Bottom of Borehole at 50.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

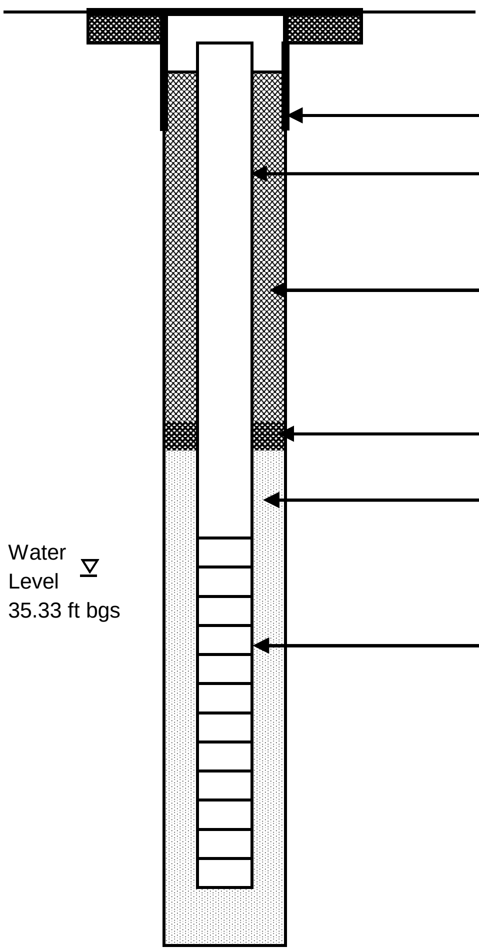
(NOT TO SCALE)

AECOM

**Well No. MW-5D**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 88.69 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 16:15 | 35.33 |
| Datum: NGVD 1988 | Date of Completion: 12/10/2009 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 60.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 80

Cement-bentonite grout from 55.0 ft to 1.0 ft

Bentonite Seal 58.0 ft to 55.0 ft

Filter pack from 70.0 ft to 58.0 ft

Sand Size Morie 00

Well screen from 70.0 ft to 60.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 70.0 ft

Bottom of Borehole at 72.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

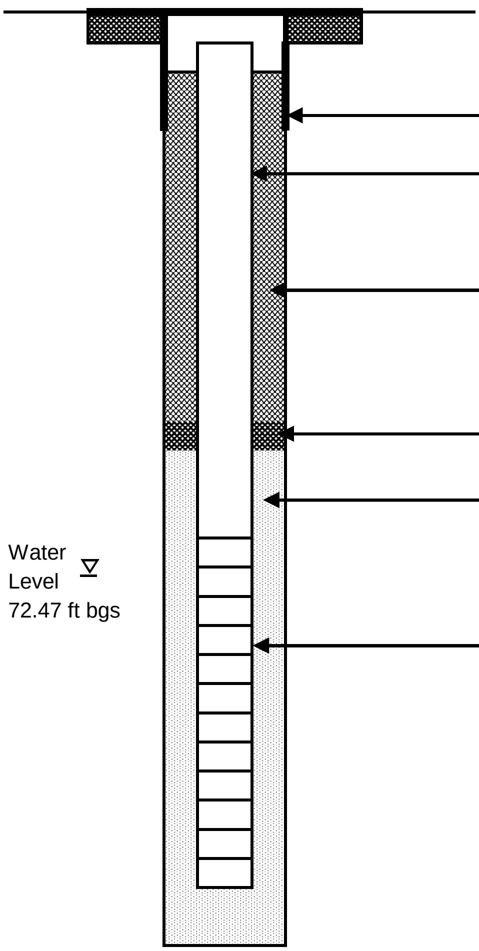
(NOT TO SCALE)

AECOM

**Well No. MW-6S**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 124.99 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 15:30 | 72.47 |
| Datum: NGVD 1988 | Date of Completion: 12/11/2009 | | | |

Locking protective flushmount (8") with concrete pad




| | | | | |
|---|---|---|---|---|
| Ground Surface | 0.0 | ft | | |
| Well casing | 0.5 | ft | | |
| Borehole diameter | 9.00 | inches | | |
| Riser Pipe from | 69.0 | ft to | 0.2 | ft |
| Diameter | 2" | inches | | |
| Type | PVC Sch 80 | | | |
| Cement-bentonite grout from | 69.0 | ft to | 1.0 | ft |
| Bentonite Seal | 72.0 | ft to | 69.0 | ft |
| Filter pack from | 84.0 | ft to | 72.0 | ft |
| Sand Size | Morie 00 | | | |
| Well screen from | 84.0 | ft to | 74.0 | ft |
| Diameter | 2" | inches | | |
| Slot size | 0.1 | inches | | |
| Type | PVC | | | |
| Bottom Cap at | 84.0 | ft | | |
| Bottom of Borehole at | 85.0 | ft | | |

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

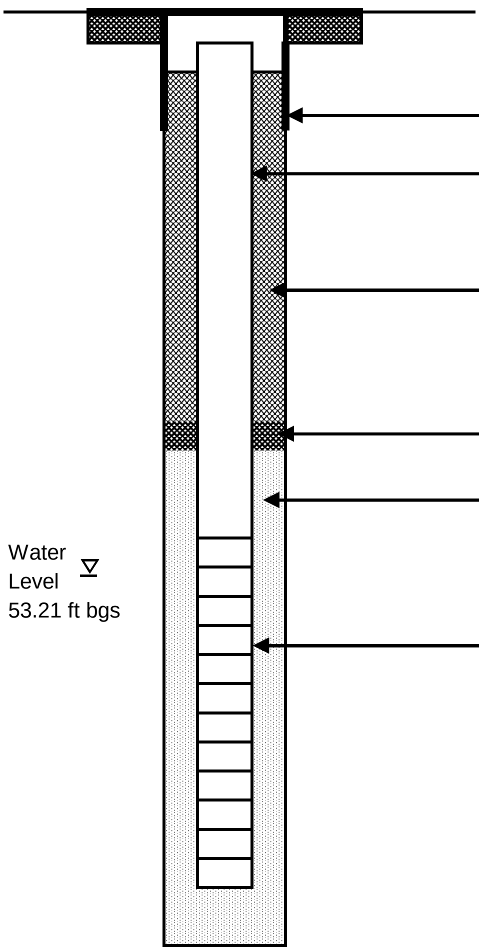
(NOT TO SCALE)

AECOM

**Well No. MW-7S**

| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
|---|---|---|---|---|
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 104.86 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 14:55 | 53.21 |
| Datum: NGVD 1988 | Date of Completion: 12/4/2009 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 46.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 40

Cement-bentonite grout from 46.0 ft to 1.0 ft

Bentonite Seal 48.0 ft to 46.0 ft

Filter pack from 60.0 ft to 48.0 ft

Sand Size Morie 00

Well screen from 60.0 ft to 50.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 60.0 ft

Bottom of Borehole at 60.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

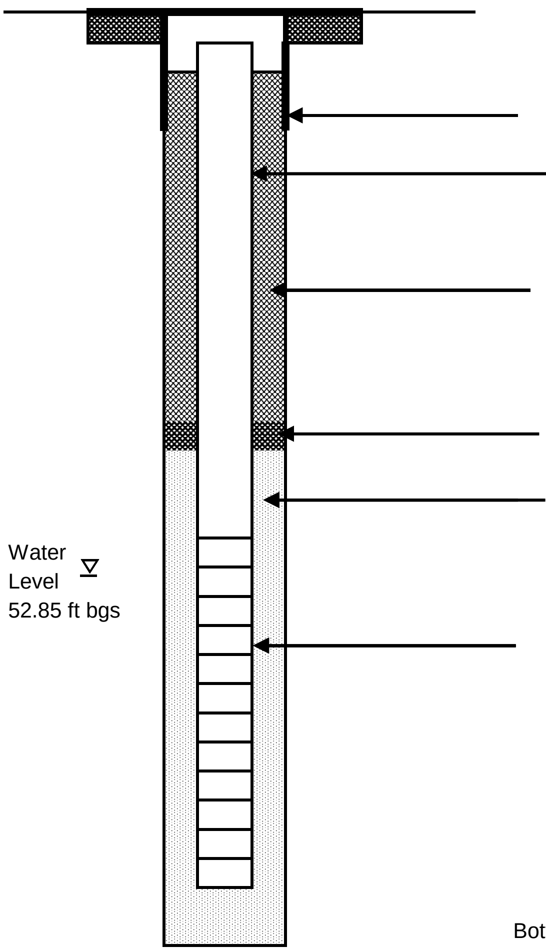
(NOT TO SCALE)

AECOM

**Well No. MW-7D**

| | | |
|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels |
| Surface/Casing Elevation (ft): 104.64 | | Date / Time / Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 / 15:00 / 52.85 |
| Datum: NGVD 1988 | Date of Completion: 12/8/2009 | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 85.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 80

Cement-bentonite grout from 80.0 ft to 1.0 ft

Bentonite Seal 83.0 ft to 80.0 ft

Filter pack from 95.0 ft to 83.0 ft

Sand Size Morie 00

Well screen from 95.0 ft to 85.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 95.0 ft

Bottom of Borehole at 95.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

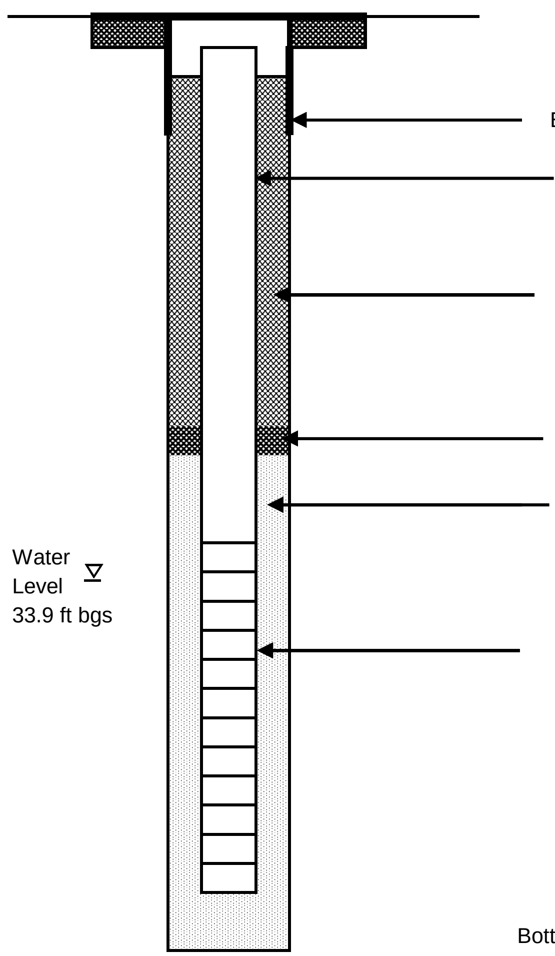
(NOT TO SCALE)

AECOM

**Well No. MW-8S**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 84.5 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 15:20 | 33.90 |
| Datum: NGVD 1988 | Date of Completion: 12/3/2009 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 34.5 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 40

Cement-bentonite grout from 34.5 ft to 1.0 ft

Bentonite Seal 38.0 ft to 34.5 ft

Filter pack from 50.0 ft to 38.0 ft

Sand Size Morie 00

Well screen from 50.0 ft to 40.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 50.0 ft

Bottom of Borehole at 50.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

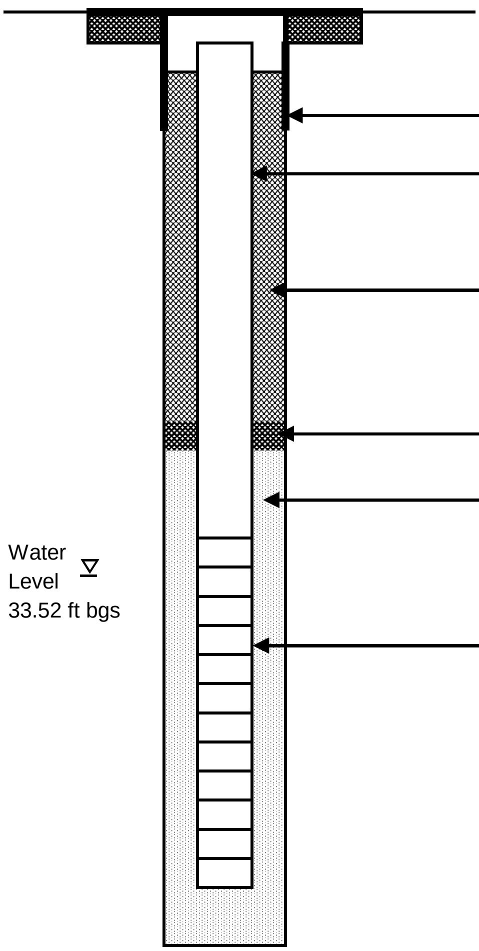
(NOT TO SCALE)

AECOM

**Well No. MW-8D**

| | | | | |
|---|---|---|---|---|
| Project: Country Cleaners | Location: Huntington, NY | Page 1 of 1 | | |
| Project No.: 60133623 | Subcontractor: Aztech | Water Levels | | |
| Surface/Casing Elevation (ft): 85.75 | | Date | Time | Depth |
| | AECOM Rep.: Claire Hunt | 5/27/10 | 15:15 | 33.52 |
| Datum: NGVD 1988 | Date of Completion: 12/3/2009 | | | |

Locking protective flushmount (8") with concrete pad




Ground Surface 0.0 ft

Well casing 0.5 ft

Borehole diameter 9.00 inches

Riser Pipe from 75.0 ft to 0.2 ft
Diameter 2" inches
Type PVC Sch 80

Cement-bentonite grout from 70.0 ft to 1.0 ft

Bentonite Seal 73.0 ft to 70.0 ft

Filter pack from 85.0 ft to 73.0 ft

Sand Size Morie 00

Well screen from 85.0 ft to 75.0 ft

Diameter 2" inches
Slot size 0.1 inches
Type PVC

Bottom Cap at 85.0 ft

Bottom of Borehole at 85.0 ft

Note: All measurements based on ground surface at 0.0 feet. (+) above grade. (-) below grade.

(NOT TO SCALE)

AECOM

**WELL NO. MW-1S**

| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>1/7/2010 | | 5. DATE WELL COMPLETED<br>1/7/2010 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 75 ONE WELL VOLUME : 0.2

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 2:05 | 72.33 | 0.496 | 13.26 | 0.27 | 9.67 | 6.4 | 240 | -5 | |
| 2:15 | 72.33 | " | 13.31 | 0.27 | 9.71 | 6.6 | 233 | -5 | |
| 2:20 | 72.33 | " | 13.62 | 0.27 | 10.45 | 6.9 | 266 | 700 | |
| 2:30 | 72.33 | " | 13.91 | 0.27 | 11.23 | 7.1 | 271 | 540 | |
| 2:40 | 72.33 | " | 13.88 | 0.27 | 10.11 | 6.7 | 265 | 321 | |
| 2:50 | 73.11 | " | 13.83 | 0.27 | 9.98 | 6.5 | 271 | 197 | |
| 3:00 | 73.11 | " | 13.79 | 0.27 | 9.96 | 6.5 | 268 | 143 | |
| 3:10 | 73.11 | " | 13.9 | 0.27 | 9.90 | 6.4 | 266 | 109 | |
| 3:20 | 73.11 | " | 13.83 | 0.26 | 9.82 | 6.4 | 261 | 233 | |
| 3:30 | 73.43 | " | 13.91 | 0.26 | 9.58 | 6.3 | 255 | 201 | |
| 3:40 | 73.43 | " | 13.45 | 0.27 | 9.7 | 6.5 | 262 | 109 | |
| 3:50 | 73.26 | " | 13.99 | 0.27 | 9.71 | 6.6 | 271 | 88 | |
| 4:00 | 73.26 | " | 14.02 | 0.27 | 9.66 | 6.4 | 260 | 42 | |
| 4:06 | 73.39 | " | 14.01 | 0.27 | 10.11 | 6.5 | 263 | 42 | |

Purged 60 gallons
Pump Type: Waterra

WELL NO. MW-1D

| WELL DEVELOPMENT FORM | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>1/8/2010 | | 5. DATE WELL COMPLETED<br>1/8/2010 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |
| WELL Diam.: 1.5 in. | WELL TD: 107 | ONE WELL VOLUME : 3.5 | |

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 8:00 | 69.35 | 0.333 | 7.46 | 0.46 | 10.78 | 7.7 | 178 | 222 | |
| 8:10 | 69.41 | " | 8.83 | 0.46 | 10.91 | 8 | 163 | 258 | |
| 8:20 | 70.31 | " | 10.1 | 0.43 | 10.56 | 8 | 166 | 245 | |
| 8:30 | 69.93 | " | 11.07 | 0.41 | 10.33 | 7.8 | 166 | 703 | |
| 8:40 | 69.93 | " | 11.13 | 0.41 | 10.41 | 7.9 | 167 | 421 | |
| 8:50 | 69.93 | " | 11.09 | 0.43 | 10.51 | 8 | 168 | 322 | |
| 9:00 | 69.52 | " | 10.59 | 0.38 | 8.99 | 7.3 | 190 | -5 | |
| 9:10 | 69.52 | " | 11.4 | 0.33 | 10.03 | 6.9 | 201 | 863 | |
| 9:20 | 70.51 | " | 10.76 | 0.29 | 9.55 | 6.5 | 201 | 613 | |
| 9:30 | 70.52 | " | 11.1 | 0.27 | 9.8 | 6.5 | 199 | 500 | |
| 9:40 | 70.52 | " | 11.56 | 0.27 | 9.8 | 6.3 | 205 | 461 | |
| 9:50 | 70.52 | " | 11.16 | 0.26 | 10.3 | 6.5 | 203 | 431 | |
| 10:00 | 70.52 | " | 11.5 | 0.26 | 10.3 | 6.2 | 204 | 303 | |

Purged 40 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-2D**

| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>12/22/2009 | | 5. DATE WELL COMPLETED<br>12/22/2009 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 94 ONE WELL VOLUME : 4.0

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 11:45 | 49.97 | 0.750 | 13.03 | 0.34 | 2 | 5.87 | 137 | -5 | |
| 11:55 | 64.25 | " | 13.2 | 0.3 | 1.91 | 5.97 | 128 | 921 | |
| 12:04 | 64.45 | " | 13.2 | 0.29 | 2.09 | 5.81 | 129 | 741 | |
| 12:15 | 64 | " | 13.17 | 0.28 | 2.15 | 5.72 | 131 | 531 | |
| 12:25 | 64 | " | 13.18 | 0.28 | 2.31 | 5.81 | 130 | 401 | |
| 12:35 | 63.5 | " | 13.21 | 0.27 | 2.22 | 5.66 | 133 | 281 | |
| 12:45 | 63.51 | " | 13.22 | 0.27 | 2.31 | 5.71 | 136 | 190 | |
| 12:55 | 64 | " | 13.2 | 0.27 | 2.25 | 5.66 | 137 | 81 | |
| 13:05 | 64.01 | " | 13.22 | 0.27 | 2.27 | 5.63 | 140 | 40 | |

Purged 60 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-3S**

| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>12/22/2009 | | 5. DATE WELL COMPLETED<br>12/22/2009 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 60 ONE WELL VOLUME : 0.7

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 9:16 | 52.45 | 0.606 | 12.73 | 0.28 | 3.48 | 5.5 | 166 | -5 | |
| 9:25 | 53.3 | " | 12.91 | 0.28 | 2.35 | 5.45 | 169 | 960 | |
| 9:34 | 53.3 | " | 13.05 | 0.28 | 2.33 | 5.45 | 171 | 531 | |
| 9:42 | 53.29 | " | 13.01 | 0.28 | 2.33 | 5.46 | 172 | 323 | |
| 9:50 | 53.29 | " | 12.97 | 0.28 | 2.34 | 5.47 | 173 | 191 | |
| 9:59 | 53.3 | " | 12.94 | 0.28 | 2.34 | 5.46 | 174 | 103 | |
| 10:08 | 53.3 | " | 12.98 | 0.28 | 2.33 | 5.46 | 174 | 66.2 | |
| 10:17 | 53.3 | " | 13.0 | 0.28 | 2.34 | 5.46 | 175 | 72 | |
| 10:26 | 53.30 | " | 13.02 | 0.28 | 2.32 | 5.46 | 176 | 54 | |
| 10:35 | 53.3 | " | 13.02 | 0.28 | 2.32 | 5.46 | 176 | 23 | |
| 10:45 | 53.3 | " | 12.96 | 0.28 | 2.3 | 5.5 | 176 | 24 | |
| 10:55 | 53.3 | " | 13 | 0.28 | 2.33 | 5.46 | 176 | 29 | |

Purged 60 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-3D**

| WELL DEVELOPMENT FORM | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>12/22/2009 | | 5. DATE WELL COMPLETED<br>12/22/2009 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 94 ONE WELL VOLUME : 3.8

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 9:16 | 52.45 | 0.707 | 12.73 | 0.28 | 3.48 | 5.5 | 166 | -5 | |
| 9:25 | 53.3 | " | 12.91 | 0.28 | 2.35 | 5.45 | 169 | 960 | |
| 9:34 | 53.3 | " | 13.05 | 0.28 | 2.33 | 5.45 | 171 | 531 | |
| 9:42 | 53.29 | " | 13.01 | 0.28 | 2.33 | 5.46 | 172 | 323 | |
| 9:50 | 53.29 | " | 12.97 | 0.28 | 2.34 | 5.47 | 173 | 191 | |
| 9:59 | 53.3 | " | 12.94 | 0.28 | 2.34 | 5.46 | 174 | 103 | |
| 10:08 | 53.3 | " | 12.98 | 0.28 | 2.33 | 5.46 | 174 | 66.2 | |
| 10:17 | 53.3 | " | 13.0 | 0.28 | 2.34 | 5.46 | 175 | 72 | |
| 10:26 | 53.3 | " | 13.02 | 0.28 | 2.32 | 5.46 | 176 | 54 | |
| 10:35 | 53.3 | " | 13.02 | 0.28 | 2.32 | 5.46 | 176 | 23 | |
| 10:45 | 53.3 | " | 12.96 | 0.28 | 2.3 | 5.5 | 176 | 24 | |
| 10:55 | 53.3 | " | 13 | 0.28 | 2.33 | 5.46 | 176 | 29 | |

Purged 70 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-4S**

| WELL DEVELOPMENT FORM | PROJECT: Country Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION: 410 West Main Street, Huntington, NY | 4. DATE WELL STARTED: 1/7/2010 | | 5. DATE WELL COMPLETED: 1/7/2010 |
| 2. CLIENT: NYSDEC | 6. NAME OF INSPECTOR: Jason N. | | |
| 3. DRILLING COMPANY: Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 70 ONE WELL VOLUME : 0.8

| Time | Depth to Water (ft) | Purge Rate (gal/min) | Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 10:35 | 61.1 | 0.444 | 13.42 | 0.24 | 9.17 | 6.2 | 192 | -5 | |
| 10:45 | 61.09 | " | 13.55 | 0.19 | 8.98 | 5.9 | 226 | -5 | |
| 10:55 | 61.09 | " | 13.56 | 0.19 | 8.96 | 5.8 | 231 | 791 | |
| 11:05 | 61.09 | " | 13.69 | 0.19 | 9.04 | 5.7 | 235 | 581 | |
| 11:15 | 61.1 | " | 13.83 | 0.19 | 8.99 | 5.7 | 234 | 371 | |
| 11:25 | 61.09 | " | 13.74 | 0.19 | 9.02 | 5.7 | 236 | 400 | |
| 11:30 | | | | Cleaning turbidity probe | | | | | |
| 12:30 | 61.09 | " | 13.6 | 0.19 | 9.55 | 5.5 | 273 | 714 | |
| | | | | Turbidity probe is off by 200-300 NTU | | | | | |
| 12:40 | 61.09 | " | 13.61 | 0.18 | 9.38 | 5.7 | 257 | 303 | |
| 12:50 | 61.1 | " | 13.54 | 0.18 | 9.6 | 5.6 | 253 | 152 | |
| | | | Cleaning turbidity probe, turbidty off by 50-100 NTU | | | | | | |

Purged 60 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-4D**

| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>1/7/2010 | | 5. DATE WELL COMPLETED<br>1/7/2010 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 104 ONE WELL VOLUME : 4.0

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 8:10 | 60.9 | 0.583 | 13.2 | 0.34 | 7.91 | 6.6 | 164 | 219 | |
| 8:20 | 60.9 | " | 13.42 | 0.28 | 6.13 | 5.5 | 191 | -5 | |
| 8:30 | 60.9 | " | 13.33 | 0.28 | 6.10 | 5.5 | 192 | 861 | |
| 8:40 | 60.9 | " | 13.35 | 0.28 | 6.09 | 5.6 | 189 | 611 | |
| 8:50 | 60.9 | " | 13.42 | 0.28 | 6.40 | 5.6 | 192 | 431.2 | |
| 9:00 | 60.9 | " | 13.3 | 0.27 | 6.61 | 5.6 | 197 | 282 | |
| 9:10 | 60.9 | " | 13.38 | 0.27 | 6.70 | 5.5 | 203 | 208 | |
| 9:20 | 60.9 | " | 13.4 | 0.27 | 6.79 | 5.6 | 204 | 190 | |
| 9:30 | 60.90 | " | 13.37 | 0.27 | 6.79 | 5.6 | 204 | 181 | |
| 9:40 | 60.9 | " | 13.45 | 0.26 | 6.81 | 5.6 | 203 | 116 | |
| 9:50 | 60.9 | " | 13.62 | 0.26 | 7.0 | 5.6 | 205 | 108 | |
| 10:00 | 60.9 | " | 13.68 | 0.26 | 7.05 | 5.6 | 206 | 103 | |
| 10:10 | 60.9 | " | 13.67 | 0.26 | 7.05 | 5.6 | 206 | 112 | |

Purged 70 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-5S**

| | | | | |
|---|---|---|---|---|
| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET<br>1 OF | SHEETS<br>1 |
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>12/21/2009 | | 5. DATE WELL COMPLETED<br>12/21/2009 | |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | | |

WELL Diam.: 1.5 in. WELL TD: 50 ONE WELL VOLUME : 1.0

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 13:45 | 38.72 | 0.522 | 13.56 | 0.27 | 4.27 | 6.47 | 122 | 343 | |
| 13:53 | 38.91 | " | 14.15 | 0.26 | 3.58 | 5.92 | 135 | 98.6 | |
| 14:00 | 38.93 | " | 12.97 | 0.26 | 4.48 | 6 | 128 | 70 | |
| 14:09 | 38.9 | " | 12.33 | 0.26 | 4.44 | 5.72 | 132 | 71.6 | |
| 14:19 | 38.88 | " | 13.47 | 0.26 | 3.83 | 5.54 | 139 | 81.6 | |
| 14:30 | 38.85 | " | 13.61 | 0.26 | 4.04 | 5.67 | 139 | 92.3 | |
| 14:39 | 39.83 | " | 13.71 | 0.26 | 4.14 | 5.59 | 140 | 101.3 | |
| 14:46 | 38.8 | " | 13.4 | 0.26 | 4.61 | 5.61 | 141 | 86.1 | |
| 14:56 | 38.80 | " | 13.33 | 0.26 | 4.78 | 5.43 | 139 | 92 | |
| 15:05 | 38.79 | " | 13.42 | 0.26 | 4.81 | 5.56 | 140 | 103 | |
| 15:15 | 38.78 | " | 13.61 | 0.26 | 4.7 | 6.0 | 129 | 91 | |
| 15:24 | 38.79 | " | 13.49 | 0.25 | 5.03 | 5.91 | 138 | 80 | |
| 15:32 | 38.79 | " | 13.62 | 0.25 | 5.1 | 6.03 | 139 | 62 | |
| 15:40 | 38.79 | " | 13.55 | 0.26 | 4.99 | 5.99 | 137 | 59.30 | |

Purged 60 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-5D**

| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>12/21/2009 | | 5. DATE WELL COMPLETED<br>12/21/2009 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 70 ONE WELL VOLUME : 2.9

| Time | Depth to Water (ft) | Purge Rate (gal/min) | Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD MEASUREMENTS | | | | | | |
| 11:15 | 38.69 | 0.565 | 12.53 | 0.34 | 3.65 | 6.74 | 114 | -5 | |
| 11:24 | 38.69 | " | 12.81 | 0.3 | 4.02 | 6.25 | 129 | -5 | |
| 11:30 | 38.7 | " | 12.59 | 0.29 | 4.25 | 5.71 | 133 | -5 | |
| 11:40 | 38.7 | " | 12.33 | 0.29 | 4.62 | 5.65 | 138 | -5 | |
| 11:45 | 38.7 | " | 13.4 | 0.29 | 4.60 | 5.68 | 137 | -5 | |
| 11:55 | 38.7 | " | 11.26 | 0.29 | 5.77 | 5.62 | 138 | -5 | |
| 12:05 | 38.7 | " | 11.4 | 0.29 | 5.76 | 5.74 | 124 | 972 | |
| 12:14 | 38.7 | " | 11.3 | 0.29 | 5.32 | 5.8 | 120 | 892 | |
| 12:22 | 38.70 | " | 10.82 | 0.29 | 5.26 | 5.79 | 126 | 861 | |
| 12:31 | 38.7 | " | 10.68 | 0.29 | 5.03 | 5.88 | 112 | 508 | |
| 12:40 | 38.7 | " | 10.92 | 0.29 | 5.2 | 5.9 | 119 | 411 | |
| 12:50 | 38.7 | " | 11.04 | 0.29 | 5.4 | 6.02 | 122 | 372 | |
| 13:00 | 38.7 | " | 11.13 | 0.29 | 5.31 | 6.09 | 124 | 262 | |
| 13:10 | 38.7 | " | 11.22 | 0.29 | 4.99 | 5.98 | 129 | 167.00 | |
| 13:19 | 38.7 | | 11.19 | 0.29 | 5.23 | 6.14 | 132 | 142.00 | |

Purged 70 gallons

Pump Type: Waterra

AECOM

**WELL NO. MW-6S**

| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>12/22/2009 | | 5. DATE WELL COMPLETED<br>12/22/2009 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 2 in. WELL TD: 84 ONE WELL VOLUME : 1.4

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 14:15 | 75.5 | 0.610 | 13.53 | 0.26 | 3.54 | 5.9 | 169 | -5 | |
| 14:20 | 75.86 | " | 13.52 | 0.26 | 3.43 | 5.9 | 169 | 768 | |
| 14:27 | 75.87 | " | 13.55 | 0.26 | 3.41 | 5.84 | 172 | 601 | |
| 14:35 | 75.87 | " | 13.56 | 0.26 | 3.44 | 5.81 | 174 | 512 | |
| 14:41 | 75.87 | " | 13.57 | 0.26 | 3.45 | 5.8 | 176 | 441 | |
| 14:49 | 75.87 | " | 13.56 | 0.26 | 3.44 | 5.81 | 175 | 312 | |
| 15:00 | 75.87 | " | 13.58 | 0.26 | 3.42 | 5.83 | 184 | 191 | |
| 15:07 | 75.87 | " | 13.6 | 0.26 | 3.45 | 5.9 | 178 | 130 | |
| 15:18 | 75.87 | " | 13.62 | 0.26 | 3.48 | 5.8 | 184 | 92 | |
| 15:28 | 75.87 | " | 13.6 | 0.26 | 3.47 | 5.82 | 182 | 61 | |
| 15:38 | 75.87 | " | 13.61 | 0.26 | 3.5 | 5.8 | 180 | 44 | |
| 15:50 | 75.87 | " | 13.6 | 0.26 | 3.51 | 5.84 | 184 | 32 | |
| 16:00 | 75.87 | " | 13.62 | 0.26 | 3.55 | 5.9 | 183 | 55.2 | |
| 16:09 | 75.87 | " | 13.61 | 0.26 | 3.61 | 5.91 | 182 | 43.4 | |
| 16:18 | 75.87 | " | 13.62 | 0.26 | 3.59 | 5.93 | 184 | 33 | |

Purged 75 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-7D**

| **WELL DEVELOPMENT FORM** | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>12/17/2009 | | 5. DATE WELL COMPLETED<br>12/17/2009 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 95 ONE WELL VOLUME : 3.6

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 11:00 | 55.78 | 0.087 | 10.66 | 0.39 | 7.36 | 4.97 | 152 | -5 | |
| 11:10 | 56.35 | " | 10.91 | 0.31 | 8.61 | 5.33 | 148 | -5 | |
| 11:20 | 55.87 | " | 10.86 | 0.29 | 7.32 | 5.4 | 152 | -5 | |
| 11:35 | 55.82 | " | 10.88 | 0.3 | 7.49 | 5.33 | 150 | -5 | |
| 11:50 | 55.81 | " | 10.91 | 0.29 | 8.01 | 5.4 | 148 | -5 | |
| 12:00 | 55.81 | " | 11.27 | 0.29 | 8.80 | 5.45 | 153 | -5 | |
| 12:10 | 55.8 | " | 11.24 | 0.29 | 8.53 | 5.43 | 152 | -5 | |
| 12:20 | 55.81 | " | 11.3 | 0.29 | 8.91 | 5.4 | 149 | -5 | |
| 12:31 | 55.80 | " | 11.2 | 0.3 | 8.93 | 5.49 | 155 | 703 | |
| 12:40 | 55.8 | " | 11.22 | 0.3 | 8.78 | 5.52 | 158 | 621 | |
| 12:51 | 55.78 | " | 10.81 | 0.28 | 9.9 | 5.6 | 159 | 427 | |
| 1:00 | 55.79 | " | 10.83 | 0.28 | 9.12 | 5.59 | 159 | 333 | |
| 1:10 | 55.8 | " | 10.28 | 0.28 | 9.42 | 5.56 | 161 | 360 | |
| 1:15 | 55.8 | " | 10.96 | 0.28 | 9.53 | 5.64 | 161 | 309 | |
| 1:25 | 55.8 | " | 10.93 | 0.28 | 9.51 | 5.60 | 161 | 303.00 | |

Purged 75 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-7S**

| WELL DEVELOPMENT FORM | PROJECT: Country Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION: 410 West Main Street, Huntington, NY | 4. DATE WELL STARTED: 12/17/2009 | | 5. DATE WELL COMPLETED: 12/17/2009 |
| 2. CLIENT: NYSDEC | 6. NAME OF INSPECTOR: Jason N. | | |
| 3. DRILLING COMPANY: Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 60 ONE WELL VOLUME : 5.5

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Horiba malfunctioned - no readings |
| | | | | | | | | | collected - well purged until water |
| | | | | | | | | | ran clear. |

Purged 60 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-8S**

| WELL DEVELOPMENT FORM | PROJECT<br>Country Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION<br>410 West Main Street, Huntington, NY | 4. DATE WELL STARTED<br>12/18/2009 | | 5. DATE WELL COMPLETED<br>12/18/2009 |
| 2. CLIENT<br>NYSDEC | 6. NAME OF INSPECTOR<br>Jason N. | | |
| 3. DRILLING COMPANY<br>Aztech Technologies | | | |

WELL Diam.: 1.5 in. WELL TD: 50 ONE WELL VOLUME : 1.2

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 7:00 | 36.75 | 0.462 | 11.81 | 0.26 | 8.05 | 7.4 | 109 | -5 | |
| 7:10 | 36.8 | " | 11.89 | 0.27 | 8.16 | 7.44 | 109 | -5 | |
| 7:20 | 36.8 | " | 10.89 | 0.25 | 8.14 | 7.19 | 115 | -5 | |
| 7:30 | 36.8 | " | 10.88 | 0.25 | 8.16 | 7.2 | 119 | -5 | |
| 7:41 | 36.8 | " | 10.89 | 0.25 | 8.43 | 7.22 | 120 | -5 | |
| 7:51 | 36.8 | " | 10.91 | 0.26 | 8.55 | 7.32 | 119 | -5 | |
| 8:00 | 36.8 | " | 10.42 | 0.26 | 8.49 | 7.02 | 122 | -5 | |
| 8:10 | 36.8 | " | 9.1 | 0.27 | 6.98 | 6.1 | 130 | -5 | |
| 8:20 | 36.81 | " | 9.03 | 0.27 | 6.90 | 6.04 | 132 | -5 | |
| 8:31 | 36.8 | " | 9.12 | 0.27 | 7.22 | 6.1 | 132 | -5 | |
| 8:40 | 36.8 | " | 9.1 | 0.27 | 7.3 | 6.1 | 132 | 923 | |
| 8:50 | 36.8 | " | 9.42 | 0.27 | 7.4 | 6.1 | 120 | 845 | |
| 9:01 | 36.8 | " | 9.33 | 0.27 | 7.31 | 6.16 | 125 | 723 | |
| 9:10 | 36.8 | " | 9.39 | 0.27 | 7.41 | 6.19 | 129 | 686 | |

Purged 60 gallons
Pump Type: Waterra

AECOM

**WELL NO. MW-8D**

| WELL DEVELOPMENT FORM | PROJECT: Country Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| 1. LOCATION: 410 West Main Street, Huntington, NY | 4. DATE WELL STARTED: 12/17/2009 | | 5. DATE WELL COMPLETED: 12/17/2009 |
| 2. CLIENT: NYSDEC | 6. NAME OF INSPECTOR: Jason N. | | |
| 3. DRILLING COMPANY: Aztech Technologies | | | |

**WELL Diam.:** 1.5 in. WELL TD: 85 ONE WELL VOLUME : 4.5

| Time | Depth to Water (ft) | Purge Rate (gal/min) | FIELD MEASUREMENTS Temp. (C) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 14:25 | 36.42 | 0.536 | 11.87 | 0.15 | 5.95 | 7.62 | 56 | -5 | |
| 14:35 | 50.35 | " | 12.1 | 0.22 | 9.30 | 8.3 | 81 | -5 | |
| 14:45 | 54.8 | " | 12.22 | 0.21 | 8.70 | 8.15 | 93 | -5 | |
| 14:55 | 55.89 | " | 12.38 | 0.2 | 9.39 | 7.98 | 100 | -5 | |
| 15:06 | 58.01 | " | 12.33 | 0.2 | 9.41 | 7.95 | 103 | -5 | |
| 15:20 | 57.7 | " | 11.63 | 0.2 | 8.91 | 8 | 107 | 634 | |
| 15:31 | 68.4 | " | 10.89 | 0.2 | 8.30 | 8.03 | 119 | 932 | |
| 15:41 | 68.92 | " | 10.9 | 0.21 | 8.42 | 8.05 | 120 | 911 | |
| 15:52 | 68.93 | " | 10.96 | 0.2 | 9.01 | 8.07 | 120 | 703 | |
| 16:01 | 68.95 | " | 11.22 | 0.19 | 7.8 | 7.89 | 126 | -5 | |
| 16:13 | 68.93 | " | 1.26 | 0.19 | 7.9 | 7.9 | 127 | -5 | |
| 16:25 | 68.92 | " | 11.74 | 0.2 | 8.75 | 7.81 | 125 | -5 | |
| 16:35 | 68.92 | " | 11.55 | 0.2 | 8.82 | 7.74 | 124 | -5 | |
| 16:45 | 68.93 | " | 11.51 | 0.2 | 8.69 | 7.78 | 126 | -5 | |

Purged 75 gallons
Pump Type: Waterra

AECOM

**WELL MW-1S**

| PROJECT | | PROJECT No. | SHEET | SHEETS |
|---|---|---|---|---|
| **WELL SAMPLING FORM** | County Cleaners | 60133623 | 1 OF | 1 |

| LOCATION | DATE WELL STARTED |
|---|---|
| Huntington, NY | 1/30/2010 |

| CLIENT | NAME OF SAMPLERS |
|---|---|
| NYSDEC | Foster, C., Hunt, C. |

WELL Diam.: 2.067 in. WELL TD: 75 ONE WELL VOLUME : 1.2

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 9:25 | 68.30 | | | | | | | | Static |
| 9:45 | | | | | | | | | Pump On |
| 11:05 | -- | 200 | 9.05 | 0.521 | 7.25 | 5.86 | 240 | 430 | DTW readings not taken - |
| 11:15 | -- | 200 | 8.15 | 0.938 | 7.64 | 5.87 | 231 | 387 | probe blocked by tubing and pump. |
| 11:20 | -- | 200 | 8.16 | 0.900 | 7.00 | 5.81 | 238 | 557 | |
| 11:25 | -- | 200 | 8.44 | 0.999 | 7.63 | 5.95 | 237 | 482 | |
| 11:30 | -- | 200 | 8.58 | 0.997 | 7.38 | 5.88 | 238 | 384 | |
| 11:35 | -- | 200 | 8.77 | 0.960 | 7.39 | 5.88 | 234 | 323 | |
| 11:40 | -- | 200 | 9.04 | 0.946 | 7.39 | 5.91 | 234 | 326 | Sample collected |
| | | | | | | | | | 152187GWMW-1S |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-1D**

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/30/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 1.939 in.   WELL TD: 107   ONE WELL VOLUME : 5.8

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 11:00 | 69.35 | | | | | | | | Static |
| 12:00 | | | | | | | | | Pump On |
| 12:58 | 69.35 | 150 | 10.68 | 0.825 | 6.82 | 5.66 | 237 | 87 | The Horiba was not connected |
| 13:08 | 69.33 | 150 | 10.58 | 0.425 | 6.52 | 5.69 | 229 | 61.6 | immediately because the |
| 13:18 | 69.32 | 150 | 10.63 | 0.9 | 6.54 | 5.65 | 222 | 50.5 | connections were frozen. |
| 13:28 | 69.32 | 150 | 10.83 | 0.816 | 6.37 | 5.70 | 218 | 44.9 | The connections were thawed |
| 13:38 | 69.32 | 150 | 10.85 | 0.404 | 6.30 | 5.63 | 226 | 34.3 | and connected. |
| 13:48 | 69.32 | 150 | 10.83 | 0.473 | 6.29 | 5.70 | 222 | 31.7 | |
| 13:58 | 69.32 | 150 | 10.87 | 0.476 | 6.28 | 5.63 | 221 | 30.7 | |
| 14:03 | 69.32 | 150 | 10.67 | 0.476 | 6.29 | 5.64 | 222 | 30.6 | |
| | | | | | | | | | |
| 14:08 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-1D |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

WELL MW-2

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/31/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 2.067 in. WELL TD: 60 ONE WELL VOLUME : 1.5

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 15:40 | 51.29 | | | | | | | | Static |
| 15:50 | | | | | | | | | Pump On |
| 16:10 | 51.30 | 340 | 11.98 | 0.342 | 6.62 | 5.71 | 258 | 515 | |
| 16:20 | 51.30 | 340 | 12.23 | 0.325 | 6.77 | 5.83 | 252 | 313 | |
| 16:30 | 51.30 | 340 | 12.37 | 0.341 | 7.26 | 5.84 | 252 | 190 | |
| 16:40 | 51.30 | 340 | 12.39 | 0.336 | 6.53 | 5.76 | 249 | 113 | |
| 16:50 | 51.30 | 340 | 12.40 | 0.350 | 7.81 | 5.80 | 247 | 73 | |
| 17:00 | 51.30 | 340 | 12.38 | 0.350 | 7.63 | 5.87 | 246 | 56.2 | |
| 17:10 | 51.30 | 340 | 12.47 | 0.349 | 7.79 | 5.80 | 247 | 47 | |
| 17:20 | 51.30 | 340 | 12.42 | 0.349 | 7.76 | 5.83 | 245 | 32 | |
| 17:30 | 51.30 | 340 | 12.43 | 0.345 | 7.78 | 5.83 | 244 | 34.5 | |
| | | | | | | | | | |
| 17:40 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-2S |
| | | | | | | | | | 152187GWMW-2SF (field filtered) |

Pump Type: Bladder Pump

Analytical Parameters: VOCs, MNA

WELL MW-2D

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/31/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 1.939 in. WELL TD: 94 ONE WELL VOLUME : 6.7

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 17:36 | 50.51 | | | | | | | | Static |
| 17:50 | 50.73 | 350 | 12.12 | 0.347 | 10.27 | 5.92 | 248 | 417 | Pump On |
| 18:00 | 50.73 | 350 | 12.25 | 0.350 | 10.44 | 5.95 | 241 | 272 | |
| 18:30 | 50.71 | 350 | 12.03 | 0.351 | 11.54 | 5.87 | 239 | 174 | |
| 18:40 | 50.71 | 350 | 12.09 | 0.349 | 11.34 | 5.77 | 249 | 181 | |
| 18:45 | 50.72 | 350 | 11.87 | 0.345 | 11.54 | 5.73 | 250 | 186 | |
| 18:50 | 50.70 | 350 | 12.00 | 0.344 | 10.92 | 5.73 | 246 | 156 | |
| | | | | | | | | | |
| 19:00 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-2D |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-3S**

| **WELL SAMPLING FORM** | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/31/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 2.067 in. WELL TD: 60 ONE WELL VOLUME : 1.3

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 11:40 | 52.54 | | | | | | | | Static |
| 11:41 | | | | | | | | | Pump On |
| 13:32 | 52.54 | 280 | 10.84 | 0.530 | 7.39 | 5.74 | 249 | >1000 | |
| 13:42 | 52.55 | 280 | 11.57 | 0.900 | 7.41 | 5.60 | 250 | >1000 | |
| 13:52 | 52.54 | 280 | 11.70 | 0.900 | 7.40 | 5.78 | 244 | 919 | |
| 14:02 | 52.54 | 280 | 11.32 | 0.900 | 7.38 | 5.75 | 241 | 454 | |
| 14:12 | 52.54 | 280 | 11.10 | 0.876 | 7.33 | 5.71 | 242 | 414 | |
| 14:22 | 52.54 | 280 | 11.32 | 0.893 | 7.38 | 5.83 | 238 | 170 | |
| 14:32 | 52.54 | 280 | 11.2 | 0.842 | 7.33 | 5.85 | 237 | 100 | |
| 14:42 | 52.52 | 280 | 11.24 | 0.892 | 7.44 | 5.92 | 228 | 69.8 | |
| | | | | | | | | | |
| 15:00 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-3S |
| | | | | | | | | | 152187GWMW-3MS (MS) |
| | | | | | | | | | 152187GWMW-3MSD (MSD) |
| | | | | | | | | | 152187GWMW-53S (field dup) |
| | | | | | | | | | 152187GWMW-3SF (field filtered) |

Pump Type: Bladder Pump

Analytical Parameters: VOCs, MNA

AECOM

WELL MW-3D

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/31/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 1.939 in. WELL TD: 94 ONE WELL VOLUME : 6.4

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 11:10 | 52.49 | | | | | | | | Static |
| 11:40 | | | | | | | | | Pump On |
| 12:25 | 52.17 | 200 | 11.58 | 0.367 | 10.95 | 5.8 | 249 | 211 | |
| 12:30 | 52.17 | 200 | 11.28 | 0.391 | 11.46 | 5.62 | 255 | 186 | |
| 12:35 | 52.17 | 200 | 11.52 | 0.373 | 10.95 | 5.65 | 249 | 141 | |
| 12:40 | 52.17 | 200 | 11.56 | 0.382 | 10.90 | 5.64 | 247 | 120 | |
| 12:45 | 52.17 | 200 | 11.25 | 0.378 | 10.94 | 5.60 | 252 | 151 | |
| | | | | | | | | | |
| 12:50 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-3D |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-4S**

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/31/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 2.067 in. WELL TD: 70 ONE WELL VOLUME : 1.6

| Time | Depth to Water (ft) | Purge Rate (ml/min) | Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | FIELD MEASUREMENTS | | | | | | |
| 8:32 | 60.93 | | | | | | | | Static |
| 10:00 | | | | | | | | | Pump On |
| 11:20 | 60.94 | 100 | 6.73 | 0.324 | 9.68 | 5.50 | 255 | 604 | |
| 11:30 | 60.91 | 100 | 7.54 | 0.246 | 9.57 | 5.54 | 252 | 541 | |
| 11:35 | 60.95 | 100 | 7.84 | 0.371 | 9.38 | 5.59 | 249 | 503 | |
| 11:40 | 60.91 | 100 | 7.62 | 0.398 | 9.20 | 5.64 | 246 | 466 | |
| 11:45 | 60.92 | 100 | 7.75 | 0.836 | 9.72 | 5.66 | 243 | 449 | |
| 11:50 | 60.91 | 100 | 7.09 | 0.785 | 9.20 | 5.68 | 242 | 404 | |
| 12:00 | 60.91 | 100 | 8.00 | 0.002 | 14.00 | 6.15 | 219 | -- | |
| 12:05 | 60.91 | 100 | 9.35 | 0.001 | 13.23 | 6.21 | 213 | 177 | |
| 12:10 | 60.91 | 100 | 11.48 | 0.000 | 12.07 | 6.21 | 210 | 170 | |
| | | | | | | | | | |
| 12:17 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-4S |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-4D**

| | | | |
|---|---|---|---|
| **WELL SAMPLING FORM** | PROJECT<br>County Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
| LOCATION<br>Huntington, NY | | DATE WELL STARTED<br>1/31/2010 | |
| CLIENT<br>NYSDEC | | NAME OF SAMPLERS<br>Foster, C., Hunt, C. | |

WELL Diam.: 1.939 in. WELL TD: 104 ONE WELL VOLUME : 6.6

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 8:39 | 60.77 | | | | | | | | Static |
| 8:50 | | | | | | | | | Pump On |
| 9:45 | 60.77 | 200 | 11.91 | 0.956 | 6.99 | 5.32 | 263 | 315 | |
| 9:55 | 60.77 | 200 | 12.12 | 0.980 | 7.21 | 5.36 | 256 | 166 | |
| 10:05 | 60.77 | 200 | 12.15 | 0.97 | 7.18 | 5.41 | 248 | 128 | |
| 10:10 | 60.77 | 200 | 12.17 | 0.971 | 7.20 | 5.46 | 249 | 129 | |
| | | | | | | | | | |
| 10:15 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-4D |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

WELL MW-5S

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/30/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 2.067 in. WELL TD: 50 ONE WELL VOLUME : 2.0

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 14:50 | 38.72 | | | | | | | | Static |
| 16:15 | 38.76 | 200 | 12.77 | 0.520 | 9.39 | 5.74 | 251 | 201 | Pump On |
| 16:25 | 38.74 | 200 | 13.08 | 0.369 | 1.79 | 5.83 | 238 | 64.2 | |
| 16:35 | 38.76 | 200 | 13.19 | 0.380 | 10.07 | 5.83 | 233 | 43.7 | |
| 16:40 | 38.74 | 200 | 13.17 | 0.393 | 9.40 | 5.82 | 231 | 44.3 | |
| 16:45 | 38.76 | 200 | 13.18 | 0.409 | 7.11 | 5.85 | 230 | 35.3 | |
| 16:50 | 38.74 | 200 | 13.14 | 0.407 | 7.13 | 5.85 | 228 | 28.4 | |
| 16:55 | 38.75 | 200 | 13.04 | 0.409 | 7.11 | 5.83 | 229 | 28.2 | |
| | | | | | | | | | |
| 17:00 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-5S |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-5D**

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/30/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 1.939 in. WELL TD: 70 ONE WELL VOLUME : 4.8

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 14:53 | 38.66 | | | | | | | | Static |
| 16:07 | 38.69 | | | | | | | | Pump On |
| 16:17 | 38.69 | | | | | | | | |
| 17:00 | 38.64 | 200 | 11.83 | 0.571 | 6.87 | 5.77 | 229 | 20.6 | |
| 17:05 | 38.68 | 200 | 12.02 | 0.734 | 6.82 | 5.70 | 228 | 19.4 | |
| 17:10 | 38.68 | 200 | 11.89 | 0.743 | 6.86 | 5.80 | 227 | 18.1 | |
| 17:15 | 38.69 | 200 | 12.08 | 0.670 | 6.89 | 5.79 | 226 | 18.0 | |
| 17:25 | 38.69 | 200 | 11.76 | 0.476 | 5.76 | 6.39 | 224 | 16.7 | |
| 17:30 | 38.69 | 200 | 12.15 | 0.350 | 5.78 | 6.80 | 228 | 15.5 | |
| 17:35 | 38.71 | 200 | 12.14 | 0.450 | 5.81 | 6.79 | 227 | 15.1 | |
| | | | | | | | | | |
| 17:40 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-5D |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-6S**

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 2/1/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 1.939 in. WELL TD: 84 ONE WELL VOLUME : 1.3

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 12:30 | 75.59 | | | | | | | | Static |
| 12:43 | | | | | | | | | Pump On |
| 12:50 | 75.61 | 285 | 10.62 | 0.792 | 9.34 | 5.94 | 244 | -- | |
| 13:00 | 75.61 | 285 | 11.40 | 0.467 | 8.95 | 5.51 | 269 | -- | |
| 13:10 | 75.59 | 285 | 11.52 | 0.359 | 9.37 | 6.19 | 247 | -- | |
| 13:20 | 75.59 | 285 | 11.53 | 0.305 | 9.42 | 6.07 | 251 | -- | |
| 13:35 | 75.40 | 285 | 11.74 | 0.368 | 9.99 | 6.03 | 253 | 85 | |
| 13:45 | 75.60 | 285 | 11.58 | 0.370 | 9.90 | 5.93 | 259 | 421 | |
| 13:50 | 75.60 | 285 | 11.63 | 0.395 | 9.74 | 5.91 | 261 | 417 | |
| 13:55 | 75.60 | 285 | 11.60 | 0.401 | 9.65 | 5.93 | 261 | 433 | |
| 14:00 | 75.60 | 285 | 11.41 | 0.401 | 9.67 | 5.92 | 266 | 329 | |
| | | | | | | | | | |
| 14:05 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-6S |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-7S**

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 1/29/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 2.067 in. WELL TD: 60 ONE WELL VOLUME : 0.7

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 15:30 | 56.21 | | | | | | | | Static |
| 17:15 | 56.55 | 200 | ~5 | 0.000 | 19.99 | -20 | 1999 | 392 | Pump On |
| 17:22 | 56.30 | 200 | ~5 | 0.000 | 19.99 | -20 | 1999 | 392 | |
| 17:30 | 56.30 | 200 | ~5 | 0.000 | 19.99 | -20 | 1999 | 392 | |
| 17:40 | 56.30 | 200 | ~5 | 0.000 | 19.99 | -20 | 1999 | 392 | |
| 18:00 | 56.30 | 200 | 0.0 | 0.009 | 14.86 | 4.84 | 286 | 418 | |
| 18:25 | 56.30 | 200 | 5.34 | 1.23 | 13.78 | 5.53 | 252 | 328 | |
| 18:30 | 56.30 | 200 | 3.99 | 1.16 | 13.39 | 5.52 | 237 | 306 | |
| 18:35 | 56.30 | 200 | 4.02 | 1.14 | 13.99 | 5.54 | 274 | 237 | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 18:40 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-7S |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-7D**

| | | | |
|---|---|---|---|
| **WELL SAMPLING FORM** | PROJECT<br>County Cleaners | PROJECT No.<br>60133623 | SHEET 1 OF SHEETS 1 |
| LOCATION<br>Huntington, NY | | DATE WELL STARTED<br>1/29/2010 | |
| CLIENT<br>NYSDEC | | NAME OF SAMPLERS<br>Foster, C., Hunt, C. | |

WELL Diam.: 1.939 in. WELL TD: 95 ONE WELL VOLUME : 6.1

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 13:00 | 55.40 | | | | | | | | Static |
| 14:40 | 55.90 | | | | | | | | Pump On |
| 14:52 | 55.90 | 200 | 11.40 | 0.520 | 8.1 | 5.0 | 276 | >1000 | |
| 14:58 | 55.90 | 200 | 11.52 | 0.485 | 8.14 | 4.91 | 279 | 915 | |
| 15:03 | 55.90 | 200 | 8.03 | 0.480 | 8.14 | 4.87 | 283 | 551 | |
| 15:08 | 55.90 | 200 | 11.47 | 0.492 | 7.90 | 4.84 | 290 | 502 | |
| 15:13 | 55.88 | 200 | 11.84 | 0.591 | 8.26 | 4.80 | 295 | 169 | |
| 15:18 | 55.90 | 200 | 11.59 | 0.691 | 8.30 | 4.85 | 291 | 124 | |
| 15:23 | 55.88 | 200 | 11.42 | 0.696 | 8.09 | 5.03 | 287 | 101 | |
| 15:28 | 55.88 | 200 | 11.78 | 0.701 | 8.09 | 5.09 | 280 | 88.1 | |
| 15:33 | 55.85 | 200 | 11.91 | 0.501 | 7.65 | 5.11 | 291 | 67.9 | |
| 15:49 | 55.85 | 200 | 11.85 | 0.566 | 7.98 | 5.22 | 285 | 40.5 | |
| 16:05 | 55.85 | 200 | 11.70 | 0.445 | 7.97 | 5.22 | 287 | 33.8 | |
| | | | | | | | | | |
| 16:15 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-7D |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

AECOM

**WELL MW-8S**

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 2/1/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 2.067 in. WELL TD: 50 ONE WELL VOLUME : 2.3

| Time | Depth to Water (ft) | Purge Rate (ml/min) | Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 9:32 | 36.79 | | | | | | | | Static |
| 10:30 | | | | | | | | | Pump On |
| 11:12 | 36.79 | 350 | 12.95 | 2.87 | 7.22 | 5.84 | 243 | 236 | |
| 11:22 | 36.79 | 350 | 13.09 | 0.314 | 8.05 | 5.78 | 245 | 51.6 | |
| 11:32 | 36.79 | 350 | 13.14 | 0.386 | 7.85 | 5.77 | 239 | 29.6 | |
| 11:42 | 36.79 | 350 | 12.97 | 0.387 | 8.03 | 5.79 | 244 | 21.3 | |
| | | | | | | | | | |
| 11:50 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-8S |
| | | | | | | | | | 152187GWMW-8SF |

Pump Type: Bladder Pump

Analytical Parameters: VOCs, MNA

AECOM

**WELL MW-8D**

| WELL SAMPLING FORM | PROJECT: County Cleaners | PROJECT No.: 60133623 | SHEET 1 OF SHEETS 1 |
|---|---|---|---|
| LOCATION: Huntington, NY | | DATE WELL STARTED: 2/1/2010 | |
| CLIENT: NYSDEC | | NAME OF SAMPLERS: Foster, C., Hunt, C. | |

WELL Diam.: 1.939 in. WELL TD: 85 ONE WELL VOLUME : 7.4

| Time | Depth to Water (ft) | Purge Rate (ml/min) | FIELD MEASUREMENTS Temp. (ºC) | Conduct. (ms/cm) | DO (mg/L) | pH | ORP (mV) | Turbidity (ntu) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 9:33 | 36.54 | | | | | | | | Static |
| 9:50 | | | | | | | | | Pump On |
| 10:10 | 40.51 | 175 | 12.06 | 0.725 | 12.33 | 6.49 | 227 | 221 | |
| 10:15 | 40.51 | 175 | 11.69 | 0.273 | 11.96 | 6.44 | 236 | 262 | |
| 10:45 | 40.51 | 175 | 11.55 | 0.275 | 11.11 | 6.73 | 222 | 292 | |
| 10:55 | 40.53 | 175 | 11.74 | 0.274 | 10.65 | 6.79 | 218 | 255 | |
| 11:05 | 39.45 | 175 | 10.52 | 0.274 | 10.81 | 6.81 | 216 | 216 | |
| | | | | | | | | | |
| 11:10 | | | | | | | | | Sample Collected |
| | | | | | | | | | 152187GWMW-8D |

Pump Type: Bladder Pump

Analytical Parameters: VOCs

# CERTIFICATE OF DISPOSAL

This certificate is to verify the wastes specified on Manifest # 004659248 JJK
have been properly disposed of in accordance with all local, state and federal regulations.

*"Disposed of" means either: 1) Burial or 2) Processed as specified in 40 CFR et seq.*

FACILITY NAME: ☒ Michigan Disposal Waste Treatment Plant (EPA I.D. # MID000724831) ☐ Wayne Disposal, Inc. (EPA I.D. # MID048090633)
*(Please check one)*

ADDRESS: 49350 N. I-94 Service Drive
Belleville, Michigan 48111

PHONE NUMBER: 1-800-592-5489

FAX NUMBER: 1-800-593-5329

Authorized Signature: ______________________

THE ENVIRONMENTAL QUALITY COMPANY 49350 N. I-94 SERVICE DRIVE BELLEVILLE MICHIGAN 48111

Form # REC-FM-013-BEL *The electronic version of this document is the controlled version. Each user is responsible for ensuring that any document being used is the current version* 8/25/08

Please print or type (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1 Generator ID Number: NYD 077 516 979

2 Page 1 of 1

3 Emergency Response Phone: 1800 457-7362

4. Manifest Tracking Number: 004659248 JJK

5 Generator's Name and Mailing Address: NEW YORK STATE DEC
825 BROADWAY, 11TH FLOOR
ALBANY, NY 12233-7015
Generator's Phone: (518) 402-8594

Generator's Site Address (if different than mailing address):
410 W MAIN STREET
HUNTINGTON, NY 11743

6 Transporter 1 Company Name: ST JOSEPH MOTOR LINES — U.S. EPA ID Number: PAD 987 358 587

7 Transporter 2 Company Name: — U.S. EPA ID Number:

8 Designated Facility Name and Site Address: MICHIGAN DISPOSAL WASTE TREATMENT P
49350 N I-94 SERVICE DRIVE
BELLEVILLE, MI 48111
Facility's Phone: (800) 592-5489
U.S. EPA ID Number: MID 000 724 831

| 9a HM | 9b U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any)) | 10 Containers No. | 10 Containers Type | 11 Total Quantity | 12 Unit Wt./Vol. | 13 Waste Codes |
|---|---|---|---|---|---|---|
| X | 1 NA3077, HAZARDOUS WASTE, SOLID, N.O.S. (PCE, TCE), 9, PGIII | 17 | DM | 8500 | P | F002 |
| | 2 NA3082, HAZARDOUS WASTE, LIQUIDS, N.O.S., (PCE, TCE), 9, PGIII (DECON WATER) | 3 | DM | 150 | G | F002 |
| | 3 NON HAZARDOUS SOLID WASTE, NOT DOT NOT RCRA REGULATED (SOIL CUTTING) | 19 | DM | 9500 | P | NONE |
| | 4 | | | | | |

14 Special Handling Instructions and Additional Information
01. K082089MDI / HAZARDOUS SOIL CUTTINGS / ERG #171 02. K082087MDI / DECON WATER / ERG #171
03. K082088MDI / NON HAZARDOUS SOIL CUTTINGS

15 GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: Kim Alvestad for NYSDEC — Signature: Kim Alvestad for NYSDEC — Month 12 Day 10 Year 08

16 International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit: Date leaving U.S.:
Transporter signature (for exports only):

17 Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Matthew Lee Williams — Signature: — Month 12 Day 10 Year 08
Transporter 2 Printed/Typed Name: — Signature: — Month Day Year

18 Discrepancy
18a Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
18b Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:
18c Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| H141 | H111 | H111 | |

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name: Tanya Cougar — Signature: — Month 12 Day 12 Year 08

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)



2356576

CleanVenture/CycleChem

CVCC 139884

# NON-HAZARDOUS SOLID WASTE

The Environmental Services Source

## BILL OF LADING

Page 1 of 1

24 Hour Emergency Number (908) 354-0210

Generator's Name and Mailing Address NYSDEC
625 BROADWAY
ALBANY, NY 12233

Generator's Phone (518) 402-9621

BOL
410 WEST MAIN STREET (DRU
HUNTINGTON NY 11724

Transporter 1 Company Name
CLEAN VENTURE INC.

State Trans. ID-NJDEPE 16755
Decal No.- 12143
Transporter's Phone (908) 355-5800

Transporter 2 Company Name

State Trans. ID-NJDEPE
Decal No.-
Transporter's Phone ( )

Designated Facility Name and Site Address
Cycle Chem Inc.
217 South First Street
Elizabeth, NJ 07206

10. US EPA ID Number
NJD002200046

Facility's Phone (908) 355-5800

GENERATOR

| | US DOT Description (Including Proper Shipping Name, Hazard Class or Division, ID Number and Packing Group) | Containers No. | Containers Type | Total Quantity | Unit Wt/Vol | Waste No. |
|---|---|---|---|---|---|---|
| a. | NON HAZARDOUS WASTE WATER Non-RCRA Non-DOT | 6 | D M | 330 | G | ID72 |
| b. | NON HAZARDOUS WASTE SOLID Non-RCRA Non-DOT | 19 | D M | 1045 | ~~G~~ P | ID27 |
| c. | | | | | | |
| d. | | | | | | |

J. Additional Descriptions for Materials Listed Above

a.

b.

c.

d.

CCI Generator # and Product Codes: 955101/947381/106216/254247 (1)REM002-1 PERC CONTAMINATED GROUNDWATER (2)PC01-2 SOIL

Plate # AF-6615 NJ

**GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and are non-hazardous by USEPA & applicable state regulations.

PLACARDS REQUIRED

PLACARDS SUPPLIED ☐ YES ☐ NO- FURNISHED BY CARRIER

| Printed/Typed Name | Signature | Month Day Year |
|---|---|---|
| Claire Hunt | C. Hunt | 02/09/10 |

TRANSPORTER

Transporter 1 Acknowledgement of Receipt of Materials

| Printed/Typed Name | Signature | Month Day Year |
|---|---|---|
| Kevin Howard | K. H | 02/09/10 |

Transporter 2 Acknowledgement of Receipt of Materials

| Printed/Typed Name | Signature | Month Day Year |
|---|---|---|
| | | |

FACILITY

Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest.

| Printed/Typed Name | Signature | Month Day Year |
|---|---|---|
| | | |

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

COPY 1 - WHITE - GENERATOR COPY 2 - PINK - TRANSPORTER COPY 3 - BLUE - CycleChem COPY 4 - CANARY - FACILITY

CleanVenture/CycleChem

CVCC 139885

# NON-HAZARDOUS SOLID WASTE

The Environmental Services Source

## BILL OF LADING



24 Hour Emergency Number (908) 354-0210

Generator's Name and Mailing Address: NYSDEC
625 BROADWAY
ALBANY, NY 12233

BOL

410 WEST MAIN STREET (DRU
HUNTINGTON NY 11724

Generator's Phone: (518) 402-9621

Transporter 1 Company Name: CLEAN VENTURE INC.

State Trans. ID-NJDEPE: 16755
Decal No.- 12069
Transporter's Phone: (908) 355-5800

Transporter 2 Company Name:

State Trans. ID-NJDEPE:
Decal No.-
Transporter's Phone ( )

Designated Facility Name and Site Address: 10. US EPA ID Number
Cycle Chem Inc.
217 South First Street
Elizabeth, NJ 07206 — NJD002200046

Facility's Phone: (908) 355-5800

| | US DOT Description (Including Proper Shipping Name, Hazard Class or Division, ID Number and Packing Group) | Containers No. | Containers Type | Total Quantity | Unit Wt/Vol | Waste No. |
|---|---|---|---|---|---|---|
| a. | NON HAZARDOUS WASTE SOLID Non-RCRA Non-DOT | X 60 | D M | 24,000 | P | ID27 |
| b. | | | | | | |
| c. | | | | | | |
| d. | | | | | | |

J. Additional Descriptions for Materials Listed Above

a.
b.
c.
d.

TRL #1

CCI Generator # and Product Codes: 955101/947381/106216/254248 (1)PC01-2 SOIL

**GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and are non-hazardous by USEPA & applicable state regulations.

PLACARDS REQUIRED

PLACARDS SUPPLIED ☐ YES ☑ NO- FURNISHED BY CARRIER

GENERATOR
Printed/Typed Name: Claire Hunt — Signature: C. Hunt — Month/Day/Year: 12/9/10

TRANSPORTER
Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Jorge Prieto — Signature: [signature] — Month/Day/Year: 12/9/10

Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: — Signature: — Month Day Year

FACILITY
Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest.
Printed/Typed Name: — Signature: — Month Day Year

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

COPY 1 - WHITE - GENERATOR COPY 2 - PINK - TRANSPORTER COPY 3 - BLUE - CycleChem COPY 4 - CANARY - FACILITY

# Appendix D
# Land Survey Results

| Surveyor ID | Y | X | Z | Boring |
|---|---|---|---|---|
| 1002 | 256520.5 | 1140818 | 110.3894 | MIP-4 |
| 1044 | 256425.3 | 1140927 | 111.2218 | MIP-01 |
| 1122 | 256955.1 | 1141091 | 80.2361 | MIP-08 |
| 1003 | 256548.3 | 1140862 | 105.2681 | MIP10 |
| 1023 | 256470.1 | 1140949 | 102.2526 | MIP11 |
| 1078 | 256560.6 | 1141083 | 88.2126 | MIP12 |
| 1151 | 256502.3 | 1141052 | 90.0521 | MIP13 |
| 1009 | 256669.8 | 1141083 | 86.5429 | MIP14 |
| 1014 | 256667.6 | 1140844 | 102.9648 | MIP15 |
| 1015 | 256656.9 | 1140660 | 116.9869 | MIP16 |
| 1026 | 256583.4 | 1140778 | 111.4122 | MIP17 |
| 1017 | 256540.9 | 1140701 | 120.0243 | MIP18 |
| 1029 | 256606.8 | 1140426 | 137.854 | MIP19 |
| 1006 | 256582.9 | 1140940 | 99.5416 | MIP2 |
| 1059 | 256462.4 | 1140503 | 139.6007 | MIP20 |
| 1018 | 256467.1 | 1140679 | 124.9771 | MIP21 |
| 1121 | 257029.3 | 1140979 | 84.1494 | MIP22 |
| 1075 | 256876.2 | 1140917 | 89.9678 | MIP23 |
| 1072 | 257059 | 1140849 | 89.536 | MIP24 |
| 1082 | 256934.9 | 1140578 | 105.8578 | MIP25 |
| 1069 | 256770 | 1140618 | 115.2065 | MIP26 |
| 1016 | 256665.5 | 1140594 | 120.2529 | MIP27 |
| 1035 | 256397.6 | 1140863 | 117.9373 | MIP28 |
| 1037 | 256366.1 | 1140860 | 119.6689 | MIP29 |
| 1007 | 256610.4 | 1140992 | 90.1597 | MIP3 |
| 1040 | 256327.7 | 1140875 | 121.16 | MIP30 |
| 1041 | 256232.7 | 1140869 | 124.0116 | MIP31 |
| 1019 | 256463.9 | 1140765 | 118.2911 | MIP32 |
| 1021 | 256529.1 | 1140877 | 103.9166 | MIP32 |
| 1022 | 256481.1 | 1140929 | 102.891 | MIP33 |
| 1032 | 256487 | 1140888 | 111 | MIP34 |
| 1020 | 256486.8 | 1140837 | 110.6405 | MIP35 |
| 1013 | 256695.2 | 1140918 | 95.285 | MIP36 |
| 1011 | 256748.1 | 1141016 | 87.6854 | MIP37 |
| 1076 | 256818.7 | 1140950 | 90.0864 | MIP38 |
| 1067 | 256756.9 | 1140851 | 95.9395 | MIP39 |
| 1057 | 256534.9 | 1140627 | 129.3361 | MIP40 |
| 1008 | 256639.1 | 1141046 | 87.7711 | MIP-5 |
| 1012 | 256734.1 | 1140969 | 91.2992 | MIP6 |
| 1010 | 256776.6 | 1141068 | 84.0419 | MIP7 |
| 1068 | 256732.4 | 1140774 | 104.2232 | MIP9 |

NY State Plane - Long Island - feet

| IDNO | Y | X | Z | WELLID |
|---|---|---|---|---|
| 1 | 256524.3 | 1140881 | 103.77 | MW-1 |
| 100 | 256368.1 | 1140859 | 119.79 | MW-1S |
| 120 | 256578.8 | 1140919 | 100.711 | MW-2 |
| 102 | 256362.7 | 1140861 | 120.08 | MW-1D |
| 104 | 256588.3 | 1140944 | 99.04 | MW-2D |
| 112 | 256482.3 | 1140942 | 102.12 | MW-3D |
| 110 | 256486.6 | 1140936 | 102.36 | MW-3S |
| 106 | 256505.2 | 1140825 | 110.32 | MW-4D |
| 108 | 256509.6 | 1140823 | 110.28 | MW-4S |
| 3 | 256610.6 | 1141061 | 88.69 | MW-5D |
| 2 | 256611.9 | 1141054 | 88.71 | MW-5S |
| 122 | 256583.1 | 1140596 | 124.99 | MW-6S |
| 116 | 256730.6 | 1140787 | 104.64 | MW-7D |
| 118 | 256731.1 | 1140780 | 104.86 | MW-7S |
| 4 | 256769.4 | 1141056 | 85.75 | MW-8D |
| 114 | 256772.2 | 1141061 | 84.5 | MW-8S |

Z - Top of Inner Casing

# Appendix E
# Geophysical Surveys

ADVANCED GEOLOGICAL SERVICES

3 Mystic Lane
Malvern, PA19355
(610) 722-5500 (ph.)
(610) 722-0250 (fax)

December 22, 2009
Ref.: 09-278-1

Ms. Claire Hunt
AECOM Technical Services, Inc.
300 Broadacres Drive
Bloomfield, New Jersey

Subject: Geophysical Investigation Results
County Cleaners Site
Huntington, New York

Dear Ms. Claire Hunt:

Advanced Geological Services (AGS) presents this letter report to AECOM Technical Services, Inc. detailing the methods and results of the geophysical investigation conducted at the County Cleaners site, located near the intersection of Laurence Hill Road and West Main Street, Huntington, New York. The objective of the geophysical investigation was to locate and identify potential utilities around several proposed drilling locations as identified by the onsite AECOM representative. The field activities for this investigation were completed by AGS on December 2, 2009

**Methods**

To meet the objective of the investigation, AGS used the Radio Frequency (RF), Hand Held Metal Detection (MD) and ground penetrating radar (GPR) methods. AGS thoroughly scanned each proposed drilling location, as identified by the onsite representative, with the RF and MD instruments. A minimum of 2 GPR profiles were collected perpendicular to each other, looking for responses consistent with potential utilities or other potential drilling obstructions. All identified subsurface features were marked on the ground surface with spray paint.

**Ground Penetrating Radar (GPR) Method**

The ground penetrating radar (GPR) method was used to provide subsurface imaging information throughout the areas of investigation. The GPR method is based upon the transmission of repetitive, radio-frequency electromagnetic (EM) pulses into the subsurface. When the transmitted energy of down going wave contacts an interface of dissimilar electrical character, part of the energy is returned to the surface in the form of a reflected signal. This reflected signal is detected by a receiving transducer and is displayed on the screen of the GPR unit as well as being recorded on the internal hard-drive. The received GPR response remains constant as long as the electrical contrast between media is present and constant. Lateral or vertical changes in the electrical properties of the subsurface result in equivalent changes in the GPR responses. The system records a continuous image of the subsurface by plotting two-way travel time of the reflected EM pulse versus distance traveled along the ground surface. Two-way travel time values are then converted to depth using known soil velocity functions.

The GPR field procedures involved (1) instrument calibration, (2) test run completion, (3) production profile collection and recording, and (4) data storage for subsequent processing and analysis in the office. Each radar profile was examined for characteristic GPR signatures that may indicate the presence of buried targets. A Geophysical Survey System SIR System 2 and a 400 megahertz (MHz) antenna were used with a recording window of 60 nanoseconds (ns) to provide the required depth penetration and subsurface detail.

**Radio Frequency (RF) Utility Locating Method**

A Radiodetection RD400/PDL2 multi-frequency RF utility locating system was used for this project. This instrument consists of a receiver/tracer and a remote transmitter, which operates at frequencies ranging between 8 kHz and 65 kHz. In addition, the receiver can be used in 60 Hz passive mode to identify active buried electrical lines. This utility tracing instrument provides audible and visual feedback to the operator when a utility that is coupled with the transmitted signal is crossed. The transmitter produces a radio-frequency signal in the utility to be traced by either induction coupling or direct hook-up. The receiver output provides measured field strength of the received signal and varies an audible pitch depending upon how far the utility is from the receiver. By carefully adjusting the gain of the receiver it is possible to determine the location of the utility and to separate it from adjacent utilities.

The direct hook-up, inductive coupling tracing methods were applied to all known utilities. In addition the passive tracing method was utilized over every proposed drilling location.

**Hand Held Metal Detection (MD) Method**

All proposed soil boring and test pit locations were also scanned using a hand held metal detection (MD) instrument. This method uses the principle of electromagnetic induction to detect shallow buried metal objects such as USTs, metal utility conduits, rebar in concrete, manhole covers, and various metallic debris. This is done by carrying a hand-held radio transmitter-receiver unit above the ground and continuously scanning the surface. A primary coil broadcasts a radio signal from a transmitter. This primary radio signal induces secondary electrical currents in metal objects. These secondary currents in turn produce a magnetic field which is detected by the receiver.

The MD instrument used for this investigation was a Fisher TW-6 pipe and cable locater. This instrument is expressly designed to detect metallic pipes, cables, USTs, manhole covers, and other buried metallic objects. The instrument produces an audible response and significant meter deflections when near a metal object. The peak instrument response usually occurs when the unit is directly over the object.

**Results**

AGS "cleared" a total of 8 proposed drilling locations (locations 1-8). Each "cleared" proposed drilling location exhibited a reflection-free GPR signature and no RF or EM responses. Proposed drilling locations were relocated to avoid identified utilities. Identified utilities were marked and identified on the ground surface with spray paint. AGS generated field sketches for each of the proposed drilling locations and scanned copies are attached.

**Closing**

AGS "cleared" 20 proposed drilling locations. Upon completion of field activities, the field results of the investigation were discussed and reviewed with the onsite AECOM representative.

All geophysical data and field notes collected as a part of this investigation will be archived at the AGS office. The data collection and interpretation methods used in this investigation are consistent with standard practices applied to similar geophysical investigations. The correlation of geophysical responses with probable subsurface features is based on the past results of similar surveys although it is possible that some variation could exist at this site. Due to the nature of geophysical data, no guarantees can be made or implied regarding the presence or absence of additional objects or targets beyond those identified.

If you have any questions regarding the results of this field investigation, please contact me at 610-722-5500. It was a pleasure working with you on this project and we look forward to being able to provide you with sub-surface imaging services in the future.

Sincerely,

Christopher Call, M.S.
Project Geophysicist, AGS

CLIENT: AECOM

SITE LOCATION:

BORING: 7

ADVANCED GEOLOGICAL SERVICES

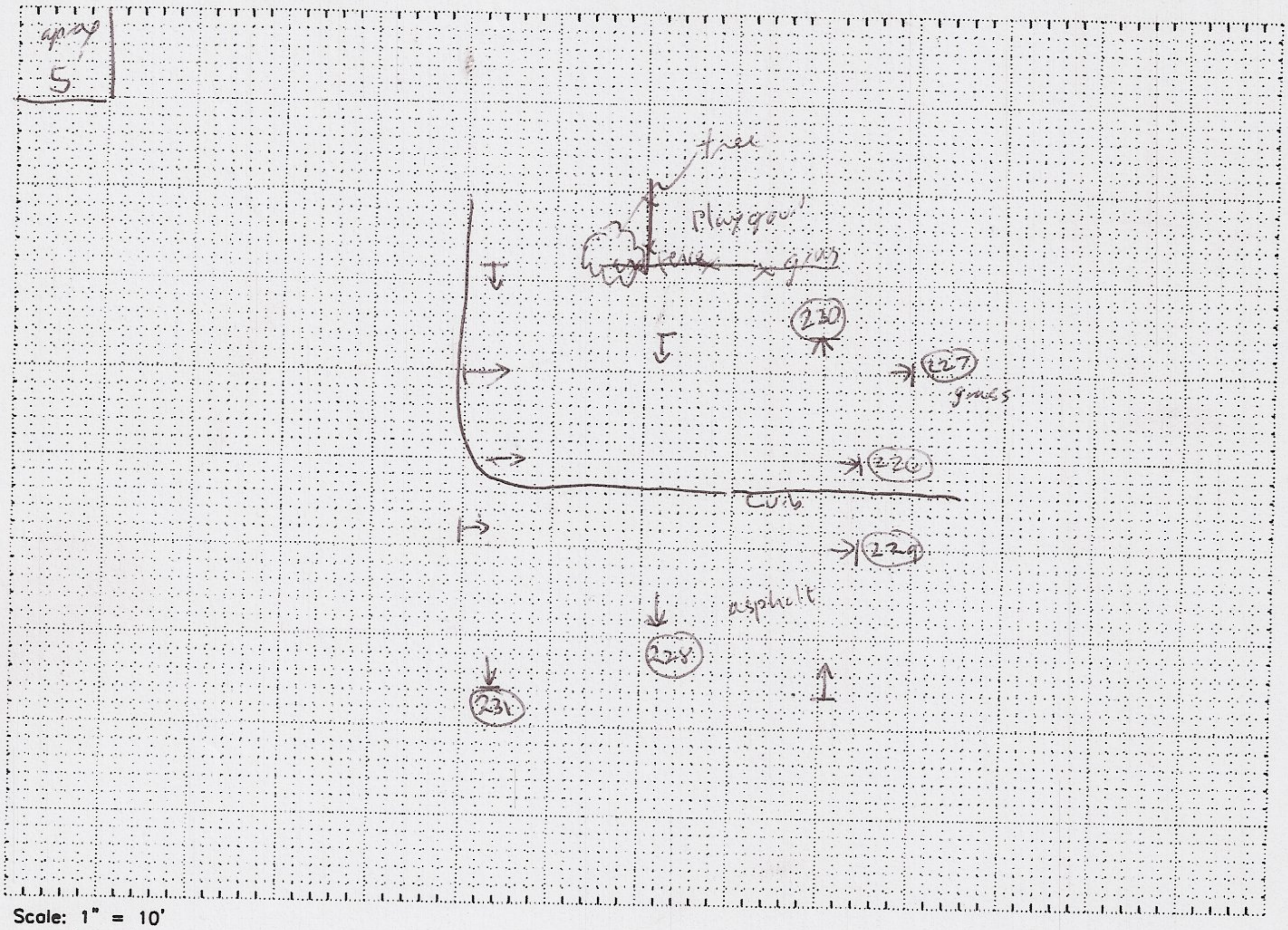
3 Mystic Lane
Malvern, PA 19355
(800) 250-3402
www.advancedgeo.com

PERSONNEL: C. Call

DATE: 12/2/09

AGS REF #:

MISC:




Scale: 1" = 10'
approx

## LEGEND

**Detected Utilities**

- _ T (Telephone, Comm.)
- _ E (Electric)
- _ NG (Natural Gas)
- _ UU (Utility–Unknown Type)
- _ SS (Sanitary Sewer)
- _ SD (Storm Drain)
- _ W (Water)
- _ FS (Fire Suppression)
- _ STM (Steam)
- _ CA (Compressed Air)
- _ ? (Suspected Utility Based on Faint/Ambiguous Response)

**Equipment/Procedure**

- ✓ Radio Freq. (RD4000)
  - _ Ambient
  - _ Direct Connect
  - _ Induction
- ✓ GPR (Radar)
- _ Metal Pipe and Cable Locator (M-Scope)
- _ Other

**Ground Conditions**

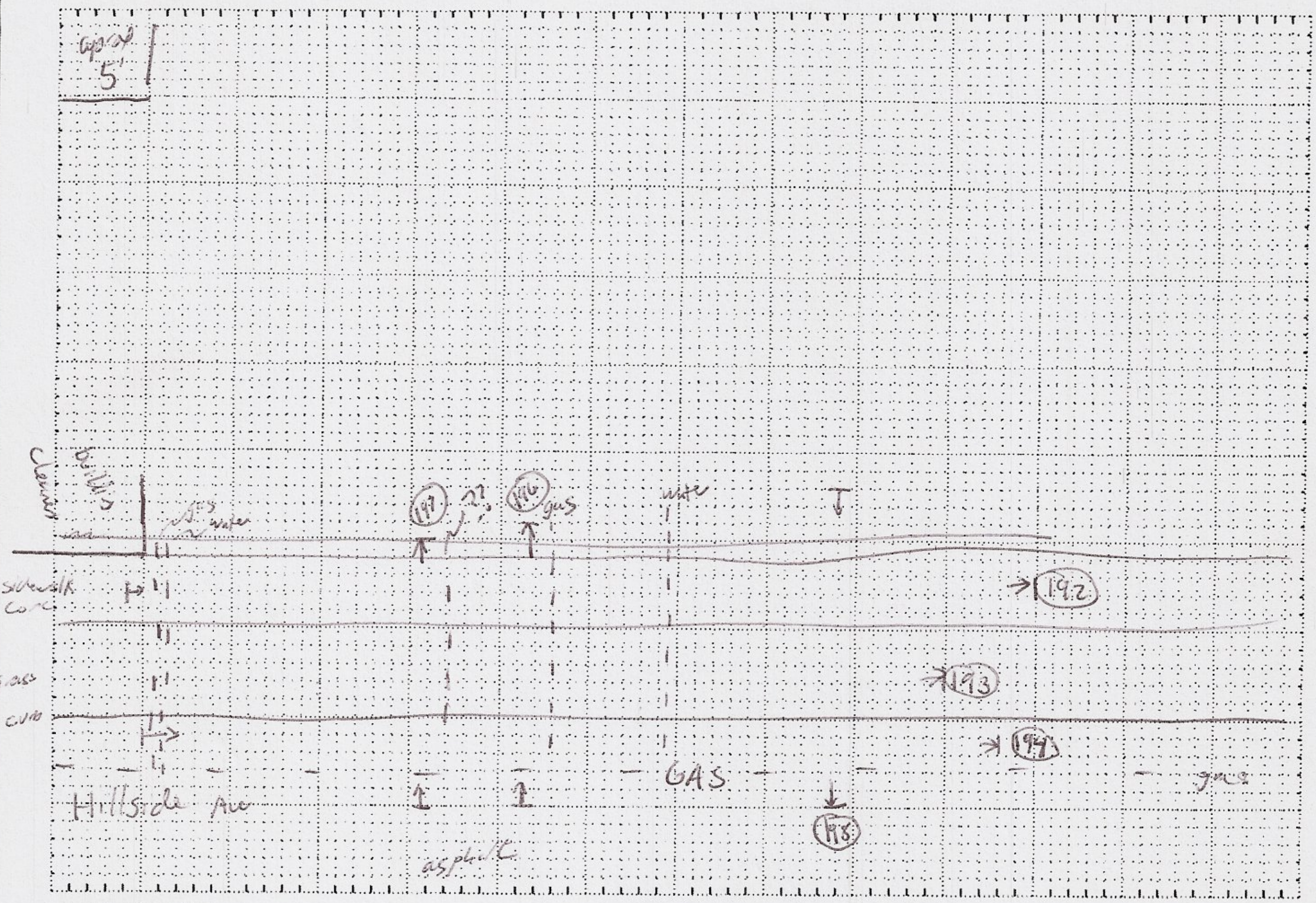
- _ RC (Reinforced Concrete)
- ✓ A (Asphalt)
- _ C (Concrete)
- _ Soil
- _ Gravel
- ✓ Grass
- _ Wet
- _ Dry
- _ Other

**Boring/GPR/Utility/Misc. Information**

- ○ Proposed Boring Location (Per Client)
- ● Final Boring Location (Per AGS)
- — — — Utility Alignment
- ├──┤ GPR Traverse
- — Localized GPR Anomaly

NOTES:

| | | |
|---|---|---|
| CLIENT: AECOM | ADVANCED GEOLOGICAL SERVICES | PERSONNEL: C. Call |
| SITE LOCATION: Hill side Ave | 3 Mystic Lane<br>Malvern, PA 19355<br>(800) 250-3402<br>www.advancedgeo.com | DATE: 12/ 2/ 09 |
| | | AGS REF #: |
| BORING: MW1 | | MISC: |




Scale: 1" = 10'
approx

## LEGEND

| *Detected Utilities* | *Equipment/Procedure* | *Ground Conditions* | *Boring/GPR/Utility/Misc. Information* |
|---|---|---|---|
| _ T (Telephone, Comm.) | ✓ Radio Freq. (RD4000) | ✓ RC (Reinforced Concrete) | ○ Proposed Boring Location (Per Client) |
| _ E (Electric) | _ Ambient | ✓ A (Asphalt) | ● Final Boring Location (Per AGS) |
| _ NG (Natural Gas) | _ Direct Connect | ✓ C (Concrete) | — — — Utility Alignment |
| _ UU (Utility-Unknown Type) | _ Induction | _ Soil | ├──┤ GPR Traverse |
| _ SS (Sanitary Sewer) | ✓ GPR (Radar) | _ Gravel | ⟶ Localized GPR Anomaly |
| _ SD (Storm Drain) | ✓ Metal Pipe and Cable Locator (M-Scope) | _ Grass | |
| _ W (Water) | _ Other | _ Wet | |
| _ FS (Fire Suppression) | | _ Dry | |
| _ STM (Steam) | | _ Other | |
| _ CA (Compressed Air) | | | |
| _ ? (Suspected Utility Based on Faint/Ambiguous Response) | | | |

NOTES:

CLIENT: AECOM

SITE LOCATION:

BORING: 2

ADVANCED GEOLOGICAL SERVICES

3 Mystic Lane
Malvern, PA 19355
(800) 250-3402
www.advancedgeo.com

PERSONNEL: C. Call

DATE: 12/2/09

AGS REF #:

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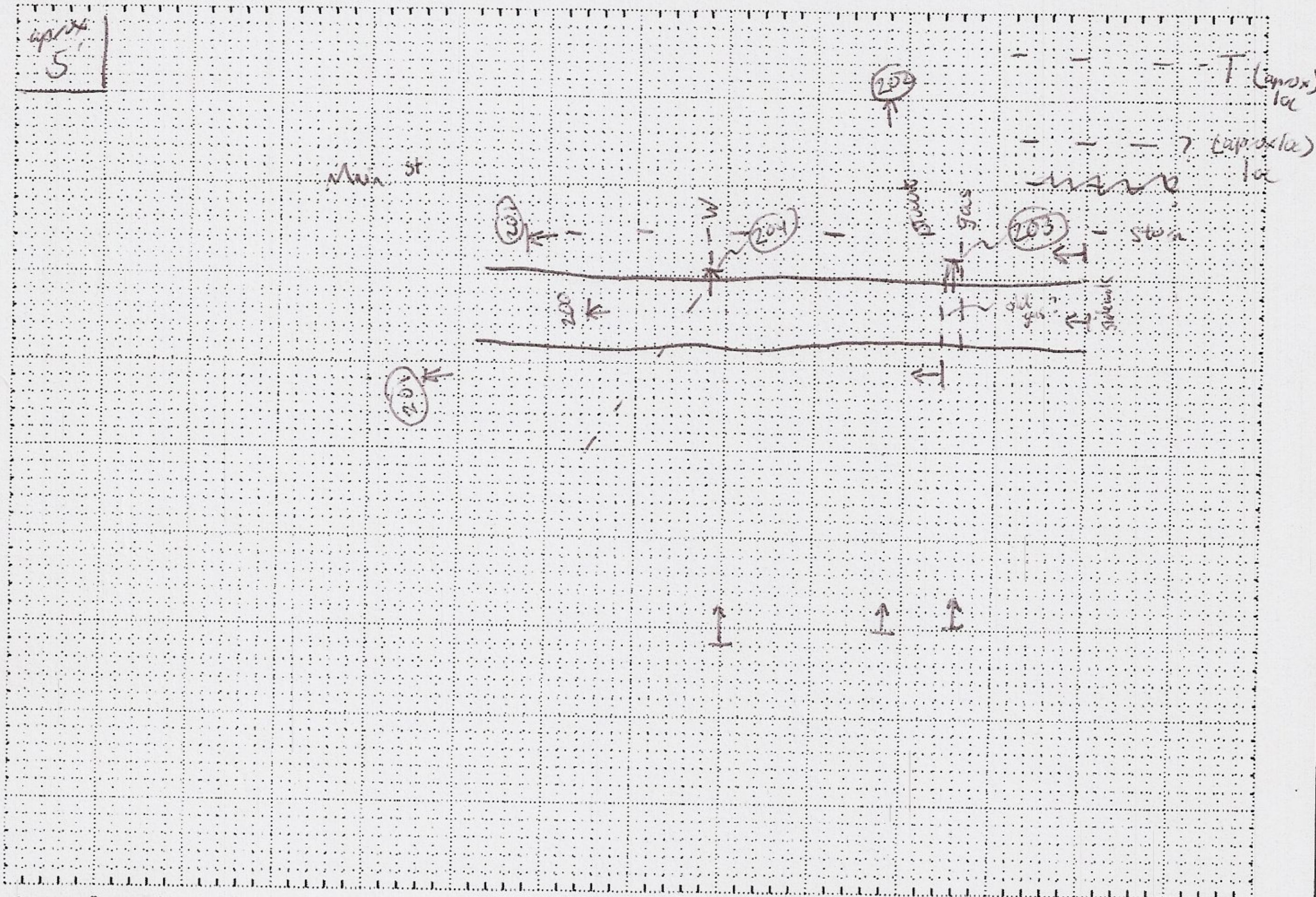



Scale: 1" = 10' aprox

LEGEND

*Detected Utilities*

- _ T (Telephone, Comm.)
- _ E (Electric)
- _ NG (Natural Gas)
- _ UU (Utility-Unknown Type)
- _ SS (Sanitary Sewer)
- _ SD (Storm Drain)
- _ W (Water)
- _ FS (Fire Suppression)
- _ STM (Steam)
- _ CA (Compressed Air)
- _ ? (Suspected Utility Based on Faint/Ambiguous Response)

*Equipment/Procedure*

- ✓ Radio Freq. (RD4000)
  - _ Ambient
  - _ Direct Connect
  - _ Induction
- ✓ GPR (Radar)
- _ Metal Pipe and Cable Locator (M-Scope)
- _ Other

*Ground Conditions*

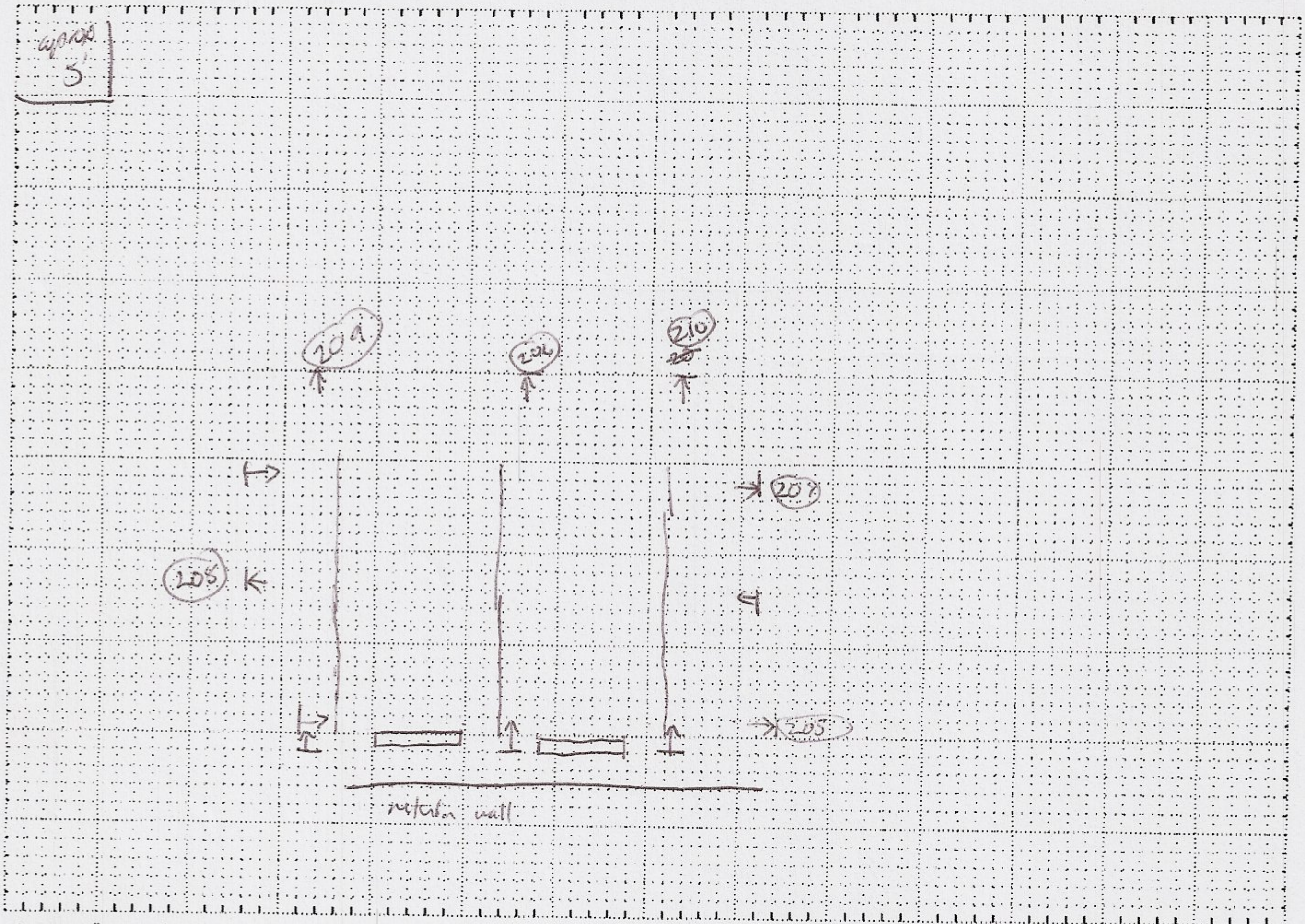
- ✓ RC (Reinforced Concrete)
- ✓ A (Asphalt)
- _ C (Concrete)
- _ Soil
- _ Gravel
- _ Grass
- _ Wet
- _ Dry
- _ Other

*Boring/GPR/Utility/Misc. Information*

- ○ Proposed Boring Location (Per Client)
- ● Final Boring Location (Per AGS)
- — — — Utility Alignment
- |——| GPR Traverse
- — Localized GPR Anomaly

NOTES:

| | | |
|---|---|---|
| CLIENT: AECOM | ADVANCED GEOLOGICAL SERVICES | PERSONNEL: C. Cull |
| SITE LOCATION: | 3 Mystic Lane<br>Malvern, PA 19355<br>(800) 250-3402<br>www.advancedgeo.com | DATE: 12/2/04 |
| | | AGS REF #: |
| BORING: 4 | | MISC: |




Scale: 1" = 10'

approx

LEGEND

**Detected Utilities**

- _ T (Telephone, Comm.)
- _ E (Electric)
- _ NG (Natural Gas)
- _ UU (Utility–Unknown Type)
- _ SS (Sanitary Sewer)
- _ SD (Storm Drain)
- _ W (Water)
- _ FS (Fire Suppression)
- _ STM (Steam)
- _ CA (Compressed Air)
- _ ? (Suspected Utility Based on Faint/Ambiguous Response)

**Equipment/Procedure**

- ✓ Radio Freq. (RD4000)
  - _ Ambient
  - _ Direct Connect
  - _ Induction
- ✓ GPR (Radar)
- ✓ Metal Pipe and Cable Locator (M–Scope)
- _ Other

**Ground Conditions**

- _ RC (Reinforced Concrete)
- ✓ A (Asphalt)
- _ C (Concrete)
- _ Soil
- _ Gravel
- _ Grass
- _ Wet
- _ Dry
- _ Other

**Boring/GPR/Utility/Misc. Information**

- ○ Proposed Boring Location (Per Client)
- ● Final Boring Location (Per AGS)
- — — — Utility Alignment
- |——| GPR Traverse
- — Localized GPR Anomaly

NOTES:

CLIENT: AECOM

SITE LOCATION:

BORING: 8

**ADVANCED GEOLOGICAL SERVICES**

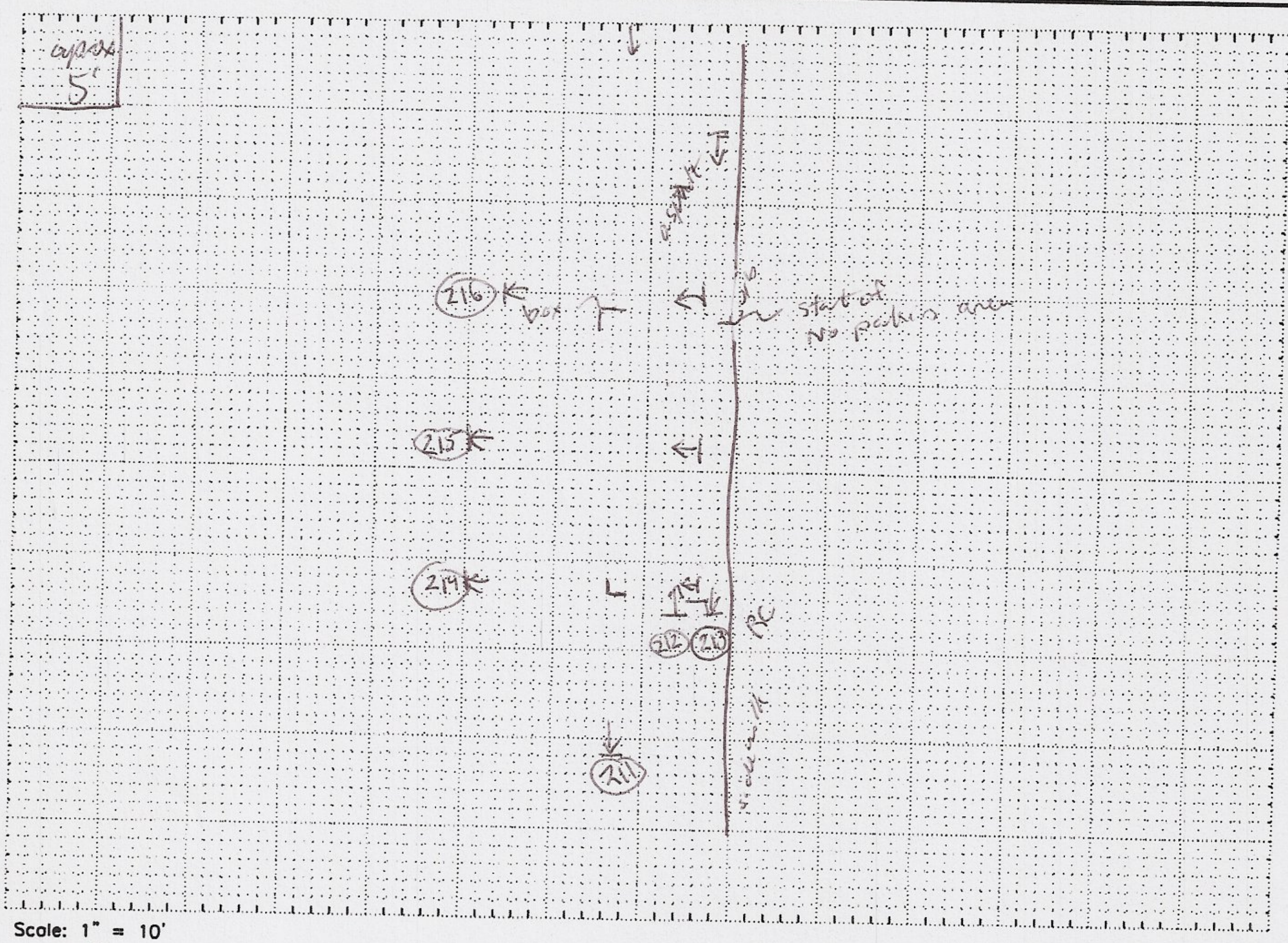
3 Mystic Lane
Malvern, PA 19355
(800) 250-3402
www.advancedgeo.com

PERSONNEL: C. Call

DATE: 12/2/09

AGS REF #:

MISC:




Scale: 1" = 10'
aprox

## LEGEND

| Detected Utilities | Equipment/Procedure | Ground Conditions | Boring/GPR/Utility/Misc. Information |
|---|---|---|---|
| _ T (Telephone, Comm.) | ✓ Radio Freq. (RD4000) | ✓ RC (Reinforced Concrete) ~sidewalk | ○ Proposed Boring Location (Per Client) |
| _ E (Electric) | _ Ambient | ✓ A (Asphalt) | ● Final Boring Location (Per AGS) |
| _ NG (Natural Gas) | _ Direct Connect | _ C (Concrete) | — — — Utility Alignment |
| _ UU (Utility–Unknown Type) | _ Induction | _ Soil | ├──┤ GPR Traverse |
| _ SS (Sanitary Sewer) | ✓ GPR (Radar) | _ Gravel | ⟶ Localized GPR Anomaly |
| _ SD (Storm Drain) | ✓ Metal Pipe and Cable Locator (M–Scope) | _ Grass | |
| _ W (Water) | _ Other | _ Wet | |
| _ FS (Fire Suppression) | | _ Dry | |
| _ STM (Steam) | | _ Other | |
| _ CA (Compressed Air) | | | |
| _ ? (Suspected Utility Based on Faint/Ambiguous Response) | | | |

NOTES:

| | | |
|---|---|---|
| CLIENT: AECOM<br>SITE LOCATION: | ADVANCED GEOLOGICAL SERVICES<br>3 Mystic Lane<br>Malvern, PA 19355<br>(800) 250-3402<br>www.advancedgeo.com | PERSONNEL: C. Call |
| | | DATE: 12/2/09 |
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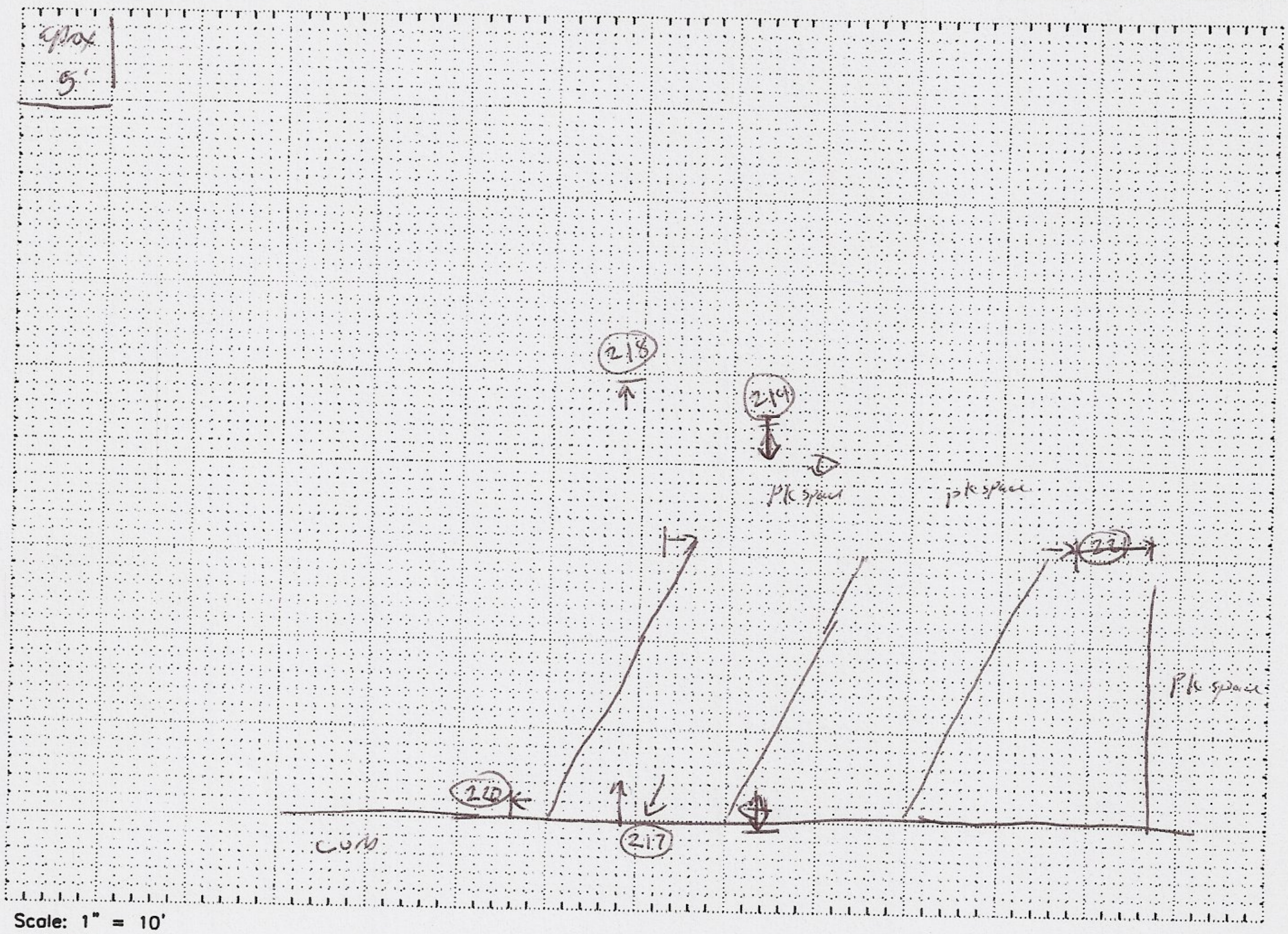
| BORING: 5 | | MISC: |




Scale: 1" = 10'
approx

LEGEND

**Detected Utilities**

- _ T (Telephone, Comm.)
- _ E (Electric)
- _ NG (Natural Gas)
- _ UU (Utility-Unknown Type)
- _ SS (Sanitary Sewer)
- _ SD (Storm Drain)
- _ W (Water)
- _ FS (Fire Suppression)
- _ STM (Steam)
- _ CA (Compressed Air)
- _ ? (Suspected Utility Based on Faint/Ambiguous Response)

**Equipment/Procedure**

- _ Radio Freq. (RD4000)
  - _ Ambient
  - _ Direct Connect
  - _ Induction
- _ GPR (Radar)
- _ Metal Pipe and Cable Locator (M-Scope)
- _ Other

**Ground Conditions**

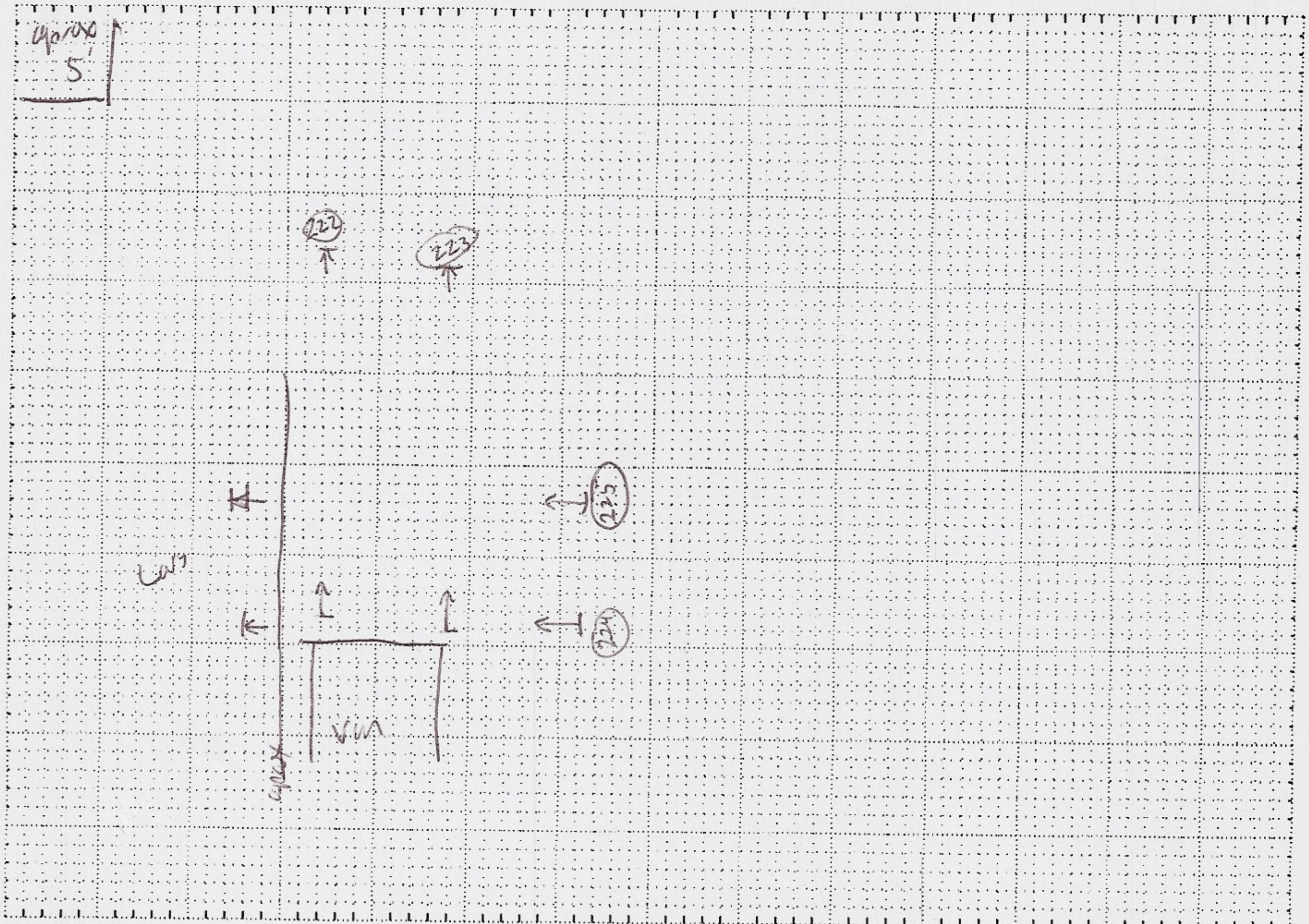
- _ RC (Reinforced Concrete)
- _ A (Asphalt)
- _ C (Concrete)
- _ Soil
- _ Gravel
- _ Grass
- _ Wet
- _ Dry
- _ Other

**Boring/GPR/Utility/Misc. Information**

- ○ Proposed Boring Location (Per Client)
- ● Final Boring Location (Per AGS)
- — — — Utility Alignment
- |——| GPR Traverse
- ⟵ Localized GPR Anomaly

NOTES:

| | | |
|---|---|---|
| CLIENT: AECOM | ADVANCED GEOLOGICAL SERVICES | PERSONNEL: C. Call |
| SITE LOCATION: | 3 Mystic Lane<br>Malvern, PA 19355<br>(800) 250-3402<br>www.advancedgeo.com | DATE: 12/2/09 |
| | | AGS REF #: |
| BORING: 3 | | MISC: |




Scale: 1" = 10'
approx

## LEGEND

| Detected Utilities | Equipment/Procedure | Ground Conditions | Boring/GPR/Utility/Misc. Information |
|---|---|---|---|
| _ T (Telephone, Comm.) | ✓ Radio Freq. (RD4000) | _ RC (Reinforced Concrete) | ○ Proposed Boring Location (Per Client) |
| _ E (Electric) | _ Ambient | ✓ A (Asphalt) | ● Final Boring Location (Per AGS) |
| _ NG (Natural Gas) | _ Direct Connect | _ C (Concrete) | — — — Utility Alignment |
| _ UU (Utility-Unknown Type) | _ Induction | _ Soil | ├───┤ GPR Traverse |
| _ SS (Sanitary Sewer) | ✓ GPR (Radar) | _ Gravel | ⟵ Localized GPR Anomaly |
| _ SD (Storm Drain) | ✓ Metal Pipe and Cable Locator (M-Scope) | _ Grass | |
| _ W (Water) | _ Other | _ Wet | |
| _ FS (Fire Suppression) | | _ Dry | |
| _ STM (Steam) | | _ Other | |
| _ CA (Compressed Air) | | | |
| _ ? (Suspected Utility Based on Faint/Ambiguous Response) | | | |

NOTES: lots of cars

CLIENT: AECOM

SITE LOCATION: off 25A ~~West~~

BORING: 6

ADVANCED GEOLOGICAL SERVICES

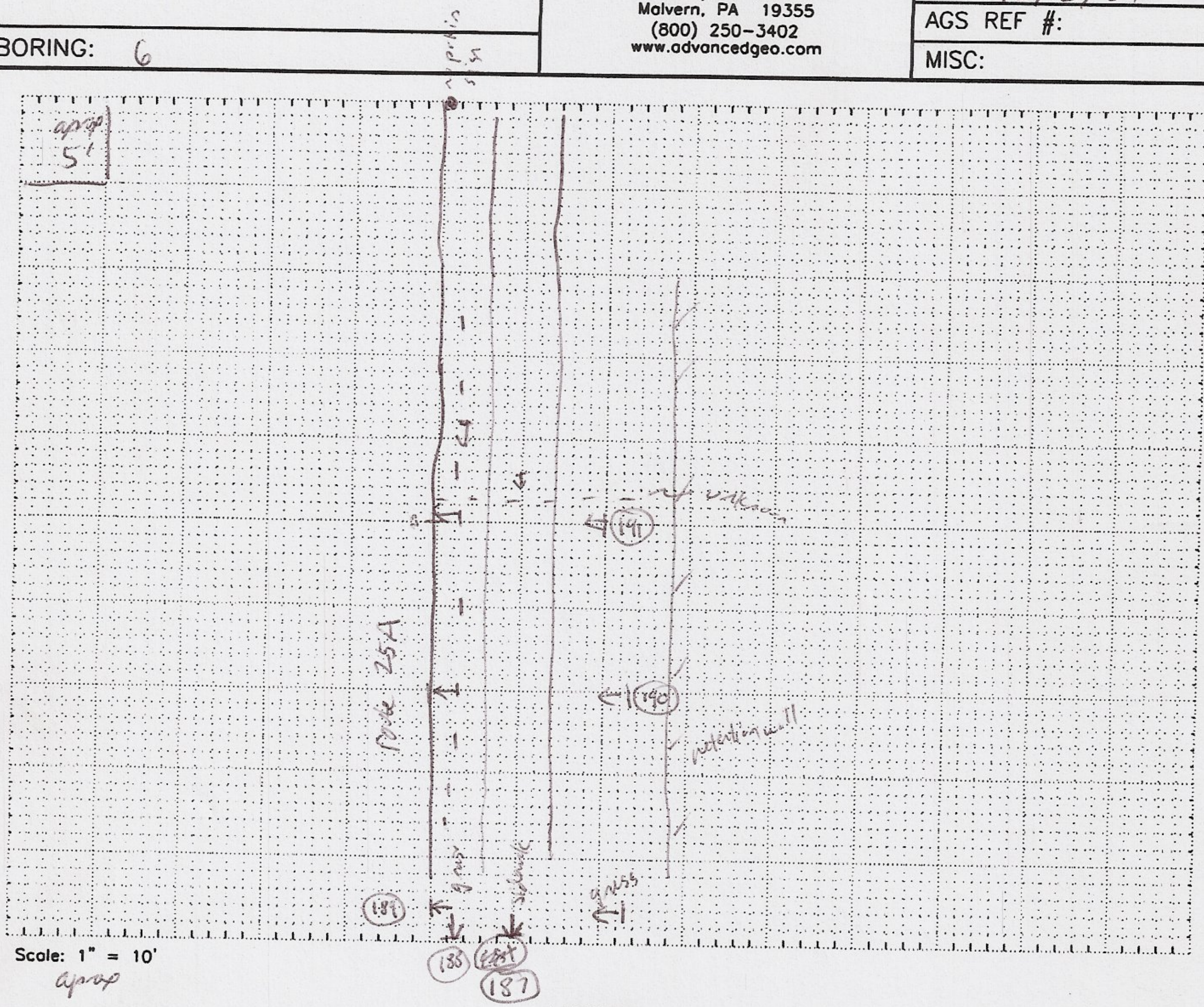
3 Mystic Lane
Malvern, PA 19355
(800) 250-3402
www.advancedgeo.com

PERSONNEL: C. Call

DATE: 12/2/09

AGS REF #:

MISC:




Scale: 1" = 10' approx

## LEGEND

| Detected Utilities | Equipment/Procedure | Ground Conditions | Boring/GPR/Utility/Misc. Information |
|---|---|---|---|
| _ T (Telephone, Comm.) | ✓ Radio Freq. (RD4000) | _ RC (Reinforced Concrete) | ○ Proposed Boring Location (Per Client) |
| _ E (Electric) | _ Ambient | _ A (Asphalt) | ● Final Boring Location (Per AGS) |
| _ NG (Natural Gas) | _ Direct Connect | ✓ C (Concrete) | — — — Utility Alignment |
| _ UU (Utility-Unknown Type) | _ Induction | _ Soil | ├──┤ GPR Traverse |
| _ SS (Sanitary Sewer) | ✓ GPR (Radar) | _ Gravel | ⟵ Localized GPR Anomaly |
| _ SD (Storm Drain) | ✓ Metal Pipe and Cable Locator (M-Scope) | ✓ Grass | |
| _ W (Water) | _ Other | _ Wet | |
| _ FS (Fire Suppression) | | _ Dry | |
| _ STM (Steam) | | _ Other | |
| _ CA (Compressed Air) | | | |
| _ ? (Suspected Utility Based on Faint/Ambiguous Response) | | | |

NOTES:

## Appendix F
## Lab Data and DUSRs on CD

# FEASIBILITY STUDY REPORT

**Site:**
Country Cleaners
410 West Main Street
Huntington, New York 11743
Site No. 152187

**Submitted to:**
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233

**Prepared for:**
NYSDEC
625 Broadway
Albany, New York 12233

**Prepared by:**
AECOM
Rusten Corporate Park
100 Red Schoolhouse Road, Suite B-1
Chestnut Ridge, NY 10977-6715

January 2012

AECOM Project No. 60133623

**Table of Contents**

## FIGURES



## TABLES

## APPENDICES

# 1 INTRODUCTION

This report presents the results of a Feasibility Study prepared by AECOM Technical Services Northeast, Inc. (AECOM) of alternatives for the environmental remediation of the Country Cleaners, Huntington, New York, located in Suffolk County. The Country Cleaners Site is listed as a Class 2 site on the New York State Department of Environmental Conservation (NYSDEC) Registry of Inactive Hazardous Waste Sites, Site No. 152187. The general location of the site is presented on Figure 1-1.

## 1.1 Background

In response to documented groundwater contamination at the site, NYSDEC commissioned a Remedial Investigation/Feasibility Study (RI/FS) for groundwater. The objective of the RI was to characterize the nature and extent of contamination of groundwater and to provide data for completing the FS. The scope of work for the RI is described in the final dynamic work plan submitted in May 2008, which incorporated NYSDEC comments on the proposed scope of work. The RI included a qualitative risk assessment to identify potential risks to human health and the environment due to contaminants present on site. The results of the RI (Draft Remedial Investigation Report, Country Cleaners, Huntington, Suffolk County, NY; AECOM, August 2010) are summarized in, and serve as the basis for, this FS report. The locations of the monitoring wells and general site features are presented on Figure 1-2.

## 1.2 Report Organization

The purpose of the FS is to identify and evaluate technologies that are available to remediate the contaminated groundwater as identified in the RI. The technologies most appropriate for the site conditions are then developed into Remedial Action Alternatives that are evaluated based on their environmental benefits and cost. The information presented in the FS will be used by NYSDEC to select on-site remedial action(s). The remedial action(s) selected for the site will be summarized by NYSDEC in a Proposed Remedial Action Plan (PRAP), which will be released for public comment. After receipt of public comments, NYSDEC will issue a Record of Decision (ROD).

The FS is organized in accordance with the outline provided in Section 4.4 of DER-10 (NYSDEC, 2010):

1. Introduction
2. Site Description and History
3. Summary of Remedial Investigation and Exposure Assessment
4. Remedial Goals and Remedial Action Objectives
5. General Response Actions
6. Identification and Screening of Technologies
7. Development and Analysis of Alternatives (assembly of technologies into alternatives, evaluation of alternatives, and evaluation of institutional/engineering controls for the selected remedy)

8. Recommended Remedy and Rationale for Selection

Additional supporting material is provided in the Appendices.

AECOM completed the following scope of work for the FS, in accordance with DER-10 Guidance and the May 2008 final dynamic work plan incorporating NYSDEC comments.

# 2 SITE DESCRIPTION AND HISTORY

## 2.1 Site Description

The site is located at 410 West Main Street in Huntington, NY at the southeast corner of the intersection of West Main Street and Hillside Avenue. The site contains a single occupancy building. The site is located in a mixed commercial and residential area in Huntington, NY. The site consists of a single story building with parking spaces in the front. Residences are located in the surrounding areas. There is a large residential complex (Nathan Hale condominiums) located north of the site. Commercial properties are located along West Main Street, including a Getty service station to the east of the site, a Rite Aid convenience store, and a medical doctor's office. St. Patrick's Roman Catholic Church and primary school are located east of the site.

### 2.1.1 Topography

The site property is located at 110 ft above mean sea level (amsl), sloping to the northeast toward Huntington Harbor. The surrounding area peaks to the west of the site at approximately 180 ft amsl.

### 2.1.2 Surface Water Hydrology

The site is located approximately 1.5 miles east of Cold Spring Harbor and approximately 1.3 miles southwest of Huntington Harbor. The site is not located in an area mapped as either a 100 year or 500 year flood zone (FEMA, 2010). Surface drainage from the site generally follows topography, flowing toward the municipal storm drains located on West Main Street. A sewage disposal facility is located adjacent to Huntington Harbor.

### 2.1.3 Groundwater Hydrology

Groundwater at the site was encountered at 57 ft below ground surface (bgs), and is interpreted to flow northeast towards Huntington Harbor. According to the potentiometric surfaces of the upper glacial aquifer, Magothy aquifer, and Lloyd aquifer prepared by the United States Geological Survey (USGS, 1995), groundwater flow in the Huntington, NY area is generally towards the north.

### 2.1.4 Local and Site Geology

Recent deposits (0 to 20 ft bgs) consist of sand, gravel, silt and clay, organic mud, peat, loam and shells. Colors are brown, yellow and gray. Upper Pleistocene deposits (0 to 300 ft bgs) consist of the following: till (clay, sand and boulders as ground moraine in the area north of the Harbor Hill terminal moraine), outwash deposits (brown well stratified sand and gravel), and ice contact deposits (crudely stratified sand and gravel and isolated masses of till). The colors are pale to yellowish brown. Below these formations are the Magothy formation, the Raritan formation clay member (aquitard) and Lloyd sand member overlaying bedrock (USGS, 1964).

## 2.2 Site History

Dry cleaning operations have been conducted at the site since at least 1985 by Jim Dandy Cleaners and previous tenants including Country Cleaners and Pamper Cleaners. Jim Dandy Cleaners currently leases the building at the site. According to the manager, Jim Dandy Cleaners does not currently use chlorinated volatile organic compounds (VOCs), having ceased its dry cleaning operations at the site around 2007. The site was listed as Class 2 in 2003.

The disposal of tetrachloroethene (perchloroethylene, or PCE) at the site has led to the contamination of on-site soil and groundwater, and off-site groundwater above the applicable NYSDEC standards. Information was gathered from a site investigation conducted at the Getty station located adjacent to the site, sampling by Suffolk County Department of Health Services (SCDHS), and NYSDEC.

Lou Halperin Properties, Inc. contracted Berninger Environmental, Inc. (BEI) to perform a limited subsurface investigation at the Getty Service Station property. PCE was detected in one monitoring well (MW-2) installed on the Getty Service Station property at 2,170 µg/L and trichloroethene (TCE) at 398 µg/L. BEI attributed the presence of chlorinated VOCs (PCE and TCE) to Country Cleaners.

Sampling at the Country Cleaners site was conducted by SCDHS starting in 1997. One source of contamination is located in a narrow yard at the south side of the property. PCE impacts were found in the soil beneath a condensate pipe at the southeast corner of the on-site building and in a nearby storm drain. In October 1997, soil samples were collected from the rear of the site. The PCE concentration in sludge collected in the area near the boiler blow down was 12,000 mg/kg.

Subsequent to the October 1997 investigation, SCDHS conducted a second round of investigation at the site in March 1998. PCE was detected at a concentration of 0.72 mg/kg, 9.3 mg/kg, 1.6 mg/kg, and 0.44 mg/kg in the soil samples collected at the site. PCE was detected at a concentration of 3,500 µg/L in the groundwater sample collected from a well located on the Getty Service Station property (MW-2), TCE at 65 µg/L, and cis-1,2-dichloroethene (DCE) at 450 µg/L.

Impact Environmental (Impact) performed additional sampling of the Country Cleaners site for SCDHS in 2000. The investigation included four borings from which soil headspace readings were obtained at multiple intervals. Headspace concentrations collected from three soil borings on the south side of the site ranged up to 2,000 ppm at 13-16 ft bgs. Impact also installed one new monitoring well, MW-1, in the southern portion of the site. The PCE concentrations in groundwater were 1,888 µg/L (MW-1) and 2,853 µg/L (Getty Service Station well MW-2); TCE and cis-1,2-DCE were also detected. Impact Environmental reported that PCE was detected at concentrations of 0.01 mg/kg and 0.031 mg/kg in the soil samples collected.

Under the order and oversight of the SCDHS, the owner remediated the storm drain in December 2001. Approximately 1,000 gallons of oily water and 36 tons of contaminated soil/sediments were removed to a depth of 26 ft bgs. An unknown quantity of soil was also removed from the unpaved portions of the yard. Subsequent sampling confirmed that PCE contamination remains in a location near the southeast corner of the building. An old floor drain was also found in the floor of the boiler room during the course of the investigation. NYSDEC was unable to conduct a thorough evaluation of the floor drain and associated piping because the new boiler was located directly over the drain. NYSDEC believes that this floor drain represents a possible point of past discharges contributing to the contaminated groundwater originating from the site.

Indoor air sampling was conducted in August 2003 by the New York State Department of Health (NYSDOH) at two structures. The samples were collected using a passive organic vapor monitoring badge and analyzed for PCE. At the structure on Hillside Avenue, PCE was identified as present at a concentration less than 5 µg/m$^3$ in the indoor air. At the structure on Scudder Avenue, PCE was identified as present at a concentration less than 5 µg/m$^3$ on the first floor and at concentrations of 12 µg/m$^3$ and 13 µg/m$^3$ in the basement air.

# 3 SUMMARY OF RI AND EXPOSURE ASSESSMENT

This section summarizes the findings of the RI conducted at the site and documented in AECOM (2010). The remedial investigation was conducted to determine the sources of contamination within the site and its threat to human health or the environment. The scope and execution of the RI is discussed below. The work to date consisted of three main efforts:

- Membrane interface probe (MIP) investigation (July 2008)
- Hydropunch – screening level investigation (September 2008 and February 2009; Triad/dynamic work plan approach)
- Groundwater monitoring well installation and sampling (December 2009 – February 2010)

The MIP borings were advanced to collect remote sensing data indicating the possible presence of chlorinated VOCs in the soils or groundwater based on the response of the ECD. No samples were collected for laboratory analysis during the initial (MIP) phase of the investigation.

Hydropunch groundwater and soil samples were collected from reoccupied MIP boring locations using direct push drilling in 2008 and early 2009. Groundwater and soil samples were analyzed for VOC analysis. The Hydropunch data were used as a screening tool to determine the appropriate screened interval for permanent monitoring well installation.

During monitoring well installation in December 2009 and January 2010, AECOM collected two soil samples for total organic carbon (TOC) and grain size analysis. Groundwater samples collected from the monitoring wells in 2010 were analyzed for VOCs.

## 3.1 Geology and Hydrogeology

The Long Island aquifer system lies within the Atlantic Coast Plain physiographic province, and is bounded on the north by the Long Island Sound and on the east and south by the Atlantic Ocean and on the west by New York Bay and the East River. The geologic formations of Long Island are composed of unconsolidated glacial deposits of Pleistocene age, and coastal plain deposits of continental and marine origin of Cretaceous age. The unconsolidated deposits consist of gravel, sand, silt, and clay underlain by bedrock of Lower Paleozoic and/or Precambrian age, which forms the base of the groundwater reservoir. Ronkonkoma terminal moraine (crudely stratified sand, gravel, and boulders; some till) forms an irregular ridge which runs to the west across Huntington. The west and Half Hollow Hills extend south through central and southern Huntington. Harbor Hill end moraine is present in the southern portion of Huntington.

Soil borings were advanced in the vicinity of the Country Cleaners site. Soil was generally classified as fine to medium sand with varying amounts of silt and gravel. A thick clay layer at an elevation of approximately 5 ft amsl was encountered throughout the site during installation of the deep wells. These soils are consistent with the Pleistocene deposits.

Long Island groundwater is present in three major aquifers: the Upper Glacial aquifer (shallow), the Magothy aquifer (intermediate), and the Lloyd Aquifer (deep). The uppermost hydrogeologic unit consists of Pleistocene saturated coarse sand and gravel and finer grained sand and gravel beds in the upper part of the Magothy formation. The lower limit of the shallow aquifer is identified by discontinuous clay bodies. The intermediate aquifer includes the Magothy formation to the top of the clay member of the Raritan formation. The deep aquifer is located within the sand member of the Raritan formation.

Groundwater level measurements were recorded on May 27, 2010 from the monitoring wells installed in December 2009 through January 2010 and the existing well MW-2. Both the deep and shallow wells are located in the shallow aquifer. Perched groundwater was identified in wells MW-3S/D, MW-4S/D, and MW-1S/D. A clay lens may be present at approximately 30 ft amsl. This clay layer may act as an aquiclude limiting vertical movement of the groundwater from the zone where the shallow wells are screened.

The groundwater elevation measurements were interpolated using inverse distance weighting for the shallow and deep wells separately. For both the shallow and deep wells the groundwater flow is towards the northeast. Groundwater flow patterns are consistent with those reported previously (USGS, 1964).

## 3.2 Nature of Contaminants Detected

The principle contaminants detected were chlorinated aliphatics. Principle chlorinated aliphatics include PCE and infrequent detection of the degradation products TCE and cis-1,2-DCE.

## 3.3 Extent of Contamination

The PCE groundwater plume is centered at the Country Cleaners site and neighboring Getty Service Center. The plume extends downgradient towards the northeast onto the Nathan Hale condominium property. The plume concentrations are expected to drop below the NYS Class GA groundwater criteria below the Nathan Hale property. There are no detections of PCE in the deep wells, indicating that the maximum depth of contamination has been adequately bounded.

## 3.4 Uncertainties in Nature and Extent of Contaminant Distribution

The identity of the contaminants is well-established, with data from collected from the permanent monitoring wells confirming findings from the MIP investigation and Hydropunch sampling in terms of compounds detected (PCE, TCE and cis-1,2-DCE), and the spatial distribution of the contamination. The horizontal (areal) extent of contamination is not fully defined to the north and northeast where shallow wells on the Nathan Hale condominium property have concentrations exceeding the NYS Class GA groundwater criterion of 5 µg/L for PCE. The vertical extent of contamination is bounded, since PCE was not detected in any of the deep wells. However, the exact depth at which the PCE concentration falls below the NYS Class GA groundwater criterion is not known.

## 3.5 Contamination Transport

Groundwater flow is generally to the northeast. The process by which a solute (dissolved phase contaminant) is transported by the bulk movement of groundwater flow is referred to as advection. The average linear velocity of groundwater through a porous aquifer is determined by the hydraulic conductivity, effective porosity of the aquifer formation, and hydraulic gradient.

Adsorption of chlorinated aliphatics at the site may be an important process influencing the movement of contaminants in groundwater. The importance of adsorption depends significantly upon the characteristics of the aquifer matrix material, which acts as the adsorbing medium. In particular, adsorption of hydrophobic organic compounds has been shown to be a function of the amount of natural organic carbon in the aquifer matrix. PCE has an organic carbon partition coefficient ($K_{oc}$) of 200 and, therefore, will be adsorbed/retarded to a degree.

The estimated seepage rates range from 30 feet per year (ft/yr) to 41 ft/yr. The contaminated groundwater would reach the nearest known Suffolk County Water Authority well S-26681 between 119 and 163 years from the time of the release. The Country Cleaners plume is likely to have dissipated from dispersion and dilution prior to reaching S-26681, resulting in no significant impacts on the well. The point at which the plume is expected to decrease below the NYS Class GA groundwater criteria is beneath the Nathan Hale condominiums near MW-8S.

Clay layers and lenses within the shallow aquifer may act as a barrier, limiting the spread of the groundwater plume. Additionally, S-26681 is screened in the deep aquifer (-485 ft amsl to -557 ft amsl; Lloyd Sand). The clay member of the Raritan formation may act as an additional barrier preventing transport of the PCE contaminated groundwater plume to this well.

## 3.6 Contaminant Fate

The fate of organic chemicals in the subsurface environment is affected by a variety of physiochemical and biological processes. Abiotic transformations such as hydrolysis, oxidation, and volatization are not significant factors in contaminant fate. Biodegradation is the one process which may have reduced PCE concentrations as evidenced by the breakdown products detected infrequently in groundwater samples within the plume. However, review of data collected from three shallow wells across the PCE plume indicates that biological transformation is currently not active at an appreciable rate.

## 3.7 Human Health Risk Assessment

A qualitative human health risk assessment was completed for the site (AECOM, 2010). Generally, the human health evaluation involves an exposure assessment, an evaluation of site occurrence, hazard identification and comparison to Federal and New York State criteria. Exposure scenarios were identified and evaluated based on analytical laboratory results of groundwater, subsurface soil and ambient air samples collected.

- Since the screen for the public water supply well in the direction of groundwater flow is located under a confining layer, the potential for exposure to contaminants in the groundwater at the site is expected to be minimal under current conditions.
- Risks would exceed generally acceptable ranges associated with ingestion of untreated groundwater at the site due to high concentrations of PCE and other contaminants.
- Concentrations in the soil are below the screening levels.
- There is a potential for exposure to soil vapor inside of buildings based on the PCE detections from air samples collected by NYSDOH at two structures in the vicinity of the site. A soil vapor intrusion study is recommended to determine the level of exposure in the on-site building and surrounding businesses and residences.

# 4 REMEDIAL GOALS AND REMEDIAL ACTION OBJECTIVES

## 4.1 Remedial Goals

For the State Superfund program, the default goal is to restore the site to pre-disposal conditions, to the extent feasible. According to 6 NYCRR Part 375-2.8, “The goal of the remedial program for a specific site is to restore that site to pre-disposal conditions, to the extent feasible. At a minimum, the remedy selected shall eliminate or mitigate all significant threats to the public health and to the environment presented by contaminants disposed at the site through the proper application of scientific and engineering principles and in a manner not inconsistent with the national oil and hazardous substances pollution contingency plan as set forth in section 105 of CERCLA, as amended as by SARA."

Per Environmental Conservation Law (ECL) Article 27 Title 13, "The goal of any such remedial program shall be a complete cleanup of the site through the elimination of the significant threat to the environment posed by the disposal of hazardous wastes at the site and of the imminent danger of irreversible or irreparable damage to the environment caused by such disposal."

## 4.2 Remedial Action Objectives

This section presents the objectives for remedial actions that may be taken to protect human health and the environment. To develop the remedial action objectives (RAOs), AECOM identified contaminants present in the environmental media in the study area; evaluated existing or potential exposure pathways in which the contaminants may affect human health and the environment; identified pathways having a moderate to high likelihood for exposure; identified chemical-specific standards, criteria, and guidance (SCGs) that apply to the likely exposure routes to establish the contaminants of concern and proposed cleanup goals for purposes of remediation; and established RAOs for the contaminants of concern to reduce the potential for future exposure. RAOs are presented for the environmental media in the study area, based on the generic NYSDEC RAOs contaminants of concern and SCG Goals.

### 4.2.1 Generic RAOs

The generic RAOs identified in DER-10 for groundwater will be applied to this site. The generic RAOs for groundwater are as follows:

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

### 4.2.2 Standards, Criteria and Guidance (SCGs)

The applicable SCGs for the site are described below. SCG selection is based on the following:

- The current, intended and reasonably anticipated future use of the site and its surroundings (mixed residential and non-residential);
- All contaminants exceeding applicable SCGs (PCE, TCE, and cis-1,2-DCE);

- The environmental media impacted by the contaminants exceeding the SCGs (groundwater);
- The extent of the impact to the environmental media;
- All actual or potential human exposures and/or environmental impacts resulting from the contaminants in environmental media; and
- No site-specific human health or environmental SCGs were identified for the Country Cleaners Site.

Chemical-specific SCGs are typically technology or health-risk based numerical limitations on the contaminant concentrations in the ambient environment. They are used to assess the extent of the remedial action required and to establish cleanup goals for a site. Chemical-specific SCGs may be directly used as actual cleanup goals, or as a basis for establishing appropriate cleanup goals for the contaminants of concern at a site. Chemical-specific SCGs for groundwater at the site are identified in Table 4-1.

Action-specific SCGs are usually administrative or activity-based limitations that guide how remedial actions are conducted. These may include record-keeping and reporting requirements; permitting requirements; design and performance standards for remedial actions; and treatment, storage and disposal practices. Action-specific SCGs identified for the site are provided in Table 4-2.

Location-specific SCGs apply to sites that contain features such as wetlands, floodplains, sensitive ecosystems, or historic buildings that are located on, or in close proximity to the site. Based on the RI, wetlands, floodplains, sensitive ecosystems or historic buildings are not located on, or in close proximity to the site. Thus, no location-specific SCGs were identified for this site.

### 4.2.3 Contaminated Groundwater Exposure Pathways

Exposure to groundwater, if used as a drinking water supply, includes ingestion, dermal contact and inhalation of vapors. Public water supply wells are located downgradient, the closest is about 4,865 ft away from the site. Low levels of chlorinated VOCs have been detected in downgradient public wells during periodic sampling conducted by SCDHS.

Groundwater flows approximately in a north-easterly direction, towards the Huntington Harbor. Potential human exposure may occur at the point of groundwater contact. The likelihood of exposure to groundwater due to construction activities is considered to be low since the groundwater is generally encountered at 52 ft amsl (approximately 58 ft bgs) in the shallow aquifer and approximately 80 ft amsl (approximately 30 ft bgs at the site) for perched groundwater. Potential human exposures include ingestion, dermal contact, and inhalation of vapors. Ingestion of groundwater (as drinking water), dermal contact and vapor inhalation scenarios are potential future exposure scenarios.

Potential human exposures to subsurface soils include ingestion, dermal contact, and inhalation under the future development scenarios with excavation.

### 4.2.4 Contaminants of Concern and SCGs

Tables 3-1 and 3-2 list the contaminants detected in samples collected on site and the chemical-specific SCGs (risk-based exposure limits) that apply to the likely exposure routes for the environmental media of interest. Proposed cleanup goals for each contaminant were developed in accordance with the procedures described below.

Proposed SCGs for organic compounds were selected by identifying the chemical-specific SCGs appropriate to the likely exposure pathways. The cleanup SCG was then selected based on the potential exposure scenarios and contaminated media encountered within the study area.

Contaminants of concern were identified for on-site environmental media by identifying the contaminants that exceeded the proposed cleanup SCGs and then evaluating the frequency that cleanup goals were exceeded and the relative toxicity of the contaminant. In general, contaminants of concern were established based on the exceedance of SCGs, frequency of detection, and being site-related.

The contaminants exceeding the applicable chemical-specific SCGs were identified in the groundwater only. These contaminants are PCE, TCE, and cis-1,2-DCE with the extent as described in Section 3.3 of this document. The groundwater flow direction is generally to the northeast toward Huntington Bay. This water body is classified as SA – saline water wildlife protection. Of the contaminants of concern in groundwater, there is a class SA criterion for TCE at 40 µg/L and a class SA guidance value of 1 µg/L for PCE. Concentrations of TCE in the groundwater from the Country Cleaners site as characterized by the RI would not exceed the class SA criteria, having a maximum detected concentration of 8 µg/L. Concentrations of PCE near the site exceed the 1 µg/L guidance value, but the concentration in the groundwater may significantly reduce prior to reaching Huntington Bay. Potential impacts to surface waters such as the Huntington Bay are not considered for this FS.

Source removal activities were conducted at the sight under the oversight of the SCDHS in 2001. As described in Section 2.2, the owner remediated the storm drain removing approximately 1,000 gallons of oily water and 36 tons of contaminated soil/sediments to a depth of 26 ft bgs; and an unknown quantity of soil from the unpaved portions of the yard. It is assumed that the majority of source contaminants at the dry cleaner have been removed. Therefore, no RAOs addressing source removal at the dry cleaner are considered in the FS.

As stated in the RI (AECOM, 2010), indoor air samples were collected by NYSDOH at two residences in the vicinity of the site. A soil vapor intrusion study is recommended to determine the level of exposure in the on-site building and surrounding businesses and residences. Therefore, RAOs addressing elevated VOC concentrations in soil vapor will not be considered in this FS.

### 4.2.5 Selected Remedial Action Objectives

This subsection presents the proposed RAOs to reduce the potential for future exposure. The RAOs for the site are:

1. Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards (PCE – 5 µg/L, TCE – 5 µg/L, and 1,2-cis-DCE – 5 µg/L), to the extent feasible.
2. Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.

# 5 GENERAL RESPONSE ACTIONS

In keeping with the requirements of DER-10, the general response actions based on the RAOs for this site were developed with the following considerations:

- Include an estimate of the areas and volumes for the contaminated groundwater.
- Are specific to the impacted medium, contaminants, and geologic characterization of the site;
- Eliminate technologies that are not appropriate for the site due to site-specific factors or constraints;
- Include non-technology specific categories;
- Give preference to presumptive remedies; and
- Consider the use of innovative technologies where available and applicable.

As described in the RI, the estimated area and volume of contaminated groundwater to assist in evaluating remedial alternatives are 3.8 acres and 9.1 million gallons. The horizontal extent exceeding the 5 µg/L NYS Class GA groundwater criterion for PCE is shown on Figure 4-1. The 5 µg/L contour is based on the data from the small number of shallow wells and is approximate. The contouring is calculated using inverse distance weighting with a power of 2. This area extends beneath Highway 25A.

The non-technology specific remedial categories defined in Section 4.1 of DER-10 are as follows:

- Removal and/or treatment
- Containment
- Elimination of Exposure
- Treatment of source at the point of exposure

Elimination of exposure is not considered further in this FS because groundwater is the sole source of water supply in the area.

Presumptive remedies defined in DER-15 (NYSDEC, 2007) for VOC contamination in groundwater include containment and treatment responses. The presumptive remedies are as following:

- Extraction and Treatment
- Air Stripping

- Granular Activated Carbon
- Chemical/Ultraviolet (UV) Oxidation
- Separate-Phase Recovery
- Air Sparging
- In-Well Air Stripping (Groundwater Recirculation)
- Bioremediation

Separate-phase recovery is not considered in this FS because this technology is primarily used for petroleum hydrocarbon contamination and a separate phase of contamination was not observed in the groundwater samples.

The general response actions evaluated in this FS include the following:

- No action with Monitored Natural Attenuation (MNA)
- Ex-situ treatment (air stripping, granular activated carbon (GAC), or chemical/ UV oxidation)
- In situ treatment (air sparging, in-well air stripping, enhanced bioremediation or chemical oxidation)
- Containment (extraction wells or physical barrier)
- Treatment of source at the point of exposure by installing air strippers at the two potentially impacted public wells

# 6 SCREENING OF TECHNOLOGIES

This section presents the results of the preliminary screening of the associated remedial technologies that may be used to control the contaminants of concern and to achieve the RAOs. The technologies associated with the general response actions have been evaluated during the preliminary screening on the basis of effectiveness and implementability. The purpose of the preliminary screening is to eliminate remedial technologies that may not be effective based on anticipated on-site conditions, or that cannot be implemented technically at the site; and, to more narrowly focus the list of alternatives that will be developed and evaluated in greater detail.

## 6.1 No Action

No Action involves taking no further action to remedy groundwater conditions at the site. It is assumed that groundwater concentrations will reduce over time by natural attenuation.

## 6.2 No Action/MNA

No Action/MNA involves taking no further action to remedy groundwater conditions at the site with the exception of conducting long term monitoring. Groundwater monitoring tracks the progress of natural attenuation of the contaminant plume. Maximum concentrations of PCE have fallen from over 2,000 µg/L in the late 1990s to 680 µg/L in 2010 indicating a half life of approximately 10 years. At that rate, the maximum concentration of PCE may fall below the NYS Class GA groundwater criterion of 5 µg/L after several decades. For this alternative, it is assumed that annual sampling for VOCs and MNA parameters would be conducted annually for at least five years in the existing wells, followed by a reduction in sampling frequency to every five years.

## 6.3 Ex Situ Treatment

This general response action involves aboveground treatment of groundwater removed from the subsurface and discharge/disposal of the treated effluent. It is assumed that extraction wells would be placed on the dry cleaner and/or Getty Service Station property. The groundwater would be extracted at a rate to create a capture zone in the area where the highest concentrations have been detected, i.e., beneath the dry cleaner and Getty Service Station property. The extraction rate and estimated contaminant concentration within the extracted groundwater would be factors in sizing the system. It is assumed that the treatment facility would be located behind the dry cleaner. Disposal of the treated water would comply with the requirements listed in TOGS 2.1.2. This could involve:

1. Treating the groundwater to the cleanup goals and discharging the treated water back into the site groundwater via injection or diffusion wells;
2. Treating the groundwater and discharging the treated water to the a stormwater sewer in conformance with State Pollutant Discharge Elimination System (SPDES) permit requirements; or
3. Treating the water sufficiently for discharge to the sanitary sewer system managed by the Huntington Publicly Owned Treatment Works (POTW).

It is assumed that the groundwater treatment technologies will remove VOC contamination to below the NYS Class GA groundwater criteria.

The following subsections describe the results of preliminary screening of technologies that were considered for ex situ treatment of groundwater.

### 6.3.1 Air Stripping

As described in DER-15 (NYSDEC, 2007), air stripping uses volatilization to transfer contaminants from groundwater to air. Water is contacted with an air stream to volatilize dissolved contaminants into the air stream. Depending on the level of contaminants in the air discharge, the contaminated air stream may need further treatment by either filtration with activated carbon, or another appropriate method prior to discharge to the atmosphere. This remedy is applicable to most of the VOCs. Air stripping is not as effective for compounds with low Henry's Law constants (less than 0.01) or high solubilities, such as gasoline-alcohol blends or acetone.

*Effectiveness* – Air stripping is expected to be an effective technology for treating the groundwater to less than the NYS Class GA groundwater criteria. This is a proven and reliable technology for treatment of water containing VOCs. A packed tower stripper could be used to treat the groundwater prior to discharge to the storm sewer or sanitary sewer system, or injected into the aquifer. Air emissions may need to be treated prior to discharge, based on the anticipated levels, for protection of human health and the environment, or compliance with an air emissions permit. Elevated levels of iron and manganese were detected in the groundwater samples collected for the RI. Therefore, pretreatment of the groundwater for metals may be required.

*Implementability* – The labor, equipment and materials for installation of an air stripper at the site are readily available. Air emissions from the stripper may require treatment by activated carbon, or appropriate method to meet NYSDEC requirements for allowable concentrations of PCE and other VOCs in air.

The process equipment that would be required to implement an air stripping treatment system includes construction of a shelter building, an electrical power source, instrumentation and controls system equipment, an equalization tank to receive influent water from the groundwater extraction well, potential metals treatment process (e.g., greensands filter), an air stripper unit with an air blower, an off-gas treatment system to remove organic vapors from air prior to discharge to the atmosphere, activated carbon for polishing of the groundwater, and discharge piping for effluent water leading to the existing stormwater sewer system. In addition, effluent discharge and SPDES permits will be required from NYSDEC, which should be attainable. Alternatively, the treated water could be discharged to the sanitary sewer. However, the fees associated with disposal to the sanitary sewer may be prohibitive. The system will need to substantially comply with appropriate State and Federal air permit requirements. Once the system is operational, typically, limited maintenance of the system is required.

Air stripping appears to be an effective and implementable technology for ex situ treatment of contaminated groundwater prior to discharge, when used in conjunction with other technologies for pre-treatment and post-treatment of the effluent. Ex situ treatment by air stripping is retained for further evaluation in this FS.

### 6.3.2 Granular Activated Carbon

Liquid phase carbon adsorption is used to remove organic compounds from groundwater by adsorbing the organic compounds onto the surface of granular activated carbon. Water is treated as it flows through the granular activated carbon. Granular activated carbon can be packed into a treatment column or placed in properly sized drums or pressure vessels connected in series. On a regular basis, the granular activated carbon must be changed since its adsorption capacity is depleted with use.

*Effectiveness* – Use of carbon may be an effective method of primary groundwater treatment of groundwater. However, the carbon usage rate for groundwater treatment is expected to be high, particularly during initial startup when higher flow rates are anticipated. Thus, significant quantities of activated carbon are anticipated to be consumed, that would result in the need for frequent carbon change-out. Carbon may also be utilized in a treatment process for the purposes of final polishing following the use of one of the other treatment technologies. Disposal of the spent carbon and system maintenance related to the carbon change-outs would be required.

*Implementability* – Granular activated carbon treatment columns or containers are readily available and relatively simple to install and replace.

This technology is retained as a potential secondary treatment to be used in conjunction with air stripping.

### 6.3.3 Ex Situ Oxidation

Ex situ oxidation processes include the use of ultraviolet (UV) radiation, ozone, or hydrogen peroxide to destroy organic contaminants as water flows into a treatment tank. If ozone is used as the oxidizer, an ozone destruction unit is used to treat collected off gases from the treatment tank and downstream units where ozone gas may collect or escape.

UV oxidation is a destruction process that oxidizes organic and explosive constituents in water by the addition of strong oxidizers and irradiation with UV light. Oxidation of target contaminants is caused by direct reaction with the oxidizers, UV photolysis, and through the synergistic action of UV light, in combination with ozone and/or hydrogen peroxide. If complete mineralization is achieved, the final products of oxidation are carbon dioxide, water, and salts. The main advantage of UV oxidation is that it is a destruction process, as opposed to air stripping or carbon adsorption, for which contaminants are extracted and concentrated in a separate phase. UV oxidation processes can be configured in batch or continuous flow modes, depending on the throughput under consideration.

UV oxidation differs from UV photolysis, a related process but one which does not typically fully convert organic contaminants to carbon dioxide, hydrogen peroxide, and salts (chlorides in the case of chlorinated compounds).

For the discussion below, oxidation by UV radiation in conjunction with peroxide is assumed.

*Effectiveness* – Ex situ oxidation is effective at remediating sites with chlorinated aliphatic contamination. Ex situ treatment is not hindered by subsurface heterogeneities that affect in situ options. Organic compounds with double bonds (e.g., TCE, PCE, and vinyl chloride) are rapidly destroyed in UV/oxidation processes. However, ex situ oxidation is subject to the same limitations as all pump and treat options, in that complete remediation may be time-consuming and often becomes ineffective or inefficient as the final remediation criteria are approached.

*Implementability* – Ex situ oxidation is readily implemented. It requires groundwater extraction and pumping to a treatment location, followed by discharge of treated water. Remediation systems capable of treating as much as 1,000,000 gallons per day (gpd) have been installed. Issues related to UV/oxidation include:

- The influent may require treatment to provide for good transmission of UV light (high turbidity causes interference). This factor can be more critical for UV/hydrogen peroxide than UV/ozone. (Turbidity does not affect direct chemical oxidation of the contaminant by hydrogen peroxide or ozone).
- Free radical scavengers can inhibit contaminant destruction efficiency. Excessive dosages of chemical oxidizers may act as a scavenger.
- The aqueous stream to be treated by UV/oxidation should be relatively free of metals (less than 10 mg/L) to minimize the potential for fouling of the quartz sleeves.
- Some VOC contaminants may be volatilized (e.g., “stripped”) rather than destroyed; therefore, off-gas treatment (by activated carbon adsorption or catalytic oxidation) may be necessary.

Ex situ oxidation is retained for further evaluation in the FS.

## 6.4 In Situ Treatment

### 6.4.1 Air Sparging

The technology of air sparging involves contaminant reduction primarily by volatilization and biodegradation. Sparging is conducted by injecting air into the subsurface below the water table under controlled pressure and volume. Contaminants, such as dissolved phase chlorinated aliphatics in the groundwater and adsorbed onto soil are volatilized (or stripped) when in contact with the injected air. Air containing stripped contaminants migrates upward through the groundwater into and through the unsaturated zone, where it is ultimately collected in vacuum/vapor extraction wells, in order to capture volatilized chemicals prior to discharge into the atmosphere. The air is then treated and discharged to the atmosphere.

In addition to the stripping process that occurs on contaminants in the groundwater, it has been shown that air sparging provides for enhanced biodegradation under certain conditions. However, PCE is degraded anaerobically in the subsurface environment. Therefore, sparging is not expected to significantly enhance biodegradation of site contaminants.

*Effectiveness* - This technology is generally effective in removal of VOCs from groundwater, especially highly volatile compounds such as chlorinated VOCs. The effectiveness of this technology is based in part on the site geology. Higher removal efficiencies are generally accomplished in coarse-grained soils, as airflow channels are more evenly distributed both laterally and vertically. However, subsurface heterogeneities may inhibit the sparged air from contacting dissolved phase contamination in groundwater. Air sparging is anticipated to reduce VOC concentrations (by approximately one order of magnitude), but is not believed to be able to meet the groundwater remediation objective for PCE (5 µg/L).

*Implementability* – An air sparging system is potentially implementable at the site, although the layout of the injection wells and vapor extraction wells would need to consider current land usage (e.g., presence of Highway 25A within the footprint of the plume). The materials, equipment and labor for installation of a sparging system are available and can be readily implemented. Sparge wells can be reliably installed to the required depth and the screened interval can be installed to meet the subsurface conditions. The system requirements include a blower/air compressor system, and a vapor extraction/treatment system. Pilot testing may be necessary to evaluate the required design parameters (e.g., sparge well spacing, injection flow rate, etc.), relative to the desired remediation of chlorinated aliphatics in groundwater. Installation of the vapor extraction system typically requires at least 5 ft of unsaturated thickness in the overburden aquifer.

Air sparging may achieve groundwater concentrations below the NYS Class GA groundwater criterion for PCE. However, this technology is eliminated from further consideration in this FS due to the potential for vapor migration.

### 6.4.2 In-Well Air Stripping (Groundwater Recirculation)

The in-well groundwater circulation well system creates in situ vertical groundwater circulation cells by drawing groundwater from the aquifer through the lower screen of a double-screened well and discharging it through the second screen (upper) section. While groundwater circulates in and out of the stripping cell, no groundwater is removed from the ground. Air is injected into the well through a gas injection line and diffuser, releasing bubbles into the contaminated groundwater. These bubbles aerate the water and form an air-lift pumping system (due to an imparted density gradient) that causes groundwater to flow upward in the well. As the bubbles rise, VOC contamination in the groundwater is transferred from the dissolved state to the vapor state through an air stripping process. Groundwater may be polished at the well head through carbon adsorption or injection of a chemical oxidant prior to recirculation.

The air/water mixture rises in the well until it encounters the dividing device within the inner casing. The divider is designed to maximize volatilization. The air/water mixture flows from the inner casing to the outer casing through the upper screen. A vacuum is applied to the outer casing, and contaminated vapors are drawn upward through the annular space between the two casings. The partially treated groundwater re-enters the subsurface through the upper screen and infiltrates back to the aquifer and the zone of contamination where it is eventually cycled back through the well, thus allowing groundwater to undergo sequential treatment cycles until the remedial objectives are met. Off-gas from the stripping system is collected and treated (e.g., using granular activated carbon). Pilot testing and field measurements would be required to determine the exact well and piping configuration.

*Effectiveness* – The effectiveness of in-well recirculation is dependent on the groundwater velocity and the contaminant concentrations within the treatment zone along with the air injection rate. The greater the concentrations and velocities, the more recirculation wells will be required along the axis of groundwater flow. A pilot test would be required prior to full scale implementation.

*Implementability* – For the subsurface conditions at the site, recirculation wells are an implementable technology to treat the plume and prevent further migration of the plume. The materials, equipment, and labor necessary to install extraction wells are readily available. Fouling of the system may occur by precipitation of oxidized constituents. The technology is not recommended for sites with lenses of low-conductivity deposits which may be present in this aquifer. Wells and screens must be placed to prevent spreading the contamination. Treatment is likely to require a long period of time to achieve the RAOs.

In-well recirculation will not be considered further due to limited available data on performance, and possible fouling of the system from elevated iron levels measured in the site groundwater.

### 6.4.3 Enhanced Bioremediation

Enhanced bioremediation refers to the addition of substrates, microbes, and/or electron acceptors to the groundwater through injection wells.

*Effectiveness* – Bioremediation can be effective for the destruction of chlorinated VOCs in groundwater; and a properly designed enhanced bioremediation system can be effective at the complete oxidation of chlorinated VOCs. The effectiveness of bioremediation could be tested prior to implementation using biotraps as an alternative to pilot or bench testing.

*Implementability* – Enhanced bioremediation is implementable but is limited by the presence of active businesses and the highway. To counter these impediments, injections could target the area of the plume with highest measured concentrations and a line of injections could be installed north of Highway 25A to create a barrier to contaminant migration for PCE from the portion of the plume extending below the highway.

Enhanced bioremediation is retained for further evaluation as a potential remedial technology in this FS.

### 6.4.4 In Situ Chemical Oxidation

In situ chemical oxidation is a technology whereby an oxidant is injected into an aquifer or subsurface soils. Common oxidants include peroxide, ozone, percarbonate and permanganate. These compounds cause rapid and complete chemical destruction of many organic chemicals. The process includes placing injection points throughout the area to be treated, and injection of the selected oxidant into the aquifer/subsurface.

*Effectiveness* – High treatment efficiencies have been demonstrated for unsaturated aliphatics. Chemical oxidants are capable of oxidizing chlorinated VOCs such as PCE.

*Implementability* – Implementation of this technology is limited by the presence of active businesses and the highway. Injections could target the area of the plume with highest measured concentrations. The materials, equipment and labor necessary to implement this technology are available from several vendors.

Application of an in situ oxidant appears to be a reasonable approach for the treatment of source area contamination beneath the dry cleaner and Getty Service Station. Use of this technology to treat the high concentration areas is retained in this FS and will be considered further in the detailed analysis.

## 6.5 Containment

### 6.5.1 Groundwater Extraction

Groundwater extraction is a commonly used method to control the migration of contaminated groundwater and to collect contaminated groundwater for subsequent (ex situ) treatment. Groundwater extraction wells are generally installed with a drill rig. Well screens and filter packs are generally installed to intercept the saturated thickness of the contaminated water-bearing zone. Extraction wells can be installed to provide a hydraulic barrier for control of migration of contaminated groundwater, or at specific locations for source area remediation.

*Effectiveness* – Groundwater extraction wells are an effective remedy that could be used in conjunction with other technologies to meet the RAOs. Extraction wells, in conjunction with an ex situ groundwater treatment system, would reduce the mobility, toxicity, and volume of contaminated groundwater. Extraction wells can be installed with limited site disturbance and relatively low potential for impacts to human health and the environment during installation, as compared to other technologies that are more intrusive. Extraction wells are a proven and reliable technology for removal of groundwater for remediation.

*Implementability* – Complete capture of the plume may not be practical. The soil in the aquifer is predominantly sand with gravel. The hydraulic conductivity is likely to be at least 175 ft/day. For this aquifer, the pumping rate to achieve a capture zone extending throughout the plume is likely to be in excess of 1,000 gpm. There are limitations on well placement due to the existence of active businesses and a highway. The materials, equipment and labor necessary to install extraction wells are readily available. Extraction wells can be reliably installed to the required depth and the screened interval can be installed to meet the subsurface conditions.

Groundwater extraction for containment is not considered further in this FS due to limitations on well placement which are likely to prohibit the complete capture of the plume. Groundwater extraction with ex situ treatment is retained assuming the highest concentrations of PCE in groundwater can be targeted.

### 6.5.2 Physical Barriers

The purpose of groundwater containment is to restrict the flow of contaminated groundwater. This is generally accomplished by a physical barrier (slurry wall, sheet piling), hydraulic control (removing water from the ground, such as by pumping from extraction wells), or reactive barriers. Containment technologies that rely on groundwater extraction are occasionally supplemented with a low permeability subsurface barrier wall to improve the effectiveness of the extraction system. Another groundwater containment technology includes groundwater collection trenches, which are constructed for the purpose of collecting groundwater.

*Effectiveness* – Physical barriers could contain the contaminated groundwater. A thick clay layer was identified at approximately 100 ft bgs. A geotechnical study would be required. Long term monitoring to document the effectiveness of the technology would be recommended.

Groundwater extraction wells may be used to exert hydraulic control to prevent the migration of the groundwater. Prior to the design of such a system a thorough analysis of the aquifer properties including pump tests would need to be performed to ensure an adequate array of extraction wells are installed. The extracted groundwater would be routed to in an ex situ treatment unit.

*Implementability* – While construction of physical barriers is possible, significant disruption to the community is anticipated, e.g. construction noise in the immediate vicinity of a large residential community. Current land use would limit placement of the barrier walls.

Groundwater extraction wells are an implementable technology for exerting hydraulic control to prevent further migration of the plume. The materials, equipment, and labor necessary to install extraction wells are readily available.

Physical barriers will not be considered further in this FS due to limits on placement.

### 6.6 Treatment at Downgradient Public Wells

Two public wells are located downgradient from the site. The locations of public wells known to exist in the area are shown on Figure 6-1. Although levels of chlorinated VOCs are currently below the NYS Class GA groundwater criteria, treatment of the extracted groundwater may be required in the future. The extracted groundwater could be treated prior to distribution by an air stripper, GAC, or UV oxidation.

*Effectiveness* – Air stripper, GAC, or UV oxidation can effectively remove PCE from groundwater to achieve the RAOs. Additional technologies may be required in pre-treatment of influent or post-treatment of the effluent.

*Implementability* – Materials and labor are readily available. Operation and maintenance (O&M) costs vary depending on the selected technology.

Treatment at the public wells is retained for further evaluation.

## 7 DEVELOPMENT AND ANALYSIS OF ALTERNATIVES

Based on the technology review and screening (as summarized in Section 6.3), five remedial alternatives have been developed for the remediation of contaminated groundwater. The selected alternatives include presumptive remedies specified in DER-15. These alternatives include readily available technologies which have been proven to be effective at similar sites with VOC contamination in groundwater.

The selected alternatives include:

- Alternative 1 – No action
- Alternative 2 – No action/MNA
- Alternative 3 – Groundwater extraction and ex situ treatment/MNA
- Alternative 4 – In situ treatment/MNA
- Alternative 5 – Groundwater treatment at downgradient public wells/MNA

### 7.1 Remedial Action Alternatives

As described above, site remedial action alternatives have been assembled using general response actions and remedial technologies that passed the preliminary screening. An expanded description of each of the alternatives is provided below. The following information is provided for each alternative:

- Size and configuration of process options
- Time for remediation
- Spatial requirements
- Options for disposal
- Substantive technical permit requirements
- Limitations or other factors necessary to evaluate the alternatives
- Beneficial and /or adverse impacts on fish and wildlife resources
- Cost

Capital costs, O&M costs, and present worth costs were estimated for each alternative. All direct and indirect capital costs and engineering costs for the construction of all facilities and process equipment, labor, materials, construction equipment and services were estimated for the alternatives. The estimates included herein assume contingencies. Costs for system start up and testing, facility operation, maintenance and repair, continuous performance and effectiveness monitoring, and periodic site condition reviews were estimated. The period of performance evaluated for cost estimations does not exceed 30 years. For the Alternative 2, a review of the data after 30 years would determine if further monitoring is necessary. Cost sheets are provided in Tables 8-1 through 8-5. Supporting information (calculations and vendor information) is provided in Appendix A.

### 7.1.1 Alternative 1 – No Action

Alternative 1 would involve taking no further action to remedy site conditions. This alternative allows for natural attenuation of impacted groundwater but without monitoring. NYSDEC guidance requires that the No Action alternative be considered in the detailed analysis of alternatives.

A detailed description of the alternative is provided below:

- Time needed to achieve the remedial goals: it is anticipated that the groundwater concentrations would remain above the NYS Class GA groundwater criteria for decades since the half life of PCE in groundwater appears to be on the order of ten years.
- An environmental easement and preparation of a report summarizing the monitoring data would be required.

No costs are estimated for this alternative.

### 7.1.2 Alternative 2 – No Action/MNA

Alternative 2 would involve taking no further action to remedy site conditions, other than to perform groundwater monitoring. This alternative allows for natural attenuation of impacted groundwater. NYSDEC guidance requires that the No Action alternative be considered in the detailed analysis of alternatives.

A detailed description of the alternative is provided below:

- Annual groundwater monitoring would be conducted every year for five years then at five-year intervals thereafter. The 15 existing wells shown on Figure 1-2 would be sampled using low flow sampling. It is assumed that periodic review reports would be prepared every five years.
- Groundwater samples would be analyzed for VOCs by EPA method 8260 and water levels in the wells would be measured. Three of the groundwater samples would also be analyzed for MNA parameters.
- Groundwater sampling would be conducted as described for Alternative 2 every year for five years then every five years thereafter. It is assumed that periodic review reports would be prepared every five years starting in 2023.
- Time needed to achieve the remedial goals: it is anticipated that the groundwater concentrations would remain above the NYS Class GA groundwater criteria for decades since the half life of PCE in groundwater appears to be on the order of ten years.
- An environmental easement and preparation of a report summarizing the monitoring data would be required.

A cost estimate is provided in Table 8-1. The costs for this option are: capital costs of $62,000, present worth O&M costs for 30 years of $491,000, and total present worth for 30 years of $553,000.

### 7.1.3 Alternative 3 – Groundwater Extraction and Ex Situ Treatment/MNA

This alternative would implement groundwater extraction for ex situ treatment by air stripping as the primary treatment. Other treatment alternatives are viable, but this technology is selected for evaluation as representative of ex situ treatment options. Air stripping uses volatilization to transfer contaminants from groundwater to air. In general, water is contacted with an air stream to volatilize dissolved contaminants into the air stream. Depending on the level of contaminants in the air discharge, the contaminated air stream may need further treatment. The treated groundwater would comply with the NYS Class GA groundwater criteria. It is assumed that the treatment system would extract and treat groundwater from the most highly contaminated region of the plume and the remainder would be subject to MNA. The extent of the capture zone may be limited due to the relatively high hydraulic conductivity of the aquifer and limitations on locating the extraction wells because of current land use.

Figure 7-1 presents a conceptual layout of Alternative 3. A detailed description of the alternative is provided below:

- It is assumed that the extraction system would consist of two wells. The extraction wells would be screened within the impacted aquifer approximately 20 to 50 ft amsl.
- A field test using the existing wells would be conducted in pre-design to provide field measurements to better define the radius of influence and capture zone for the extraction wells.

- The groundwater treatment system would consist of an equalization tank, bag filters, an air stripper, and an effluent holding tank. The facility would be heated adequately to allow year-round operation.
- The treatment system would be located on-site in a new structure located behind the dry cleaner. The treatment facility is expected to be approximately 6 ft by 8 ft.
- Land on the dry cleaner and Getty Service Station property would be disturbed during construction for installation of the wells and to install the piping and electrical conduit below ground surface. The extraction wells would be flush mounted.
- For an influent flow rate of 200 gpm, a packed tower with a 36" diameter and a 25 ft packing depth is assumed. The groundwater would be filtered (bag filter) initially to address elevated metals concentrations to reduce fouling.
- No treatment of the air effluent is assumed.
- Because the treated groundwater would comply with NYS Class GA groundwater criteria, disposal to the local POTW, storm drains, or re-injection to the aquifer are viable options. It is assumed that the treated groundwater is partially re-injected to the aquifer and the remainder is discharged to the nearest stormwater catch basin.
- This alternative assumes a stormwater catch basin is present in the area surrounding the dry cleaner for disposal of a portion of the groundwater effluent.
- Costs also include an environmental easement and preparation of a report summarizing the monitoring data.
- Time needed to achieve the remedial goals: reduction of PCE concentrations in the source area to the SCGs is expected within the first two or three years of treatment. The remainder of the plume is expected to attenuate within 30 years.
- Periodic groundwater sampling would be required to evaluate the effectiveness of the treatment. Groundwater sampling would be conducted as described for Alternative 2 every year for five years then every five years thereafter. It is assumed that periodic review reports would be prepared every five years starting in 2023.
- An environmental easement would be required.

A cost estimate is provided in Table 8-2. The costs for this option are: capital costs of $652,000, present worth O&M costs for 30 years of $739,000, and present worth for 30 years of $1,391,000.

### 7.1.4 Alternative 4 – In Situ Treatment/MNA

The maximum concentration of PCE in the groundwater (600 µg/L to 700 µg/L) is amenable to both enhanced bioremediation by reductive dechlorination and by chemical oxidation. Enhanced bioremediation would likely be less expensive in terms of labor, chemicals, and equipment related to handling; however, bioremediation would go through a sequential dechlorination that would generate daughter products. Though more expensive to implement, chemical oxidation would directly destroy the PCE. Chemical oxidation followed by bioremediation is an approach that is used at many sites. At some sites, bioremediation is enhanced through the addition of food source and/or limiting nutrients, and other sites natural attention (bioremediation) is monitored after chemical oxidation injections.

For the purpose of this evaluation, this alternative would implement in situ treatment by chemical oxidation followed by enhanced bioremediation. Chemical oxidation would be applied initially because the chemical oxygen demand and biological oxygen demand measurements for this aquifer are low. These in situ treatments would be used to reduce PCE levels in the area under the dry cleaner and Getty Service Station property where the highest PCE levels were detected. Additionally, a downstream barrier would be implemented north of Highway 25A to capture contamination migrating to the northeast. It is assumed a pre-design pilot study would be conducted. Costs also include an environmental easement and preparation of a report summarizing the monitoring data.

Figure 7-2 presents a conceptual layout of Alternative 4. A detailed description of the alternative is provided below:

- Injections to promote chemical oxidation and bioremediation in the source area would be performed.
- Injections would be made on approximately a 15 ft grid (23 injections) from 50 ft amsl to 20 ft amsl on the dry cleaner and Getty Service Station properties. The barrier injections would be installed at approximately 15 ft intervals (nine points) from 50 ft amsl to 20 ft amsl on the driveway of the Nathan Hale property located just north of Highway 25A. The proposed injection locations are shown on Figure 7-2.
- First, a chemical oxidant would be applied to the 23 source area injection sites located on the Country Cleaners Site and the neighboring Getty Service Station. A second polishing injection of chemical oxidants would be conducted. A percarbonate based oxidant and iron silica based activator are assumed for costing.
- Following the chemical oxidant remediation, injections for enhanced bioremediation would be placed in the 23 source area injection sites and the nine barrier locations.
- Prior to full implementation, laboratory and pilot studies would be conducted to more clearly define design parameters. The type of chemical oxidant (e.g., Fenton's Reagent, potassium or sodium permanganate, etc.) and optimum substrate mixture for bioremediation for this site would be determined. The remediation could be staged to evaluate the effectiveness of the initial measures (e.g., chemical oxidation injections) and determine if additional remedial measures are necessary.
- For bioremediation, injection of a micro-emulsion is assumed for cost purposes. The micro-emulsion would provide free lactic acid, controlled release lactic acid and long release fatty acids for effective hydrogen production. This application provides cost-effective anaerobic treatment of contaminants in groundwater.
- The remediation would need to meet the requirements of an EPA Underground Injection Control (UIC) Program.
- Time needed to achieve the remedial goals: reduction of PCE concentrations in the source area to SCGs is expected within the first two to three years from of the initial time of application. The remainder of the plume is expected to attenuate within 30 years.
- Periodic groundwater sampling would be required to evaluate the effectiveness of the treatment. Groundwater sampling would be conducted as described for Alternative 2 every year for five years then every five years thereafter. It is assumed that periodic review reports would be prepared every five years starting in 2013.

- An environmental easement would be required.

A cost estimate is provided in Table 8-3. The costs for this option are: capital costs of $678,000, present worth O&M costs for 30 years of $491,000, and present worth for 30 years of $1,169,000.

### 7.1.5 Alternative 5 - Groundwater Treatment at Downstream Public Wells/MNA

This alternative would provide treatment at the two public wells (S-71533 and S-26681) located downgradient from the site as shown on Figure 6-1. PCE concentrations in these wells do not currently exceed the NYS Class GA groundwater criterion and the NY State drinking water standards. If selected, this alternative would be implemented in the event PCE concentrations consistently exceeded NYS Class GA groundwater criterion for PCE or daughter products. Although PCE can be treated by a number of technologies, for this alternative analysis it is assumed that an air stripper will be installed as the primary removal technology because long term O&M requirements are relatively low.

A detailed description of the alternative is provided below:

- Well productions rates are 650 gpm for S-71533 and 1,500 gpm for S-26681. For the 650 gpm supply well, a packed tower 72” in diameter with a 12 ft packing depth is assumed. For the 1,500 gpm supply well, a packed tower 96” in diameter with a 12 ft packing depth is assumed. No water filtration or treatment of the effluent air is assumed.
- Drinking water to be treated to meet primary drinking water regulations – maximum contaminant levels.
- An area of approximately 6 ft by 8 ft is required for the air stripper and associated equipment. The layout of the public water well facilities is not known. It is assumed that there is adequate space available for implementation of this alternative at the well facilities.
- Time needed to achieve the remedial goals: it is anticipated that the groundwater concentrations would remain above the NYS Class GA groundwater criteria for decades since the half life of PCE in groundwater appears to be on the order of ten years.
- Long term monitoring would be implemented at the site since groundwater contamination remains at the site. The monitoring is the same as described for Alternative 2.
- Groundwater sampling would be conducted as described for Alternative 2 every five years. It is assumed that periodic review reports would be prepared every five years.
- An environmental easement and preparation of a report summarizing the monitoring data would be required.

A cost estimate is provided in Table 8-4. The costs for this option are: capital costs of $399,000, present worth O&M costs for 30 years of $1,037,000, and present worth for 30 years of $1,436,000. For cost estimations, the construction of the air strippers is assumed to occur in 2013.

## 7.2 Detailed Analysis of Alternatives – General

The purpose of the detailed analysis of remedial action alternatives is to present the relevant information to select an on-site remedy. During the detailed analysis, the alternatives established in Section 7.1 are compared on the basis of environmental benefits and costs using criteria established by NYSDEC in DER-10 (NYSDEC, 2010). This approach is intended to provide needed information to compare the merits of each alternative and select an appropriate remedy that satisfies the RAOs for the site.

### 7.2.1 Description of Evaluation Criteria

The alternatives were evaluated against the following remedy selection evaluation criteria. Of these criteria, the first two are threshold criteria that must be satisfied in order for an alternative to be considered for selection. The remaining seven criteria are balancing criteria used to compare the positive and negative aspects of the alternatives. Community acceptance is evaluated after completion of the proposed remedial action plan by NYSDEC.

1 <u>Overall Protection of Human Health and the Environment:</u> This criterion is an evaluation of the ability of the alternative to protect public health and the environment; the ability of the alternative to eliminate, reduce or control any existing or potential human exposures or environmental impacts identified in the RI and to achieve the RAOs identified in Section 4. This assessment considers other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with SCGs.

2 <u>SCGs:</u> This criterion is used to evaluate the extent to which each alternative conforms to the SCGs identified in Section 4.

3 <u>Long-Term Effectiveness and Permanence:</u> This criterion addresses the long-term effectiveness and permanence of the alternative after implementation. If contamination remains after implementation, this criterion requires evaluation of human exposures, ecological receptors or impacts to the environment.

4 <u>Reduction of Toxicity, Mobility, and Volume through Treatment:</u> This criterion is an evaluation of the ability of the alternatives to reduce the toxicity, mobility and volume of site contamination. Alternatives that permanently or significantly reduce the toxicity, mobility or volume of the contamination at the site are preferred.

5 <u>Short-Term Impacts and Effectiveness:</u> This criterion is an evaluation of potential short-term adverse environmental impacts and human exposures during construction or implementation of the alternative. Short-term impacts are conditions which may cause human exposures, adverse environmental impacts and nuisance conditions. Means of controlling short-term impacts are identified. The effectiveness of these controls is evaluated. Examples of short-term impacts include increased truck traffic, odors, vapors, dust, habitat disturbance, run off, and noise.

6 <u>Implementability:</u> This criterion evaluates the technical and administrative feasibility of implementing an alternative. Technical feasibility includes difficulties associated with construction and the ability to monitor the effectiveness of the alternative. Administrative feasibility includes the availability of the necessary personnel and material and potential difficulties in obtaining approvals, access, etc.

7 Cost Effectiveness: An evaluation of the overall cost effectiveness of an alternative. An assessment is made as to whether the cost is proportional to the overall effectiveness of the alternative.
8 Land Use: This criterion is an evaluation of the current, intended and reasonable anticipated future use of the site and its surroundings as it relates to the alternative when unrestricted levels are not achieved.
9 Community Acceptance: This criterion is evaluated after the public review of the remedy selection process as part of the final DER selection/approval of the remedy for the site.

## 7.3 Detailed Analysis of Site Alternatives

Alternatives No. 1 through 5 are evaluated individually in terms of the seven environmental and one cost criteria described above. Descriptions of the alternatives are provided in Section 7.1.

### 7.3.1 Alternative 1 – No Action

1 Overall Protection of Human Health and the Environment: This alternative is not protective of human health and the environment, since the site would remain in its present condition. Groundwater can continue to migrate off site, potentially impacting the downgradient public wells.
2 Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals: Reduction in PCE contamination below the chemical-specific SCGs for the site is expected in several decades assuming a 10-year half life for the contamination. No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) can be met during sampling activities.
3 Long-Term Effectiveness and Permanence: Because this alternative does not involve removal or treatment of the contaminated groundwater, the risks involved with the migration of contaminants and direct contact with contaminants remain essentially the same over a long period of time.
4 Reduction of Toxicity, Mobility, and Volume through Treatment: This alternative does not involve the removal or treatment of the source of on-site contamination. Therefore, neither the toxicity, nor mobility, nor volume of contamination is expected to be reduced significantly. As the plume expands under this alternative, the volume of groundwater with concentrations greater than the standards may increase for some time before eventually decreasing to below standards. Natural attenuation of contaminants is expected to reduce the concentration in groundwater over time.
5 Short-Term Impacts and Effectiveness: No short-term impacts are anticipated during the implementation of this alternative, since no construction activities are involved.
6 Implementability: This alternative is readily implementable.
7 Cost Effectiveness: No costs are estimated for this alternative. This alternative does not effectively mitigate risk from contamination at the site, and the costs are lower than alternatives providing active remediation of treatment at the public wells.
8 Land Use: Institutional controls (e.g., environmental easement or access restrictions) would be required for the on-site property to preclude contact with contaminated media (i.e., groundwater withdrawal or use restrictions).

### 7.3.2 Alternative 2 – No Action/MNA

9 Overall Protection of Human Health and the Environment: This alternative is not protective of human health and the environment, since the site would remain in its present condition. Groundwater can continue to migrate off site, potentially impacting the downgradient public wells.

10 Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals: Reduction in PCE contamination below the chemical-specific SCGs for the site is expected in several decades assuming a 10-year half life for the contamination. No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) can be met during sampling activities.

11 Long-Term Effectiveness and Permanence: Because this alternative does not involve removal or treatment of the contaminated groundwater, the risks involved with the migration of contaminants and direct contact with contaminants remain essentially the same over a long period of time.

12 Reduction of Toxicity, Mobility, and Volume through Treatment: This alternative does not involve the removal or treatment of the source of on-site contamination. Therefore, neither the toxicity, nor mobility, nor volume of contamination is expected to be reduced significantly. As the plume expands under this alternative, the volume of groundwater with concentrations greater than the standards may increase for some time before eventually decreasing to below standards. Natural attenuation of contaminants is expected to reduce the concentration in groundwater over time.

13 Short-Term Impacts and Effectiveness: No short-term impacts are anticipated during the implementation of this alternative, since no construction activities are involved, only sampling. Field personnel wear appropriate personal protective equipment during groundwater sampling in order to limit health risks due to exposure to contaminants and physical hazards. In addition, equipment used for sampling purposes is decontaminated prior to leaving the site, as needed, in order to avoid the transport of contaminants.

14 Implementability: This alternative is readily implementable. Groundwater sampling can be performed without sophisticated equipment, and the necessary services and equipment are readily available.

15 Cost Effectiveness: The present worth (30 year life) for this alternative is estimated to total approximately $553,000. This alternative does not effectively mitigate risk from contamination at the site, and the costs are lower than alternatives providing active remediation of treatment at the public wells.

16 Land Use: Institutional controls (e.g., environmental easement or access restrictions) would be required for the on-site property to preclude contact with contaminated media (i.e., groundwater withdrawal or use restrictions).

### 7.3.3 Alternative 3 – Groundwater Extraction and Ex Situ Treatment/MNA

1 Overall Protection of Human Health and the Environment: This alternative is considered to be protective of human health and the environment. Implementation of this alternative would result in remediation of groundwater. Although the alternative will not meet the SCGs throughout the site, this alternative for groundwater remediation is considered to be

protective of human health since PCE concentrations in groundwater are expected to reach the chemical SCGs within 30-years.

2 SCGs: It is expected that this alternative will meet the chemical-specific SCGs for on-site groundwater between the source area and the downgradient property line within a 30-year timeframe. No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) will be met during construction activities.

3 Long-Term Effectiveness and Permanence: Chemical-specific SCGs are expected to be achieved within 30 years. Therefore, this alternative is considered an adequate and reliable remedy for mitigating human health and environmental impacts due to groundwater.

4 Reduction of Toxicity, Mobility, and Volume through Treatment: The toxicity, mobility and volume of on-site groundwater contamination are expected to be reduced significantly through the use of extraction wells, ex situ treatment, and natural attenuation at the fringe of the plume.

5 Short-Term Impacts and Effectiveness: There are minimal short-term effects related to the installation and construction of this type of treatment system. Potential exists for worker exposure to contaminated groundwater during the installation of the extraction wells and during the startup of the system. Extraction well(s) will be installed by a drill rig. Workers and construction vehicles will be present on active businesses. Some flexibility in the work schedule (e.g., working weekends) may be required. Field personnel would wear appropriate personal protective equipment during groundwater sampling in order to limit health risks due to exposure to contaminants and physical hazards. In addition, equipment used for sampling purposes would be decontaminated prior to leaving the site, as necessary, in order to avoid the transport of contaminants. In terms of short-term effectiveness, contaminant concentrations will start to be reduced as soon as the treatment begins. However, meeting SCGs will not be achieved in the short term.

6 Implementability: This alternative is readily implementable on a technical basis. Construction and installation of the groundwater extraction/treatment systems would involve standard construction methods and equipment; and materials and services necessary for construction are readily available. With regard to O&M, the materials and services required for the systems are also readily available. Groundwater sampling can be performed without sophisticated equipment, and the necessary services and equipment are readily available.

In terms of administrative concerns, this alternative is also considered to be implementable. Implementation of this alternative would require coordination with and approval by Town of Huntington agencies as well as coordination with the owners/occupants of the dry cleaner and Getty Service Station. However, no specific problems are anticipated in obtaining permits or approvals from the various agencies. A thorough survey of utilities and piping traversing the properties would need to be conducted prior to the installation of the injection/extraction wells and the associated infrastructure.

7 Cost Effectiveness: The present worth for this alternative is estimated to total approximately $1,391,000. This alternative effectively mitigates risk from contamination at the site, and the cost is similar to the cost of the in situ remediation alternative.

8 Land Use: This alternative is expected to achieve the chemical-specific SCGs for this site within a reasonable timeframe. No changes to land use are anticipated.

### 7.3.4 Alternative 4 – In Situ Treatment/MNA

1. Overall Protection of Human Health and the Environment: This alternative is considered to be protective of human health and the environment. Implementation of this alternative would result in remediation of groundwater within the area of higher contamination and create a barrier to contaminant migration at the northeast extent of the plume.
2. SCGs: This alternative is expected to meet the chemical-specific SCGs for on-site groundwater between the source area and the plume limits within a 30-year timeframe for the majority of the site areas. No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) will be met during construction activities.
3. Long-Term Effectiveness and Permanence: This alternative is considered an adequate and reliable remedy for mitigating human health and environmental impacts (in terms of affecting habitat or vegetation) due to groundwater. The injection of an oxidant has a potential to eliminate impacts within the region of the plume with highest PCE concentrations, allowing the lower concentrations of VOCs to further dissipate through bioremediation.
4. Reduction of Toxicity, Mobility, and Volume through Treatment: The injections to promote chemical destruction through oxidant and bioremediation would immediately reduce the concentration of VOCs within the injected area. The injections will target groundwater impacts beneath the dry cleaner and Getty Service Station properties. Injections at the northeast extent of the plume create a barrier to migration by promoting bioremediation in this area; eventually reducing the toxicity and limiting mobility of the contaminated groundwater.
5. Short-Term Impacts and Effectiveness: Short-term impacts associated with the injected chemicals include risks to workers during handling of the solution. Injections will be accomplished with a drill rig. Workers and construction vehicles will be present on active businesses potentially causing some disruption. Some flexibility in the work schedule (e.g., working weekends) may be considered. Field personnel would wear appropriate personal protective equipment during groundwater sampling in order to limit health risks due to exposure to contaminants and physical hazards. In addition, equipment used for sampling purposes would be decontaminated prior to leaving the site, as necessary, in order to avoid the transport of contaminants. In terms of short-term effectiveness, contaminant concentrations will start to be reduced as soon as the treatment begins. However, meeting SCGs will not be achieved in the short term.
6. Implementability: This alternative is readily implementable on a technical basis. Construction and installation of the injection systems would involve standard construction methods and equipment; and materials and services necessary for construction are readily available. Several vendors supply the oxidants. Confirmatory groundwater sampling would be performed to monitor the effectiveness of injections. A pilot study may be implemented as part of pre-design work. Modification of the construction schedule to minimizing disruptions to the dry cleaner and Getty Service Station would be considered.
7. Cost Effectiveness: The present worth for this alternative is estimated to total approximately $1,169,000. This alternative effectively mitigates risk from contamination at the site, and the cost is similar to the cost of the ex situ remediation alternative.
8. Land Use: This alternative is expected to achieve the chemical-specific SCGs for this site within a reasonable timeframe (less than 10 years). No changes to land use are anticipated.

### 7.3.5 Alternative 5 – Groundwater Treatment at Downgradient Public Wells/MNA

1 Overall Protection of Human Health and the Environment: This alternative is considered to be protective of human health from ingestion of groundwater extracted from the public wells. This alternative is not protective of human health and the environment in the vicinity of the site, since the site would remain in its present condition with gradual reduction of contaminant levels through natural attenuation.

2 Compliance with Applicable or Relevant and Appropriate SCGs and Remediation Goals: Groundwater extracted from the downgradient public wells will comply with the chemical-specific SCGs for the site. For groundwater at the site, reduction in PCE contamination below the chemical-specific SCGs for the site is expected in several decades. No location-specific SCGs were identified. Action-specific SCGs (e.g., OSHA regulations) will be met during sampling and construction activities. Drinking water to be treated to meet primary drinking water regulations – maximum contaminant levels.

3 Long-Term Effectiveness and Permanence: At the public wells, this alternative effectively mitigates risk to human health resulting from site-related contamination. At the site, the risks involved with the migration of contaminants and direct contact with contaminants would remain essentially the same over a long period of time.

4 Reduction of Toxicity, Mobility, and Volume through Treatment: This alternative reduces the toxicity of groundwater extracted from the downgradient wells. This alternative does not involve the removal or treatment of the source of on-site contamination. Therefore, neither the toxicity, nor mobility, nor volume of contamination is expected to be reduced significantly. Natural attenuation of contaminants may reduce the concentrations in groundwater over time. Reduction of PCE contamination is expected within several decades.

5 Short-Term Impacts and Effectiveness: There are minimal short term effects related to the installation and construction of this type of treatment system. Field personnel would wear appropriate personal protective equipment during groundwater sampling in order to limit health risks due to exposure to contaminants and physical hazards. In addition, equipment used for sampling purposes would be decontaminated prior to leaving the site, as necessary, in order to avoid the transport of contaminants. This alternative has little or no short-term effectiveness, as there is no reduction in contaminant mass, mobility, or toxicity in the short term.

6 Implementability: This alternative is readily implementable on a technical basis. Construction and installation of the treatment systems would involve standard construction methods and equipment; and materials and services necessary for construction are readily available. With regard to O&M, the materials and services required for the systems are also readily available. Also, the instrumentation and control systems will be automated with remote access capabilities, such that the effect of possible system shut-downs would be minimized. Groundwater sampling can be performed without sophisticated equipment, and the necessary services and equipment are readily available.

9 Cost Effectiveness: The present worth for this alternative is estimated to total approximately $1,436,000. This alternative effectively mitigates risk from contamination from the site at the two known public downgradient wells, but the cost is higher than all of the other remediation alternatives examined.

7 Land Use: Institutional controls (e.g., environmental easement or access restrictions) would be required for the on-site property to preclude contact with contaminated media (i.e., groundwater withdrawal or use restrictions).

# 8 COMPARATIVE ANALYSIS OF ALTERNATIVES AND RECOMMENDED REMEDY

This section presents a comparative analysis of remedial alternatives and a recommended alternative. The alternatives are compared below on the basis of criteria defined in Section 7.2.1. The cost comparison is provided on Table 8-1, and the overall comparative analysis is summarized on Table 8-2.

## 8.1 Overall Protection of Human Health and the Environment

The proposed remedy Alternative 4 will satisfy these criteria by chemical oxidation and bioremediation of chlorinated VOC contaminants in groundwater beneath the site, which constitutes the most significant threat to human health and the environment. Alternative 3 would also satisfy this requirement by ex-situ remediation of the VOC contaminants. Alternative 1 does not provide any protection to public health and the environment and will not be evaluated further. Alternative 2 provides no protection to the environment, as no treatment is applied to the contaminated groundwater, and will not be evaluated further. Alternative 5 is protective of human health at the point of exposure, but is not protective of the environment.

## 8.2 SCGs

Alternatives 3 and 4 are expected to achieve substantial compliance with the chemical-specific SCGs/remediation action objectives for groundwater within 30 years. Alternatives 1 and 2 are not expected to achieve compliance within 30 years. Alternative 5 achieves compliance with the primary drinking water regulations, maximum contaminant levels at the point of exposure but does not achieve substantial compliance with the chemical-specific SCGs/remediation action objectives for groundwater at the site. Each of the alternatives evaluated is considered to be in compliance with action-specific SCGs; permits and approvals necessary for implementing these alternatives will be obtained prior to initiating the remedial action. No location-specific SCGs were identified.

## 8.3 Long-Term Effectiveness and Permanence

Alternatives 3 and 4 are considered to be adequate, reliable and permanent remedies for the remediation of groundwater.

## 8.4 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternatives 3 and 4 provide for the reduction of toxicity, mobility and volume of impacted groundwater.

## 8.5 Short-Term Impacts and Effectiveness

Alternatives 3 and 4 involve intrusive work which may provide some disruption of the dry cleaner and Getty Service Station during construction activities. Alternatives 3 and 4 are expected to realize significant reductions in the groundwater contaminant levels within the first year after construction.

## 8.6 Implementability

Alternatives 3 and 4 are technically implementable with readily available methods, equipment, materials, and services. Alternatives 3 and 4 are also administratively implementable. Property owners or tenants may object to the intrusive work required for Alternatives 3 and 4.

## 8.7 Cost Effectiveness

The estimated costs associated with the implementation of each alternative are summarized on Table 8-1. Alternatives 3 and 4 are expected to provide effective remediation of groundwater. The present worth costs for Alternatives 3 and 4 are $1,391,000 and $1,169,000, respectively.

## 8.8 Land Use

Environmental easements are required for Alternatives 3 and 4 because groundwater contamination is expected to remain above the NYS Class GA groundwater criteria for an extended period of time.

## 8.9 Recommended Alternative

Alternatives 3 and 4 are expected to meet the threshold criteria (protection of human health and the environment, and compliance with SCGs). Both Alternatives 3 and 4 provide long-term effectiveness and permanence; reduction in the toxicity, mobility and volume of the contamination; and are implementable. Both alternatives require intrusive activities which may be disruptive to the owners or tenants at the dry cleaners and Getty Service Station. Both alternatives may require some pre-design data collection. The estimated costs for these alternatives are similar, differing by four percent. Both alternatives are expected to significantly reduce contaminant levels and do not require implementation of land use restrictions.

Alternative 4 is recommended because it is expected to provide a similar level of effectiveness as Alternative 3, but it provides a means of addressing downgradient contamination through installation of barrier injections as well as remediation in the source area. For Alternative 4, no equipment is left on-site or and periodic maintenance of equipment is not required. Although Alternative 4 is intrusive and potentially disruptive to the owners and tenants at the dry cleaner and Getty Service Station, the construction period is expected to be shorter than for Alternative 3 (approximately one week), and does not require trenching and repair of pavement, or coordination with government agencies for permit acquisition.

# 9 REFERENCES

AECOM Technical Services, Inc. (AECOM), 2008. Final Dynamic Work Plan Remedial Investigation/Feasiblility Study Country Cleaners. May.

AECOM, 2010. Draft Remedial Investigation Report. Country Cleaners Site. August.

New York State Department of Environmental Conservation (NYSDEC), 2007. Presumptive/Proven Remedial Technologies. DER-15. February.

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

Table 3-1

Shallow Wells - Groundwater Concentration Summary Statistics

| Parameter | CAS | Detection Frequency | Detection Limit Range | Minimum Detected Value | Maximum Detected Value | Maximum Detected Sample | NYSDEC Class GA Groundwater Criteria | Number of Exceed-ances | NYS MCL | Number of Exceed-ances | EPA MCL | Number of Exceed-ances |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Shallow Wells** | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | |
| Chloroform | 67-66-3 | 1 / 8 | 1 - 5 | 3.3 | 3.3 | MW-7S | 7 | 0 | 50 | 0 | 80 | 0 |
| cis-1,2-Dichloroethene | 156-59-2 | 1 / 8 | 1 - 5 | 9.3 | 9.3 | MW-4S | 5 | **1** | 5 | **1** | 70 | 0 |
| Tetrachloroethene (PCE) | 127-18-4 | 6 / 8 | 1 - 5 | 1.1 | 680 | MW-4S | 5 | **5** | 5 | **5** | 5 | **5** |
| Trichloroethene (TCE) | 79-01-6 | 1 / 8 | 1 - 5 | 8 | 8 | MW-2S | 5 | **1** | 5 | **1** | 5 | **1** |
| **Inorganics-Total (ug/L)** | | | | | | | | | | | | |
| Iron | 7439-89-6 | 3 / 3 | 150 - 150 | 200 | 500 | MW-2S | 300 | **2** | 300 | **2** | NL | -- |
| Manganese | 7439-96-5 | 0 / 3 | 25 - 25 | -- | -- | -- | 300 | 0 | 300 | 0 | NL | 0 |
| **Inorganics-Filtered (ug/L)** | | | | | | | | | | | | |
| Iron | 7439-89-6 | 0 / 3 | 150 - 150 | -- | -- | -- | 300 | 0 | 300 | 0 | NL | 0 |
| Manganese | 7439-96-5 | 0 / 3 | 25 - 25 | -- | -- | -- | 300 | 0 | 300 | 0 | NL | 0 |
| **Shallow Hydropunch Samples** | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | |
| 2-Butanone | 78-93-3 | 1 / 10 | 5 - 25 | 4.8 | 4.8 | HP-16C | 50 | 0 | 50 | 0 | NL | -- |
| Acetone | 67-64-1 | 6 / 10 | 5 - 25 | 7.4 | 19 | HP-16C | 50 | 0 | 50 | 0 | NL | -- |
| Benzene | 71-43-2 | 1 / 10 | 1 - 5 | 0.71 | 0.71 | HP-16C | 1 | 0 | 5 | 0 | 5 | 0 |
| cis-1,2-Dichloroethene | 156-59-2 | 3 / 10 | 1 - 5 | 13 | 41 | HP-04B | 5 | **3** | 5 | **3** | 70 | 0 |
| Methyl tert-butyl Ether | 1634-04-4 | 2 / 10 | 1 - 5 | 0.5 | 2.95 | HP-02E | NL | -- | 10 | 0 | NL | -- |
| Tetrachloroethene (PCE) | 127-18-4 | 6 / 10 | 1 - 5 | 0.58 | 1,500 | HP-02E | 5 | **4** | 5 | **4** | 5 | **4** |
| Toluene | 108-88-3 | 1 / 10 | 1 - 5 | 1.3 | 1.3 | HP-16C | 5 | 0 | 5 | 0 | 1000 | 0 |
| trans-1,2-Dichloroethene | 156-60-5 | 1 / 10 | 1 - 5 | 0.73 | 0.73 | HP-04B | 5 | 0 | 5 | 0 | 100 | 0 |
| Trichloroethene (TCE) | 79-01-6 | 4 / 10 | 1 - 5 | 9.8 | 36 | HP-05B | 5 | **4** | 5 | **4** | 5 | **4** |

Table 3-2

Deep Wells - Groundwater Concentration Summary Statistics

| Parameter | CAS | Detection Frequency | Detection Limit Range | Minimum Detected Value | Maximum Detected Value | Maximum Detected Sample | NYSDEC Class GA Groundwater Criteria | Number of Exceed-ances | NYS MCL | Number of Exceed-ances | EPA MCL | Number of Exceed-ances |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Deep Wells** | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | |
| Methyl tert-butyl Ether | 1634-04-4 | 2 / 7 | 0.5 - 0.5 | 0.51 | 0.58 | MW-4D | NL | -- | 10 | 0 | NL | -- |
| **Deep Hydropunch Samples** | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | |
| 1,1-Dichloroethane | 75-34-3 | 1 / 16 | 1 - 5 | 1.1 | 1.1 | HP-02G | 5 | 0 | 5 | 0 | NL | -- |
| 1,1-Dichloroethene | 75-35-4 | 1 / 16 | 1 - 5 | 0.76 | 0.76 | HP-02G | 5 | 0 | 5 | 0 | 7 | 0 |
| 2-Butanone | 78-93-3 | 2 / 16 | 5 - 25 | 4.15 | 5 | HP-39D | 50 | 0 | 50 | 0 | NL | -- |
| Acetone | 67-64-1 | 2 / 16 | 5 - 25 | 11.5 | 24 | HP-39D | 50 | 0 | 50 | 0 | NL | -- |
| Benzene | 71-43-2 | 2 / 16 | 1 - 5 | 0.67 | 0.81 | HP-39E | 1 | 0 | 5 | 0 | 5 | 0 |
| Bromodichloromethane | 75-27-4 | 1 / 16 | 1 - 5 | 1.2 | 1.2 | HP-05C | 50 | 0 | 50 | 0 | 80 | 0 |
| Chloroform | 67-66-3 | 10 / 16 | 1 - 5 | 0.56 | 2.3 | HP-12C | 7 | 0 | 50 | 0 | 80 | 0 |
| cis-1,2-Dichloroethene | 156-59-2 | 2 / 16 | 1 - 5 | 0.53 | 1.3 | HP-33H | 5 | 0 | 5 | 0 | 70 | 0 |
| Dibromochloromethane | 124-48-1 | 2 / 16 | 1 - 5 | 0.54 | 2.2 | HP-05C | 50 | 0 | 50 | 0 | 80 | 0 |
| Methyl tert-butyl Ether | 1634-04-4 | 2 / 16 | 1 - 5 | 1.3 | 1.4 | HP-33I | NL | -- | 10 | 0 | NL | -- |
| Tetrachloroethene (PCE) | 127-18-4 | 11 / 16 | 1 - 5 | 1.4 | 92 | HP-33H | 5 | **5** | 5 | **5** | 5 | **5** |
| Toluene | 108-88-3 | 2 / 16 | 1 - 5 | 1.095 | 1.1 | HP-39D | 5 | 0 | 5 | 0 | 1000 | 0 |
| Trichloroethene (TCE) | 79-01-6 | 7 / 16 | 1 - 5 | 0.71 | 2.8 | HP-05C | 5 | 0 | 5 | 0 | 5 | 0 |

Table 4-1
Chemical-Specific Standards, Criteria, and Guidance

| Title | Citation | Description/applicability |
|---|---|---|
| Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations | 6 NYCRR 700-706 Water Quality Regulations; especially Part 703.5; summarized in TOGS 1.1.1. | Groundwater (Class GA) standards and guidance values; applicable. Establishes long-term remediation goals.<br>PCE: 5 ug/L, TCE: 5 ug/L, cis-1,2-DCE: 5 ug/L, and vinyl chloride: 2 ug/L |
| New York Public Water Supplies | 10 NYCRR 5-1.52 (Tables); 10 NYCRR 170.4 (Standards for Raw Water) | Drinking Water standards; relevant. May be used where groundwater standard may not be protective of aquifer use for potable water supply.<br>Principle Organic Contaminant Maximum Contaminant Level: 5 ug/L (Table 3) |
| Primary Drinking Water Regulations – Maximum Contaminant Levels | 40 CFR 141.61 | Establishes federal maximum contaminant levels for organic contaminants in drinking water; relevant where it addresses contaminants not included in state standards, or has more stringent criteria.<br>PCE: 5 ug/L, TCE: 5 ug/L, cis-1,2-DCE: 70 ug/L, and vinyl chloride: 2 ug/L |
| Ambient (Surface Water) standards and guidance values | NYCRR 700-706; especially Part 701 (establishes water classes); 6 NYCRR 925 Table I (designates Huntington Bay as Class SA)<br>6 NYCRR 700-706 Water Quality Regulations; especially Part 703.5; summarized in TOGS 1.1.1. | Surface Water Standards (Class SA); potentially applicable to discharge to Huntington Bay.<br>PCE: 1 ug/L, TCE: 40 ug/L, cis-1,2-DCE: none, and vinyl chloride: none |

GA Source of Drinking Water (groundwater)
SA Wildlife Protection (saline waters)

Table 4-2

Action-Specific Standards, Criteria, and Guidance

| Title | Citation | Description/applicability |
|---|---|---|
| Hazardous Waste Regulations | 6 NYCRR Part 370 | Potentially applicable for off-site disposal of contaminated groundwater classified as hazardous waste |
| Solid Waste Regulations | 6 NYCRR Part 360 | Potentially applicable for off-site disposal of contaminated groundwater classified as hazardous waste |
| Selection of remedial actions at hazardous waste disposal sites | NYSDEC TAGM 4030 | This TAGM provides guidelines to select an appropriate remedy at State Superfund sites, and sets forth a hierarchy of remedial technology treatments consistent with SARA and RCRA land disposal restrictions. |
| Guidelines for the Control of Toxic Ambient Air Contaminants | Air Guide 1 | Potentially applicable for alternatives with discharges to air (e.g., air stripping) |
| Underground Injection/ Recirculation at Groundwater Remediation Sites | NYSDEC T.O.G.S. 2.1.2 | Potentially applicable for alternatives involving re-injection of groundwater |
| Surface water standards | 6 NYCRR 701.8 (best uses for Class C); 6 NYCRR 703.5; TOGS 1.1.1. | Potentially applicable for alternatives with discharges to surface water |
| Sanitary Sewer | Huntington Municipal Code §164 especially Article III, §164.16 Special agreements and arrangements | Potentially Applicable for alternatives with discharges to sanitary sewer system |
| Stormwater discharge permit | Environmental Conservation Law Article 17 Title 8; Implementing Regulations - 6nycrr Part 750; Huntington Municipal Code §170 | Potentially applicable for discharges to stormwater sewer system |

**Table 8-1**
**Alternative 2: No Action/MNA- Cost Estimate Summary**

| Item | Item Description | Quantity | Unit Cost | Unit | Extension |
|---|---|---|---|---|---|
| | | | | | |
| **CAPITAL COSTS** | | | | | |
| ***Subcontractor Costs*** | | | | | |
| | *Environmental Easement* | 1 | $ 25,000 | LS | $ 25,000 |
| | *Site Management Plans* | 1 | $ 20,000 | LS | $ 20,000 |
| | | | | | |
| | **Subtotal Subcontractor Costs** | | | | **$ 45,000** |
| | General Contractor (15% subcontractor) | | | | $ 6,750 |
| | | | | | |
| | **Subtotal Construction Costs (Subcontractor + Gen. Contr.)** | | | | **$ 51,750** |
| | Design Engineering (0% construction) | | | | $ - |
| | Contingency (20%) | | | | $ 10,350 |
| | | | | | |
| | **TOTAL CAPITAL COSTS** | | | | **$ 62,100** |
| | | | | | |
| **ANNUAL O&M COSTS** | | | | | |
| ***Annual Groundwater Monitoring*** | | | | | |
| | Field Sampling Labor | 1 | $ 11,600 | Year | $ 11,600 |
| | Documentation | 1 | $ 10,000 | Year | $ 10,000 |
| | Van rental | 1 | $ 750 | Year | $ 750 |
| | Equipment rental | 1 | $ 2,400 | Year | $ 2,400 |
| | Analytical Costs (HCV Invoice) | 1 | $ 3,093 | Year | $ 3,093 |
| | Travel & Incidental expenses | 1 | $ 600 | Year | $ 600 |
| | **Total O&M Annual Groundwater Monitoring Costs** | | | | **$ 28,443** |
| | | | | | |
| ***Periodic Review Reports*** | | 1 | $ 25,000 | Year | **$ 25,000** |
| | | | | | |
| | **Total Groundwater Monitoring O&M** | | | | **$ 284,430** |
| | **(Years 2014-2018, 2023, 2028, 2033, 2038, 2043)** | | | | |
| | **Total Periodic Review Report O&M** | | | | **$ 125,000** |
| | **(Years 2023, 2028, 2033, 2038, 2043)** | | | | |
| | Contingency (20%) | | | | $ 81,886 |
| | | | | | |
| | **Total O&M Costs** | | | | **$ 491,316** |
| | | | | | |
| | **COST TO IMPLEMENT REMEDIAL ACTION ALTERNATIVE** | | | **Assume:** | **$ 553,416** |

**Table 8-2**
**Alternative 3: Groundwater Extraction and Ex Situ Treatment/MNA - Cost Estimate Summary**

| Item | Item Description | Quantity | Unit Cost | Unit | Extension |
|---|---|---|---|---|---|
| | | | | | |
| **CAPITAL COSTS** | | | | | |
| *Subcontractor Costs* | | | | | |
| | *Pre-Design Study* | 1 | $ 150,000 | LS | $ 150,000 |
| | *Mob/Demob* | 1 | $ 10,000 | ls | $ 10,000 |
| | *Utility Clearance* | 1 | $ 1,800 | ls | $ 1,800 |
| | ***2 Extraction wells*** | | | | |
| | *Well Drilling* | 160 | $ 30 | ft | $ 4,800 |
| | *Screen* | 60 | $ 30 | ft | $ 1,800 |
| | *Riser Pipe* | 100 | $ 50 | ft | $ 5,000 |
| | *box* | 2 | $ 300 | ea | $ 600 |
| | *Pump Installation* | 16 | $ 155 | hrs | $ 2,480 |
| | *Pumps* | 2 | $ 5,582 | ea | $ 11,164 |
| | ***2 Injection wells*** | | | | |
| | *Well Drilling* | 120 | $ 50 | ft | $ 6,000 |
| | *Screen* | 60 | $ 90 | ft | $ 5,400 |
| | *Riser Pipe* | 60 | $ 50 | ft | $ 3,000 |
| | *box* | 2 | $ 300 | ea | $ 600 |
| | *Standby* | 8 | $ 155 | hrs | $ 1,240 |
| | ***Soil Disposal Costs*** | | | | |
| | *Lab Testing* | 1 | $ 1,000 | ls | $ 1,000 |
| | *Disposal of 55 gal drums* | 50 | $ 73 | drum | $ 3,650 |
| | *QA/QC Fee* | 1 | $ 40 | ls | $ 40 |
| | *Manifest Prep Fee* | 1 | $ 50 | ls | $ 50 |
| | *Label Prep Fee* | 1 | $ 425 | ls | $ 425 |
| | *Reg. Admin Fee* | 1 | $ 336 | ls | $ 336 |
| | *Transporation* | 1 | $ 1,694 | ls | $ 1,694 |
| | *Demurrage* | 1 | $ 450 | ls | $ 450 |
| | *Tax (8.625%)* | 1 | 8.63% | pct | $ 660 |
| | *NJ Recycling Tax* | 1 | $ 40 | ls | $ 40 |
| | ***Electrical and Plumbing, connection to stormwater basin*** | | | | |
| | *Plumber Certified in Town* | 24 | $ 200 | hrs | $ 4,800 |
| | *Electrician Certified in Town* | 16 | $ 200 | hrs | $ 3,200 |
| | *Contractor* | 120 | $ 300 | hrs | $ 36,000 |
| | *Backhoe* | 2 | $ 1,500 | day | $ 3,000 |
| | *Mob/Demob* | 1 | $ 5,000 | ls | $ 5,000 |
| | *Materials* | 0.08 | $ 52,000 | % | $ 4,160 |
| | *Road Opening Permits* | 1 | $ 1,000 | ls | $ 1,000 |
| | *SPDES permit compliance* | 150 | $ 100 | hrs | $ 15,000 |
| | ***Treatment Equipment and Installation*** | | | | |
| | *System* | 1 | $ 65,000 | ls | $ 65,000 |
| | *Freight* | 1 | $ 10,000 | hrs | $ 10,000 |
| | *Installation& Startup* | 72 | $ 100 | % | $ 7,200 |
| | *Materials* | 1 | $1,300 | ls | $ 1,300 |
| | *Tax* | 1 | 8.63% | pct | $ 7,206 |
| | ***Site Management Plans*** | 1 | $ 20,000 | ls | $ 20,000 |
| | ***Environmental Easement*** | 1 | $ 25,000 | LS | $ 25,000 |
| | | | | | |
| | **Subtotal Subcontractor Costs** | | | | **$ 420,094** |
| | General Contractor (15% subcontractor) | | | | $ 63,014 |

**Table 8-2**
**Alternative 3: Groundwater Extraction and Ex Situ Treatment/MNA - Cost Estimate Summary**

| Item | Item Description | Quantity | Unit Cost | | Unit | Extension | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | **Subtotal Construction Costs (Subcontractor + Gen. Contr.)** | | | | | **$** | **483,109** |
| | Design Engineering (15% construction) | | | | | $ | 72,466 |
| | Contingency (20%) | | | | | $ | 96,622 |
| | | | | | | | |
| | **TOTAL CAPITAL COSTS** | | | | | **$** | **652,197** |
| | | | | | | | |
| **ANNUAL O&M COSTS** | | | | | | | |
| ***Annual System Operations*** | | | | | | | |
| | Energy | 113880 | $ | 0.14 | kW | $ | 15,943 |
| | Site Visits | 20 | $ | 2,640 | ls | $ | 52,800 |
| | ***Subtotal*** | | | | | **$** | **68,743** |
| ***Annual Groundwater Monitoring*** | | | | | | | |
| | Field Sampling Labor | 1 | $ | 11,600 | Year | $ | 11,600 |
| | Documentation | 1 | $ | 10,000 | Year | $ | 10,000 |
| | Van rental | 1 | $ | 750 | Year | $ | 750 |
| | Equipment rental | 1 | $ | 2,400 | Year | $ | 2,400 |
| | Analytical Costs (HCV Invoice) | 1 | $ | 3,093 | Year | $ | 3,093 |
| | Travel & Incidental expenses | 1 | $ | 600 | Year | $ | 600 |
| | ***Subtotal*** | | | | | **$** | **28,443** |
| ***Periodic Review Reports*** | | 1 | $ | 25,000 | Year | **$** | **25,000** |
| | | | | | | | |
| | **Total System Operations O&M (Three Years)** | | | | | **$** | **206,230** |
| | **Total Groundwater Monitoring O&M** | | | | | **$** | **284,430** |
| | **(Years 2014-2018, 2023, 2028, 2033, 2038, 2043)** | | | | | | |
| | **Total Periodic Review Report O&M** | | | | | **$** | **125,000** |
| | **(Years 2023, 2028, 2033, 2038, 2043)** | | | | | | |
| | Contingency (20%) | | | | | $ | 123,132 |
| | | | | | | | |
| | **Total O&M Costs** | | | | | **$** | **738,792** |
| | | | | | | | |
| | **COST TO IMPLEMENT REMEDIAL ACTION ALTERNATIVE** | | | | **Assume:** | **$** | **1,390,988** |

**Table 8-3**
**Alternative 4: In Situ Treatment/MNA- Cost Estimate Summary**

| Item | Item Description | Quantity | Unit Cost | Unit | Extension |
|---|---|---|---|---|---|
| | | | | | |
| **CAPITAL COSTS** | | | | | |
| ***Subcontractor Costs*** | | | | | |
| | ***Lab/Pilot Study, Data Evaluation and Reporting*** | | | | |
| | *Pilot Study* | 1 | $ 150,000 | ls | $ 150,000 |
| | ***Drilling*** | | | | |
| | *Utility Clearance* | 1 | $ 1,800 | ls | $ 1,800 |
| | *Initial -Enhanced Bio - Drilling - direct push* | | | | |
| | *Mob/demob* | 1 | $ 2,000 | ls | $ 2,000 |
| | *Day Rate* | 16 | $ 3,200 | day | $ 51,200 |
| | *In excess of 8hr day* | 4 | $ 185 | day | $ 740 |
| | *Pressure Washer* | 16 | $ 155 | day | $ 2,480 |
| | *Initial ChemOx - Drilling - direct push* | | | | |
| | *Mob/demob* | 1 | $ 2,000 | ls | $ 2,000 |
| | *Day Rate* | 12 | $ 3,200 | day | $ 38,400 |
| | *In excess of 8hr day* | 4 | $ 185 | day | $ 740 |
| | *Pressure Washer* | 12 | $ 155 | day | $ 1,860 |
| | *Polishing ChemOx - Drilling - direct push* | | | | |
| | *Mob/demob* | 1 | $ 2,000 | ls | $ 2,000 |
| | *Day Rate* | 12 | $ 3,200 | day | $ 38,400 |
| | *In excess of 8hr day* | 4 | $ 185 | day | $ 740 |
| | *Pressure Washer* | 12 | $ 155 | day | $ 1,860 |
| | ***Chemicals*** | | | | |
| | *Source area* | | | | |
| | *Micro-emulsion* | 1 | $ 27,195 | ls | $ 27,195 |
| | *Primer* | 1 | $ 4,200 | ls | $ 4,200 |
| | *Chemical Oxidation* | 2 | $ 25,200 | ls | $ 50,400 |
| | *Barrier* | | | | |
| | *Micro-emulsion* | 1 | $ 5,535 | ls | $ 5,535 |
| | *Primer* | 1 | $ 2,268 | ls | $ 2,268 |
| | *Tax* | 1 | 8.63% | pct | $ 7,732 |
| | *Shipping* | | | | |
| | ***Site Management Plans*** | 1 | $ 20,000 | ls | $ 20,000 |
| | ***Environmental Easement*** | 1 | $ 25,000 | LS | $ 25,000 |
| | | | | | |
| | **Subtotal Subcontractor Costs** | | | | **$ 436,551** |
| | General Contractor (15% subcontractor) | | | | $ 65,483 |
| | | | | | |
| | **Subtotal Construction Costs (Subcontractor + Gen. Contr.)** | | | | **$ 502,033** |
| | Design Engineering (15% construction) | | | | $ 75,305 |
| | Contingency (20%) | | | | $ 100,407 |
| | | | | | |
| | **TOTAL CAPITAL COSTS** | | | | **$ 677,745** |
| **ANNUAL O&M COSTS** | | | | | |
| ***Annual Groundwater Monitoring*** | | | | | |
| | Field Sampling Labor | 1 | $ 11,600 | Year | $ 11,600 |
| | Documentation | 1 | $ 10,000 | Year | $ 10,000 |
| | Van rental | 1 | $ 750 | Year | $ 750 |
| | Equipment rental | 1 | $ 2,400 | Year | $ 2,400 |
| | Analytical Costs | 1 | $ 3,093 | Year | $ 3,093 |

**Table 8-3**
**Alternative 4: In Situ Treatment/MNA- Cost Estimate Summary**

| Item | Item Description | Quantity | Unit Cost | Unit | Extension |
|---|---|---|---|---|---|
| | Travel & Incidental expenses | 1 | $ 600 | Year | $ 600 |
| | **Total O&M Annual Groundwater Monitoring Costs** | | | | **$ 28,443** |
| | | | | | |
| ***Periodic Review Reports*** | | 1 | $ 25,000 | Year | **$ 25,000** |
| | | | | | |
| | **Total Groundwater Monitoring O&M** | | | | **$ 284,430** |
| | **(Years 2014-2018, 2023, 2028, 2033, 2038, 2043)** | | | | |
| | **Total Periodic Review Report O&M** | | | | **$ 125,000** |
| | **(Years 2023, 2028, 2033, 2038, 2043)** | | | | |
| | Contingency (20%) | | | | $ 81,886 |
| | | | | | |
| | **Total O&M Costs** | | | | **$ 491,316** |
| | | | | | |
| | **COST TO IMPLEMENT REMEDIAL ACTION ALTERNATIVE** | | | **Assume:** | **$ 1,169,061** |

**Table 8-4**
**Alternative 5: Groundwater Treatment at Downgradient Public Wells/MNA - Cost Estimate Summary**

| Item | Item Description | Quantity | Unit Cost | Unit | Extension |
|---|---|---|---|---|---|
| | | | | | |
| **CAPITAL COSTS** | | | | | |
| ***Subcontractor Costs- System Construction*** | | | | | |
| | ***Treatment System Equipment, Installation and Startup*** | | | | |
| | *650 gpm Supply Well* | | | | |
| | *System* | 1 | $ 90,000 | ls | $ 90,000 |
| | *Installation&Startup* | 120 | $ 100 | hr | $ 12,000 |
| | *Materials* | 0.05 | $ 102,000 | % | $ 5,100 |
| | *Tax* | 1 | 8.63% | pct | $ 9,243 |
| | *Freight* | 1 | $ 5,000 | ls | $ 5,000 |
| | *Electrician* | 16 | $ 100 | hr | $ 1,600 |
| | *1500 gpm Supply Well* | | | | |
| | *System* | 1 | $ 100,000 | ls | $ 100,000 |
| | *Installation&Startup* | 120 | $ 100 | hr | $ 12,000 |
| | Materials | 0.05 | $ 112,000 | % | $ 5,600 |
| | *Tax* | 1 | 8.63% | pct | $ 10,149 |
| | *Freight* | 1 | $ 5,000 | ls | $ 5,000 |
| | *Electrician* | 16 | $ 100 | hr | $ 1,600 |
| | | | | | |
| | **Subtotal Subcontractor Costs** | | | | **$ 257,292** |
| | General Contractor (15% subcontractor) | | | | $ 38,594 |
| | | | | | |
| | **Subtotal Construction Costs (Subcontractor + Gen. Contr.)** | | | | **$ 295,885** |
| | Design Engineering (15% construction) | | | | $ 44,383 |
| | Contingency (20%) | | | | $ 59,177 |
| | | | | | |
| | **TOTAL CAPITAL COSTS** | | | | **$ 399,445** |
| **ANNUAL O&M COSTS** | | | | | |
| ***Annual System Operations*** | | | | | |
| | Energy | 109500 | $ 0.14 | kW | $ 15,330 |
| | Maintenance | 1 | $ 1,000 | ls | $ 1,000 |
| | ***Subtotal*** | | | | **$ 16,330** |
| ***Annual Groundwater Monitoring*** | | | | | |
| | Field Sampling Labor | 1 | $ 11,600 | Year | $ 11,600 |
| | Documentation | 1 | $ 10,000 | Year | $ 10,000 |
| | Van rental | 1 | $ 750 | Year | $ 750 |
| | Equipment rental | 1 | $ 2,400 | Year | $ 2,400 |
| | Analytical Costs (HCV Invoice) | 1 | $ 3,093 | Year | $ 3,093 |
| | Travel & Incidental expenses | 1 | $ 600 | Year | $ 600 |
| | ***Subtotal*** | | | | **$ 28,443** |
| ***Periodic Review Reports*** | | 1 | $ 25,000 | Year | **$ 25,000** |
| | | | | | |
| | **Total System Operations O&M (30 Years)** | | | | **$ 489,900** |
| | **Total Groundwater Monitoring O&M** | | | | **$ 199,101** |
| | **(Years 2013, 2018, 2023, 2028, 2033, 2038, 2043)** | | | | |
| | **Total Periodic Review Report O&M** | | | | **$ 175,000** |
| | **(Years 2013, 2018, 2023, 2028, 2033, 2038, 2043)** | | | | |
| | Contingency (20%) | | | | $ 172,800 |
| | | | | | |
| | **Total O&M Costs** | | | | **$ 1,036,801** |

**Table 8-4**

**Alternative 5: Groundwater Treatment at Downgradient Public Wells/MNA - Cost Estimate Summary**

| Item | Item Description | Quantity | Unit Cost | Unit | Extension |
|---|---|---|---|---|---|
| | | | | | |
| | **COST TO IMPLEMENT REMEDIAL ACTION ALTERNATIVE** | | | **Assume:** | **$ 1,436,246** |

Table 8-5

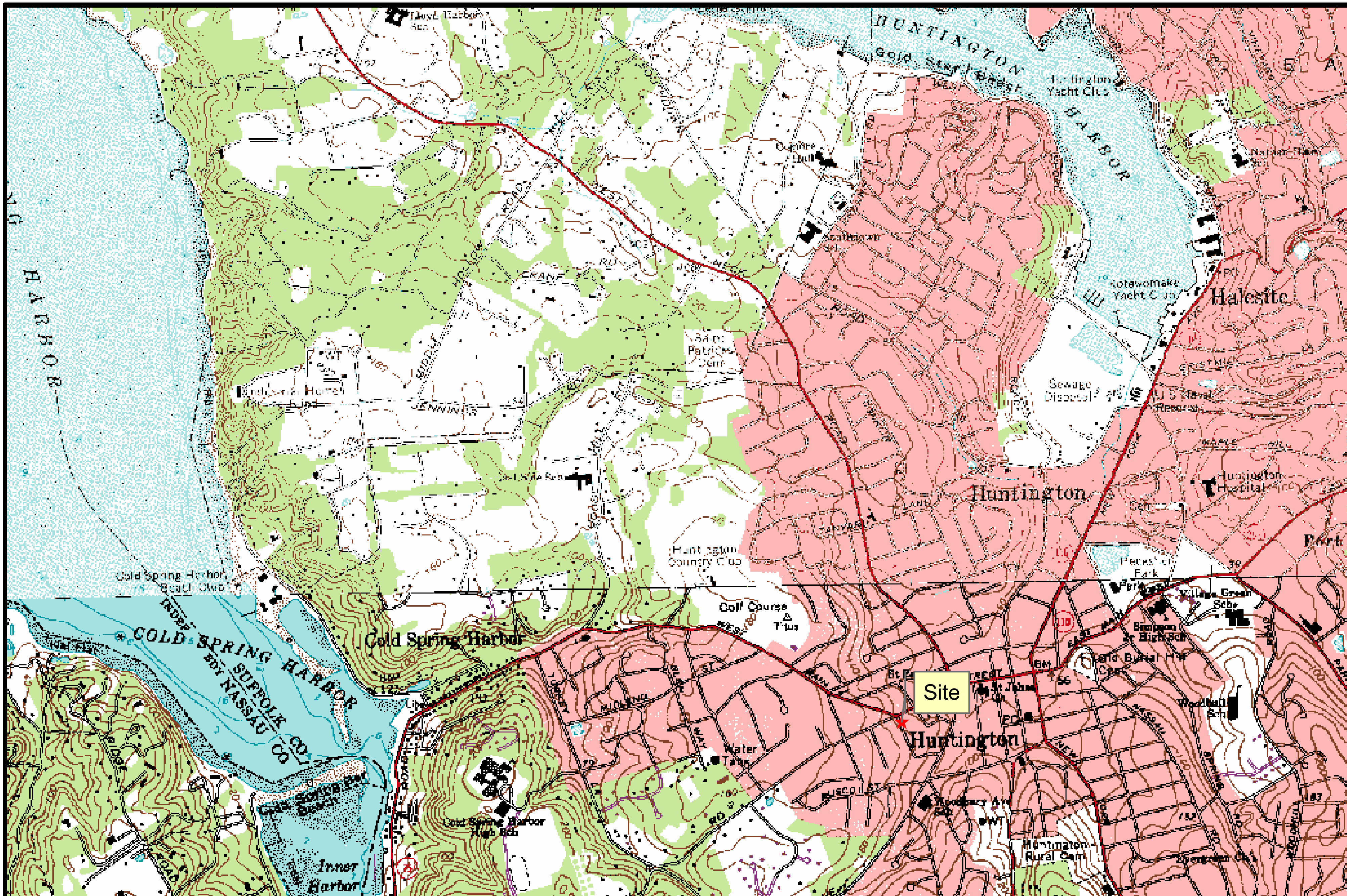
Detailed Evaluation of Alternatives Summary

| Alternative | Compliance with SCGs | Protection of Human Health and Environment | Reduction of Toxicity, Mobility, or Volume | Short-Term Effectiveness | Long-Term Effectiveness | Implementability | Cost Effectiveness | Land Use |
|---|---|---|---|---|---|---|---|---|
| Alternative 1 – No Action | Non-compliant | None; contamination remains in groundwater. | Little or none; some natural attenuation may occur. | No short term impacts. | Not effective; PCE levels expected to remain over SCG more than 30 years after release. | Readily implementable. | No costs. | None |
| Alternative 2 – No Action/ Monitored Natural Attenuation | Non-compliant | None; contamination remains in groundwater. | Little or none; some natural attenuation may occur. | No short term impacts. | Not effective; PCE levels expected to remain over SCG more than 30 years after release. | Readily implementable. | Low cost but limited effectiveness. | Environmental easement or access restrictions. |
| Alternative 3– Groundwater Extraction with Ex Situ Treatment by Air Stripping/ Monitored Natural Attenuation | Expected to meet SCGs throughout most of site but some areas of non-compliance likely to persist. | Expected to provide protection of human health and the environment. | Expected to achieve significant reductions in contaminant concentrations and toxicity. May also reduce off-site migration (to north) based on positioning of extraction wells. | Requires coordination with owners/tenants (dry cleaner and Getty Service Station) to minimize disruptions of current operations. | Expected to effectively lower PCE levels within 10 years. | Implementable. Coordination with government agencies and owners/tenants required. | High cost but effective remediation expected. | Environmental easement or access restrictions. |
| Alternative 4– In Situ Treatment/ Monitored Natural Attenuation | Expected to meet SCGs throughout most of site but some areas of non-compliance likely to persist. | Expected to provide protection of human health and the environment. | Expected to achieve significant reductions in contaminant concentrations and toxicity. | Requires coordination with owners/tenants (dry cleaner and Getty Service Station) to minimize disruptions of current operations. | Expected to effectively lower PCE levels within 10 years. | Implementable. Coordination with government agencies and owners/tenants required. | High cost but effective remediation expected. | Environmental easement or access restrictions. |

Table 8-5

Detailed Evaluation of Alternatives Summary

| Alternative | Compliance with SCGs | Protection of Human Health and Environment | Reduction of Toxicity, Mobility, or Volume | Short-Term Effectiveness | Long-Term Effectiveness | Implementability | Cost Effectiveness | Land Use |
|---|---|---|---|---|---|---|---|---|
| Alternative 5 – *Treatment at Downgradient Public Wells*/ Monitored Natural Attenuation | Expected to meet SCGs in the public water supply. Non-compliant at site. | Expected to provide protection of human health at downgradient public wells. In the vicinity of the site, none; contamination remains in groundwater. | Contaminant concentrations and toxicity to achieve levels less than NYS Class GA groundwater criteria at the public wells. In the vicinity of the site, little or none; some natural attenuation may occur. | Requires coordination with county to minimize disruptions of current operations. | Expected to effectively lower PCE levels at the downgradient public wells. | Implementable. Coordination with county representatives required. | Moderate cost but effectively mitigates risk from ingestion of public water but no remediation at site. | Environmental easement or access restrictions. |




**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 500 1,000 2,000
Feet

★ Site

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Site Location Map

Project No: 60133623
Figure No: 1-1
October 1, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70 Feet

Permanent Monitoring Well
Site
Approximate Groundwater Flow Direction

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Site Features

Project No: 60133623
Figure No: 1-2

October 1, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70 Feet

Shallow Wells
Site
PCE NYS Class GA Groundwater Criterion 5 ug/L
Extrapolation of 5 ug/L
Approximate Groundwater Flow Direction

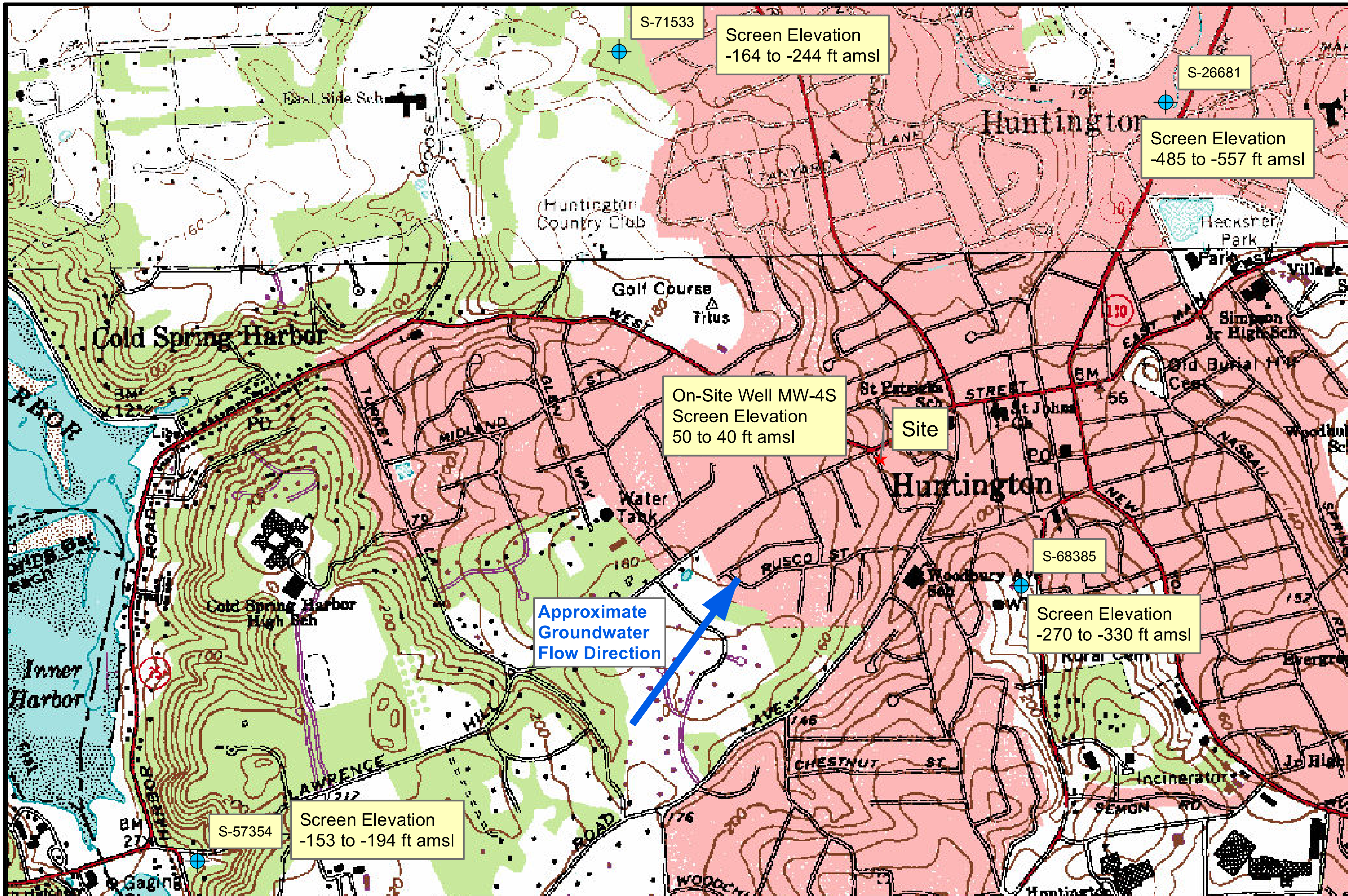
Labels show the assumed lowest elevation of the PCE plume (ft amsl).

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

PCE Concentrations - Shallow Wells

Project No: 60133623
Figure No: 4-1
July 29, 2010




**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 500 1,000 2,000 Feet

Site
Suffolk County Water Authority Potable Wells

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Suffolk County Water Authority
Potable Well Locations

Project No: 60133623
Figure No: 6-1
July 29, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 7.5 15 30
Feet

Treatment System
Extraction Wells
Injection Wells
Approximate Groundwater Flow Direction
Pipes
Site

Design assumes the Town of Huntington will permit a connection to the nearest stormwater catch basin. Approval is required during pre-design.

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Prepared by:
AECOM

Alternative 3 - Groundwater Extraction and Ex Situ Treatment/MNA Conceptual Layout

Project No: 60133623
Figure No: 7-1
October 1, 2010


**NYSDEC Site No. 152187**
Country Cleaners
Huntington, New York

0 17.5 35 70
Feet

⊗ Injection Points
★ Site
→ Approximate Groundwater Flow Direction

Prepared for:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Prepared by:
AECOM

Alternative 4 - In Situ Treatment/ MNA Conceptual Layout

Project No: 60133623
Figure No: 7-2
October 1, 2010

# Appendix A
# Remedial Alternative Supporting Information

# Air Stripper Calculations

**Table of Contents**

## 1 TECHNOLOGY DESCRIPTION

As the process name implies, volatile contaminants are “stripped” from the pumped groundwater and into the air. The two most commonly used air stripper systems are packed column and low profile. In a packed tower air stripping system, contaminated water flow down through a column that is filled with randomly packed or structured packing material while air is introduced below the packed bed and flows upward through the column countercurrent to the flow of water. In a low profile aeration system, contaminated water flows down over baffled aeration trays while air is forced upward through the perforations in the trays.

Air stripping is used to separate VOCs from water and is ineffective for inorganic contaminants. Henry's law constant is used to determine whether air stripping will be effective. Generally, organic compounds with constants greater than 0.01 atmospheres - $m^3$/mol are considered amenable to stripping. Some compounds that have been successfully separated from water using air stripping include BTEX, chloroethane, TCE, DCE, and PCE.

## 2 INPUTS AND ASSUMPTIONS

In order to model an air stripper and get a preliminary estimate of the size requirements several inputs must be determined. The main inputs listed in Table D-1 are the minimum and maximum volume of water to be air stripped, the minimum temperature of water, the maximum concentration of VOCs in the untreated water, the desired concentrations in the treated water and Henry’s constant for the VOCs. In addition, the operation schedule, range of air temperatures, and mineral content, must be considered. It is assumed to run full time for the entire year. The influent air conditions and mineral content are listed in Table D-1.

Table D-1 – Site Information

| System | Country On-site 1 | Country On-site 2 | Country On-site 3 | Country Supply Well 1 | Country Supply Well 2 |
|---|---|---|---|---|---|
| **Water Influent** | | | | | |
| Max PCE (ug/L) | 700 | 700 | 700 | 10 | 10 |
| Min Liquid Temp (deg.F) | 60 | 60 | 60 | 60 | 60 |
| Flow Rate (gpm) | 200 | 1,000 | 2,000 | 650 | 1500 |
| **Water Effluent** | | | | | |
| PCE (ug/L) less than | 5 | 5 | 5 | 5 | 5 |
| **Air Influent** | | | | | |
| PCE less than | 0 | 0 | 0 | 0 | 0 |
| **Water Quality** | | | | | |
| Iron (unfiltered) ug/L | 340-500 | 340-500 | 340-500 | | |
| Iron (filtered) ug/L | <150 | <150 | <150 | <100 | <100 |
| Manganese (unfiltered) ug/L | <25 to 28 | <25 to 28 | <25 to 28 | | |
| Manganese (filtered) ug/L | <25 | <25 | <25 | <1 | <1 |
| Calcium ug/L | | | | 7,000-10,000 | 7,000-10,000 |
| Magnesium ug/L | | | | 3,000-4,000 | 3,000-4,000 |

### 2.1 Air Flow Rates

The air flow rate for a given VOC concentration is generally lower for a packed column air stripper than a low profile air stripper. The range of air flow rates for the two types of air strippers is 5 to 250 cfm/$ft^2$ for a packed column and 30 to 60 cfm/$ft^2$ (US Army Corps of

Engineers [USACE], 2001). Thus the tray area for a low profile air stripper will be greater than the tower cross sectional area for the same conditions. For both types of air strippers if the air flow rate is too high flooding may occur, in which case the water floods the top of the air stripper. There is a narrow range of possible air flow rates for the low profile air stripper since a rate that is too high will force the air through the holes in the trays too quickly forming a jet and dispersing the water and if the air flow rate is too low the water will drip through the holes in the trays. Both of these conditions negatively affect the efficiency of the stripper.

### 2.2 Water Flow Rates

Based on the hydraulic conductivity of the area and the desired capture water flow rates ranging from 200 to 2,000 gpm were examined. The range of water flow rates for the two types of air strippers is 20 to 45 gpm/ft$^2$ for a packed column and 1 to 15 cfm/ft$^2$ (USACE, 2001).

### 2.3 Other Inputs

All the values used in the calculations are provided in the attached calculations sheets.

## 3 RESULTS

For the packed column analysis, the on-site well packing depths ranged from 19 to 38 ft with diameters ranging from 3 to 10 ft. The supply well packed column packing depths ranged from 3 to 5 ft with diameters ranging from 5 to 9 ft. The on-site wells would require low profile systems with 4 to 5 trays with areas ranging from 7 to 220 ft$^2$. The supply wells would require low profile systems with at least one tray with areas ranging from 22 to 165 ft$^2$.

For the emissions analysis, for an added measure of conservatism, the air stripper is assumed to be 100% efficient, and therefore, all of the VOCs are emitted into the air. This analysis uses worst-case values. Actual air emissions will be less than in this conservative analysis. The on-site wells were estimated to emit between 0.3 and 3 tons per year.

## 4 FURTHER CONSIDERATIONS

Air strippers may become fouled by mineral deposits. In cases of high metal concentrations pre-treatmend of the water prior to stripping may be necessary. In general fouling is a concern when the calcium levels are greater than 40 mg/L, iron is greater than 0.3 mg/L, magnesium is greater than 10 mg/L or manganese is greater than 0.05 mg/L. Fouling may also occur if there is excessive biological growth. After fouling has occurred and compromised the effectiveness of the air stripper, maintenance is required. For packed column air strippers the packing must eigher be removed for cleaning or washed with an acid solution. Since these operations are both costly, low profile air strippers are often desirable when fouling is expected (USACE, 2001). Low profiles generally are easier to clean after fouling.

The following factors may limit the applicability and effectiveness of the process:

- The potential exists for inorganic (e.g., iron greater than 5 ppm, hardness greater than 800 ppm) or biological fouling of the equipment, requiring pretreatment or periodic column cleaning.
- Off-gases may require treatment based on mass emission rate.

## 5 REFERENCES

US Army Corps of Engineers, 2001. Engineer Design Guide, DG 1110-1-3, Engineering and Design-Air Stripping, October 31, 2001.

| System | Country On-site 1 | Country On-site 2 | Country On-site 3 | Country Supply Well 1 | Country Supply Well 2 |
|---|---|---|---|---|---|
| **Water Influent** | | | | | |
| Max PCE (ug/L) | 700 | 700 | 700 | 10 | 10 |
| Min Liquid Temp (deg.F) | 60 | 60 | 60 | 60 | 60 |
| Flow Rate (gpm) | 200 | 1,000 | 2,000 | 650 | 1500 |
| **Water Effluent** | | | | | |
| PCE (ug/L) less than | 5 | 5 | 5 | 5 | 5 |
| **Air Influent** | | | | | |
| PCE less than | 0 | 0 | 0 | 0 | 0 |
| **Water Quality** | | | | | |
| Iron (unfiltered) ug/L | 340-500 | 340-500 | 340-500 | | |
| Iron (filtered) ug/L | <150 | <150 | <150 | <100 | <100 |
| Manganese (unfiltered) ug/L | <25 to 28 | <25 to 28 | <25 to 28 | | |
| Manganese (filtered) ug/L | <25 | <25 | <25 | <1 | <1 |
| Calcium ug/L | | | | 7,000-10,000 | 7,000-10,000 |
| Magnesium ug/L | | | | 3,000-4,000 | 3,000-4,000 |
| | | | | | |
| **Air Emissions (tons/year)** | 0.307 | 1.535 | 3.070 | 0.014 | 0.033 |

| | |
|---|---|
| PCE Henry's Constant H (atm) @ 60F = | 800 |
| PCE Henry's Constant H (unitless) @ 60F = | 0.6 |

| | | Packed Column | Low Profile |
|---|---|---|---|
| min air flow rate | cfm/ft$^2$ | 5 | 30 |
| max air flow rate | cfm/ft$^2$ | 250 | 60 |
| min water flow rate | gpm/ft$^2$ | 20 | 1 |
| max water flow rate | gpm/ft$^2$ | 45 | 15 |
| Min A/W ratio | cfm/gpm | 0.11 | 2.00 |
| Max A/W ratio | cfm/gpm | 12.50 | 7.50 |

56.1

**PACKED COLUMN EQUATIONS (page 1 of 2)**

From USACE, 2001.

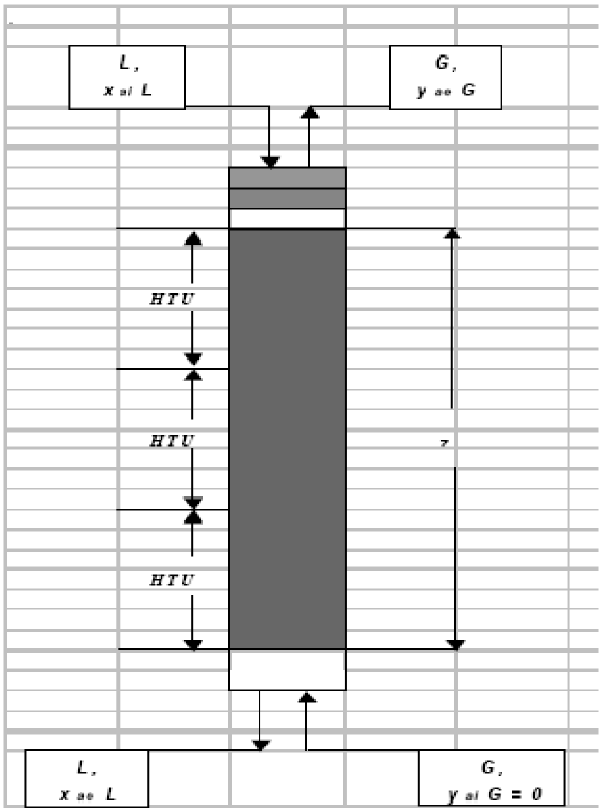



**Figure D-1. Random "dumped" packed tower.**

**Table D-5**
**Water at 20°C (293.16 K)**

| | | |
|---|---|---|
| $s$ | $= 0.072764 \dfrac{\text{N}}{\text{m}} = \dfrac{\text{kg}}{\text{s}^2}$ | liquid surfacetension |
| $\mu_L$ | $= 0.0010042 \dfrac{\text{kg}}{\text{m s}}$ | liquidviscosity |
| $\rho_L$ | $= 998.20 \dfrac{\text{kg}}{\text{m}^3}$ | liquid density |

**Table D-7**
**Air at 20°C (293.16 K) and 1 atm**

| | | |
|---|---|---|
| $\mu_G$ | $= 1.773 \times 10^{-5} \dfrac{\text{kg}}{\text{m s}}$ | gasviscosity |
| $\rho_G$ | $= 1.2046 \dfrac{\text{kg}}{\text{m}^3}$ | gasdensity |

**Table D-6**
**Packing Characteristics**

| | | |
|---|---|---|
| $d_p$ | $= 0.0508$ m | nominal diameter |
| $a_t$ | $= 157 \dfrac{\text{m}^2}{\text{m}^3}$ | totalsurfacearea |
| $s_c$ | $= 0.033 \dfrac{\text{kg}}{\text{s}^2}$ | criticalsurfacetension for polyethylenepacking |
| $c_f$ | $= 15$ | packing factor |

**PACKED COLUMN EQUATIONS (page 2 of 2)**

From USACE, 2001.

Assuming influent air has not PCE:

$$\frac{Q_{G\,min}}{Q_L} = \frac{(C_{ai} - C_{ae})}{H_a C_{ai}}$$

$$L = \rho_L \frac{Q_L}{A}\left[\frac{kg}{m^2\ s}\right]$$

$$N_{Re} = \frac{V_L \rho_L}{a_t\ \mu_L} \quad \text{(Reynolds Number)}$$

$$N_{Fr} = \frac{a_t V_L^2}{g_c} \quad \text{(FroudeNumber)}$$

$$N_{We} = \left(\frac{1}{a_t}\right)\frac{V_L^2 \rho_L}{g_c s} \quad \text{(Weber Number)}$$

Calculate the wetted area of the packing, $a_w$ from the dimensionless relation:

$$\frac{a_w}{a_t} = 1 - \exp\left[-1.45\left(\frac{s_c}{s}\right)^{0.75}\left(N_{Re}^{\ 0.1} N_{Fr}^{\ -0.05} N_{We}^{\ 0.2}\right)\right]$$

*k*. Calculate the liquid phase mass transfer coefficient, Onda $K_L$ from the following relationship:

$$K_L\left(\frac{\rho_L}{\mu_L g_c}\right)^{\frac{1}{3}} = 0.0051\left(\frac{V_L\ \rho_L}{a_w\ \mu_L}\right)^{\frac{2}{3}}\left(\frac{\mu_L}{\rho_L D_L}\right)^{-0.5}\left(a_t d_p\right)^{0.4}$$

*l*. Calculate the gas phase mass transfer coefficient, Onda $K_G$, using a stripping factor ($R$) between 2 and 5. Try $R = 2.5$ if air pollution control is required, $R = 4.5$ if it isn't.

$$\frac{K_G}{(a_t D_G)} = 5.23\left(\frac{G}{a_t\ \mu_G}\right)^{0.7}\left(\frac{\mu_G}{\rho_G D_G}\right)^{\frac{1}{3}}\left(a_t d_p\right)^{-2.0}$$

*q*. Calculate the overall mass transfer coefficient, Onda $K_{LA}$.

$$\frac{1}{K_{LA}} = \frac{1}{H'_a\ K_G\ a_w} + \frac{1}{K_L\ a_w}$$

$$HTU = \frac{V_L}{K_{LA}}$$

$$NTU = \left(\frac{R}{R-1}\right)\ln\left(\frac{\left[\left(\frac{x_{ai}}{x_{ae}}\right)(R-1)\right]+1}{R}\right)$$

$$Z = NTU \times HTU \ \text{packingdepth[m]}$$

**LOW PROFILE EQUATIONS (page 1 of )**
From USACE, 2001.

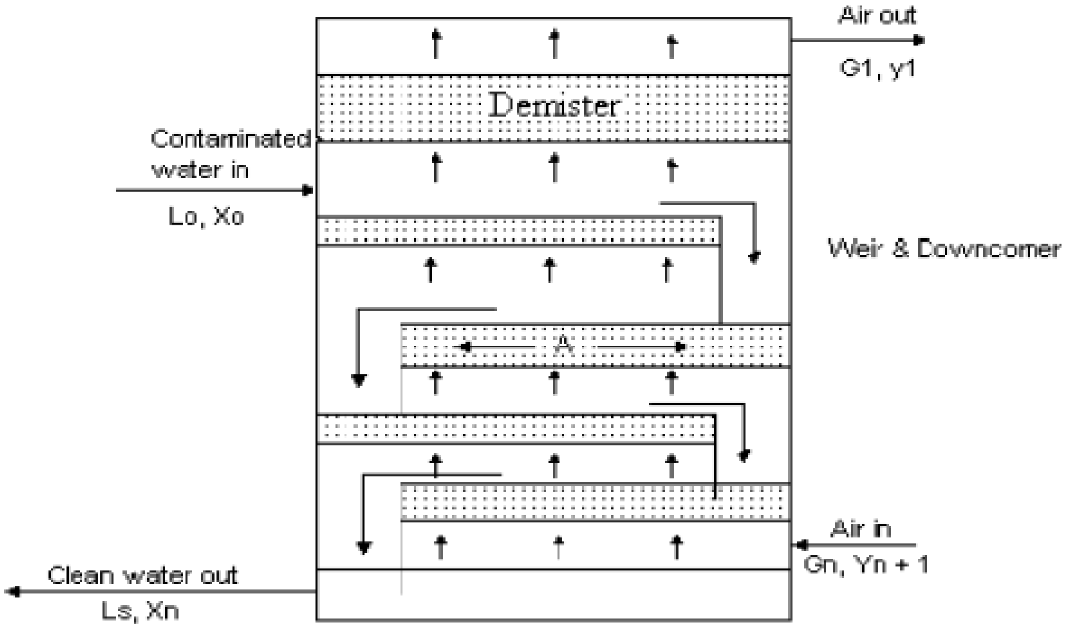



**Figure C-1. Cross-sectional area of perforated plate section.**

$$N_{\text{theoretical}} = \frac{\log\left[\frac{\left(X_0 - \frac{Y_{n+1}}{m}\right)}{\left(X_n - \frac{Y_{n+1}}{m}\right)}\left(1-\frac{1}{S}\right) + \frac{1}{S}\right]}{\log S}$$

where

| | | |
|---|---|---|
| $X_0$ | = | concentration of contaminant (TCE) in the inlet water phase: 10 mg/L |
| $X_n$ | = | concentration of contaminant (TCE) in the treated water phase: 0.1 mg/L |
| $N$ | = | number of theoretical plates. Assumes that the liquid on each plate is completely mixed and that the vapor leaving the plates is in equilibrium with the liquid. |
| $H$ | = | Henry's Constant (atm) |
| $m$ | = | slope of equilibrium curve ($H/Pt$) |
| $G$ | = | lb-moles air/min |
| $L$ | = | lb-moles of water/min |
| $S$ | = | stripping factor ($mG/L$) |
| $Pt$ | = | ambient pressure (atm) |
| $Y_{n+1}$ | = | concentration of volatiles in the air entering the air stripper. |

| | | Reference Values | Country 1-lower | Country 1-upper | Country 2-lower | Country 2-upper | Country 3-lower | Country 3-upper | Country SW1-lower |
|---|---|---|---|---|---|---|---|---|---|
| Preliminary Stripper Cross Section | | | | | | | | | |
| water flow rate per cross section | $gpm/ft^2$ | | 26 | 45 | 26 | 45 | 26 | 45 | 26 |
| Water flow rate | gpm | | 200 | 200 | 1,000 | 1,000 | 2,000 | 2,000 | 650 |
| total cross section | ft2 | | 7.7 | 4.4 | 38.5 | 22.2 | 76.9 | 44.4 | 25.0 |
| Number of Strippers | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| prelim cross section per stripper | ft2 | | 7.7 | 4.4 | 38.5 | 22.2 | 76.9 | 44.4 | 25.0 |
| prelim diameter of strippers | ft | | 3.13 | 2.38 | 7.00 | 5.32 | 9.90 | 7.52 | 5.64 |
| Standard Diameter Stripper | | | | | | | | | |
| **diameter (d)** | **ft** | | **4** | **3** | **7** | **6** | **10** | **8** | **6** |
| packing material diameter | in | | 4 | 3 | 7 | 6 | 10 | 8 | 6 |
| water flow rate per stripper (QL) | gpm | | 200 | 200 | 1000 | 1000 | 2000 | 2000 | 650 |
| cross section per stripper (A) | ft2 | | 12.6 | 7.1 | 38.5 | 28.3 | 78.5 | 50.3 | 28.3 |
| water flow rate per cross section (VL) | gpm/ft2 | 20-45 | 15.9 | 28.3 | 26.0 | 35.4 | 25.5 | 39.8 | 23.0 |
| | | | | | | | | | |
| water flow rate per stripper (QL) | m3/s | | 0.0126 | 0.0126 | 0.0631 | 0.0631 | 0.1262 | 0.1262 | 0.0410 |
| diameter (d) | m3/s | | 1.22 | 0.91 | 2.13 | 1.83 | 3.05 | 2.44 | 1.83 |
| cross section per stripper (A) | m2 | | 1.17 | 0.66 | 3.58 | 2.63 | 7.30 | 4.67 | 2.63 |
| water flow rate per cross section (VL) | m/s | | 0.0108 | 0.0192 | 0.0176 | 0.0240 | 0.0173 | 0.0270 | 0.0156 |
| | | | | | | | | | |
| Untreated Water Conc. (Cai) | ug/L | | 700 | 700 | 700 | 700 | 700 | 700 | 10 |
| Treated Water Conc. (Cae) | ug/L | | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Henry's Constant (H') | unitless | 0.6 | | | | | | | |
| A/W ratio minimum (Qgmin/QL) | m3/m3 | | 1.65 | 1.65 | 1.65 | 1.65 | 1.65 | 1.65 | 0.83 |
| | | | | | | | | | |
| gravitational constant (gc) | m/s2 | 9.807 | | | | | | | |
| | | | | | | | | | |
| liquid surfacetension of water at 60 F (s) | kg/s2 | 0.072764 | | | | | | | |
| liquid viscosity of water at 60 F ($\mu_L$) | kg/ms | 0.0010042 | | | | | | | |
| liquid density of water at 60 F ($\rho_L$) | kg/m3 | 998.2 | | | | | | | |
| Liquid Diffusivity of PCE at 60 F (DL) | m2/s | 5.86E-10 | | | | | | | |
| | | | | | | | | | |
| nominal diameter ($d_p$) | m | 0.0508 | | | | | | | |
| total surface area ($a_t$) | m2/m3 | 157 | | | | | | | |
| critical surface tension for polyethylene packing ($s_c$) | kg/s2 | 0.033 | | | | | | | |
| packing factor ($c_f$) | unitless | 15 | | | | | | | |
| | | | | | | | | | |
| Liquid mass velocity | kg/m2s | | 10.8 | 19.2 | 17.6 | 24.0 | 17.3 | 27.0 | 15.6 |
| | | | | | | | | | |
| Reynolds Number (Nre) | | | 68.4 | 121.7 | 111.7 | 152.1 | 109.5 | 171.1 | 98.8 |
| Nre^0.1 | | | 1.53 | 1.62 | 1.60 | 1.65 | 1.60 | 1.67 | 1.58 |

| | | Reference Values | Country 1-lower | Country 1-upper | Country 2-lower | Country 2-upper | Country 3-lower | Country 3-upper | Country SW1-lower |
|---|---|---|---|---|---|---|---|---|---|
| Froude Number (NFr) | | | 0.00187 | 0.00591 | 0.00498 | 0.00924 | 0.00479 | 0.01169 | 0.00390 |
| NFr^-0.05 | | | 1.37 | 1.29 | 1.30 | 1.26 | 1.31 | 1.25 | 1.32 |
| Weber Number (Nwe) | | | 0.00104 | 0.00329 | 0.00277 | 0.00514 | 0.00266 | 0.00651 | 0.00217 |
| Nwe^0.2 | | | 0.253 | 0.319 | 0.308 | 0.348 | 0.306 | 0.365 | 0.293 |
| wetted area (aw) | m2/m3 | | 54.2 | 64.9 | 63.3 | 69.4 | 62.9 | 71.8 | 60.9 |
| Liquid phase mass transfer coefficient (KL) | m/s | | 0.00021 | 0.00027 | 0.00026 | 0.00030 | 0.00026 | 0.00031 | 0.00024 |
| gasviscosity of air at 60 F ($\mu_G$) | kg/ms | 1.77E-05 | | | | | | | |
| gas density of air at 60 F ($\rho_G$) | kg/m3 | 1.2046 | | | | | | | |
| Gas Diffusivity of PCE at 60 F (Dg) | m2/s | 7.13E-06 | | | | | | | |
| Gas flow rate (VGmin=QGmin/QL*VL) | m/s | | 0.018 | 0.032 | 0.029 | 0.040 | 0.029 | 0.045 | 0.013 |
| Stripping Factor ( R) | unitless | 2.5 to 4.5 or 10 | 15 | 2.5 | 15 | 2.5 | 15 | 2.5 | 15 |
| Gas flow rate (VG=Vgmin*R) | m/s | | 0.268 | 0.079 | 0.438 | 0.099 | 0.429 | 0.112 | 0.195 |
| Gas flow rate (QG) | m3/s | | 0.313 | 0.052 | 1.566 | 0.261 | 3.132 | 0.522 | 0.513 |
| Gas flow rate (G=VG*ρG) | kg/sm2 | | 0.323 | 0.096 | 0.528 | 0.120 | 0.517 | 0.135 | 0.235 |
| Gas phase mass transfer coefficient (KG) | m/s | | 3.27E-03 | 1.39E-03 | 4.61E-03 | 1.63E-03 | 4.54E-03 | 1.77E-03 | 2.62E-03 |
| Overall Mass Transfer Coefficient (KLA) | s^-1 | | 0.010 | 0.013 | 0.015 | 0.016 | 0.015 | 0.017 | 0.013 |
| Height of transfer unit (HTU) | m | | 1.1 | 1.5 | 1.2 | 1.5 | 1.2 | 1.6 | 1.2 |
| Number of Transfer Units (NTU) | unitless | | 5.2 | 7.4 | 5.2 | 7.4 | 5.2 | 7.4 | 0.7 |
| Packing depth (Z) | m | | 5.6 | 10.8 | 6.2 | 11.2 | 6.2 | 11.5 | 0.9 |
| **Packing depth (Z)** | **ft** | | **18.3** | **35.4** | **20.3** | **36.8** | **20.2** | **37.6** | **2.8** |
| Air to Water Ratio (A/W) | m3 air/m3 H2O | | 24.8 | 4.1 | 24.8 | 4.1 | 24.8 | 4.1 | 12.5 |
| Air to Water Ratio (A/W) | cfm/gpm | | 3.3183305 | 0.5530551 | 3.3183305 | 0.5530551 | 3.3183305 | 0.5530551 | 1.671101673 |
| Air to Water Ratio (A/W) | cfm/cfm | | 24.821112 | 4.136852 | 24.821112 | 4.136852 | 24.821112 | 4.136852 | 12.49984051 |
| Air flow rate | cfm | | 663.66609 | 110.61102 | 3318.3305 | 553.05508 | 6636.6609 | 1106.1102 | 1086.216087 |
| Air flow rate (cfm/ft2 packed column) | | | 52.81287 | 15.648258 | 86.225093 | 19.560322 | 84.500591 | 22.005362 | 38.41703545 |
| Water flow rate (gpm/ft2 packed column) | | | 15.915494 | 28.294212 | 25.984481 | 35.367765 | 25.464791 | 39.788736 | 22.98904734 |

| | | Country SW1-upper | Country SW2-lower | Country SW2-upper |
|---|---|---|---|---|
| Preliminary Stripper Cross Section | | | | |
| water flow rate per cross section | gpm/ft$^2$ | 45 | 26 | 45 |
| Water flow rate | gpm | 650 | 1,500 | 1,500 |
| total cross section | ft2 | 14.4 | 57.7 | 33.3 |
| Number of Strippers | | 1 | 1 | 1 |
| prelim cross section per stripper | ft2 | 14.4 | 57.7 | 33.3 |
| prelim diameter of strippers | ft | 4.29 | 8.57 | 6.51 |
| Standard Diameter Stripper | | | | |
| **diameter (d)** | **ft** | **5** | **9** | **7** |
| packing material diameter | in | 5 | 9 | 7 |
| water flow rate per stripper (QL) | gpm | 650 | 1500 | 1500 |
| cross section per stripper (A) | ft2 | 19.6 | 63.6 | 38.5 |
| water flow rate per cross section (VL) | gpm/ft2 | 33.1 | 23.6 | 39.0 |
| | | | | |
| water flow rate per stripper (QL) | m3/s | 0.0410 | 0.0946 | 0.0946 |
| diameter (d) | m3/s | 1.52 | 2.74 | 2.13 |
| cross section per stripper (A) | m2 | 1.82 | 5.91 | 3.58 |
| water flow rate per cross section (VL) | m/s | 0.0225 | 0.0160 | 0.0265 |
| | | | | |
| Untreated Water Conc. (Cai) | ug/L | 10 | 10 | 10 |
| Treated Water Conc. (Cae) | ug/L | 5 | 5 | 5 |
| Henry's Constant (H') | unitless | | | |
| A/W ratio minimum (Qgmin/QL) | m3/m3 | 0.83 | 0.83 | 0.83 |
| | | | | |
| gravitational constant (gc) | m/s2 | | | |
| | | | | |
| liquid surfacetension of water at 60 F (s) | kg/s2 | | | |
| liquid viscosity of water at 60 F ($\mu_L$) | kg/ms | | | |
| liquid density of water at 60 F ($\rho_L$) | kg/m3 | | | |
| Liquid Diffusivity of PCE at 60 F (DL) | m2/s | | | |
| | | | | |
| nominal diameter ($d_p$) | m | | | |
| total surface area ($a_t$) | m2/m3 | | | |
| critical surface tension for polyethylene packing ($s_c$) | kg/s2 | | | |
| packing factor ($c_f$) | unitless | | | |
| | | | | |
| Liquid mass velocity | kg/m2s | 22.4 | 16.0 | 26.4 |
| | | | | |
| Reynolds Number (Nre) | | 142.3 | 101.4 | 167.6 |
| Nre^0.1 | | 1.64 | 1.59 | 1.67 |

| | | Country SW1-upper | Country SW2-lower | Country SW2-upper |
|---|---|---|---|---|
| Froude Number (NFr) | | 0.00809 | 0.00410 | 0.01122 |
| NFr^-0.05 | | 1.27 | 1.32 | 1.25 |
| | | | | |
| Weber Number (Nwe) | | 0.00450 | 0.00228 | 0.00624 |
| Nwe^0.2 | | 0.339 | 0.296 | 0.362 |
| | | | | |
| wetted area (aw) | m2/m3 | 68.0 | 61.4 | 71.4 |
| | | | | |
| Liquid phase mass transfer coefficient (KL) | m/s | 0.00029 | 0.00025 | 0.00031 |
| | | | | |
| gasviscosity of air at 60 F ($\mu_G$) | kg/ms | | | |
| gas density of air at 60 F ($\rho_G$) | kg/m3 | | | |
| | | | | |
| Gas Diffusivity of PCE at 60 F (Dg) | m2/s | | | |
| | | | | |
| Gas flow rate (VGmin=QGmin/QL*VL) | m/s | 0.019 | 0.013 | 0.022 |
| Stripping Factor ( R) | unitless | 2.5 | 15 | 2.5 |
| Gas flow rate (VG=Vgmin*R) | m/s | 0.047 | 0.200 | 0.055 |
| Gas flow rate (QG) | m3/s | 0.085 | 1.183 | 0.197 |
| Gas flow rate (G=VG*ρG) | kg/sm2 | 0.056 | 0.241 | 0.066 |
| | | | | |
| Gas phase mass transfer coefficient (KG) | m/s | 9.63E-04 | 2.66E-03 | 1.08E-03 |
| | | | | |
| Overall Mass Transfer Coefficient (KLA) | s^-1 | 0.013 | 0.013 | 0.015 |
| | | | | |
| Height of transfer unit (HTU) | m | 1.7 | 1.2 | 1.8 |
| | | | | |
| Number of Transfer Units (NTU) | unitless | 0.8 | 0.7 | 0.8 |
| | | | | |
| Packing depth (Z) | m | 1.3 | 0.9 | 1.4 |
| **Packing depth (Z)** | **ft** | **4.4** | **2.8** | **4.5** |
| | | | | |
| Air to Water Ratio (A/W) | m3 air/m3 H2O | 2.1 | 12.5 | 2.1 |
| Air to Water Ratio (A/W) | cfm/gpm | 0.278516945 | 1.671101673 | 0.278516945 |
| Air to Water Ratio (A/W) | cfm/cfm | 2.083306752 | 12.49984051 | 2.083306752 |
| | | | | |
| Air flow rate | cfm | 181.0360145 | 2506.652509 | 417.7754181 |
| Air flow rate (cfm/ft2 packed column) | | 9.220088508 | 39.40208764 | 10.85567721 |
| Water flow rate (gpm/ft2 packed column) | | 33.10422816 | 23.57851009 | 38.97672076 |

| Scenario | | Country 1-lower | Country 1-upper | Country 2-lower | Country 2-upper | Country 3-lower | Country 3-upper | Country SW1-lower | Country SW1-upper |
|---|---|---|---|---|---|---|---|---|---|
| Untreated Water Conc. (Xo) | ug/L | 700 | 700 | 700 | 700 | 700 | 700 | 10 | 10 |
| Treated Water Conc. (Xn) | ug/L | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Air In conc. (Yn+1) | ug/L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Henry's Constant (H) | atm | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Ambient Pressur (Pt) | atm | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Slope of Equilibrium curve (m=H/Pt) | | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Water Flowrate (L) | gpm | 200 | 200 | 1,000 | 1,000 | 2,000 | 2,000 | 650 | 650 |
| Conversion to lb-mol/min | | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 |
| L | lb-mol/min | 92.68 | 92.68 | 463.39 | 463.39 | 926.78 | 926.78 | 301.20 | 301.20 |
| A/W Ratio | cfm/gpm | 2.00 | 3.30 | 2.00 | 3.30 | 2.00 | 3.30 | 2.00 | 3.30 |
| Air Flowrate (G) | cfm | 400 | 660 | 2,000 | 3,300 | 4,000 | 6,600 | 1,300 | 2,145 |
| Conversion to lb-mol/min | | 0.0026 | 0.0026 | 0.0026 | 0.0026 | 0.0026 | 0.0026 | 0.0026 | 0.0026 |
| G | lb-mol/min | 1.05 | 1.74 | 5.26 | 8.68 | 10.53 | 17.37 | 3.42 | 5.64 |
| Stripping Factor (S) | | 9.09 | 14.99 | 9.09 | 14.99 | 9.09 | 14.99 | 9.09 | 14.99 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| N(theoretical) | | 2.19 | 1.80 | 2.19 | 1.80 | 2.19 | 1.80 | 0.29 | 0.24 |
| Tray Efficiency E | | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **N(actual)** | | **5** | **4** | **5** | **4** | **5** | **4** | **1** | **1** |
| Exchange Tray area min | ft2 | 7 | 11 | 33 | 55 | 67 | 110 | 22 | 36 |
| Exchange Tray area max | ft2 | 13 | 22 | 67 | 110 | 133 | 220 | 43 | 72 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Tray Area with weir/downcomer | ft2 | 8 | 13.2 | 40 | 66 | 80 | 132 | 26 | 42.9 |
| Tray Area with weir/downcomer | ft2 | 16 | 26.4 | 80 | 132 | 160 | 264 | 52 | 85.8 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| pressure drop per tray (estimated) | in wc | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| pressure drop across piping (estimated) | in wc | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Total pressure drop | in wc | 30 | 26 | 30 | 26 | 30 | 26 | 14 | 14 |

| Scenario | | Country SW2-lower | Country SW2-upper |
|---|---|---|---|
| Untreated Water Conc. (Xo) | ug/L | 10 | 10 |
| Treated Water Conc. (Xn) | ug/L | 5 | 5 |
| Air In conc. (Yn+1) | ug/L | 0 | 0 |
| Henry's Constant (H) | atm | 800 | 800 |
| Ambient Pressur (Pt) | atm | 1 | 1 |
| Slope of Equilibrium curve (m=H/Pt) | | 800 | 800 |
| Water Flowrate (L) | gpm | 1,500 | 1,500 |
| | Conversion to lb-mol/min | 0.46 | 0.46 |
| L | lb-mol/min | 695.08 | 695.08 |
| A/W Ratio | cfm/gpm | 2.00 | 3.30 |
| Air Flowrate (G) | cfm | 3,000 | 4,950 |
| | Conversion to lb-mol/min | 0.0026 | 0.0026 |
| G | lb-mol/min | 7.89 | 13.03 |
| Stripping Factor (S) | | 9.09 | 14.99 |

| | | | |
|---|---|---|---|
| N(theoretical) | | 0.29 | 0.24 |
| Tray Efficiency E | | 0.5 | 0.5 |
| **N(actual)** | | **1** | **1** |
| Exchange Tray area min | ft2 | 50 | 83 |
| Exchange Tray area max | ft2 | 100 | 165 |

| | | | |
|---|---|---|---|
| Tray Area with weir/downcomer | ft2 | 60 | 99 |
| Tray Area with weir/downcomer | ft2 | 120 | 198 |

| | | | |
|---|---|---|---|
| pressure drop per tray (estimated) | in wc | 4 | 4 |
| pressure drop across piping (estimated) | in wc | 10 | 10 |
| Total pressure drop | in wc | 14 | 14 |

| GW TECHNOLOGY: | Ex Situ Air Stripping--Packed Tower | | | |
|---|---|---|---|---|
| | | | | |
| RACER PARAMETERS | Scenario A | Scenario B | Scenario C | Scenario D |
| | Small Site | | Large Site | |
| Remedial Action: | Easy | Difficult | Easy | Difficult |
| Media/Waste Type | Groundwater | Groundwater | Groundwater | Groundwater |
| Contaminant | VOCs | VOCs | VOCs | VOCs |
| Approach | Ex Situ | Ex Situ | Ex Situ | Ex Situ |
| System Definition: | | | | |
| Type of Air Stripper | Packed Tower | Packed Tower | Packed Tower | Packed Tower |
| Influent Flow Rate (GPM) | 50 | 50 | 500 | 500 |
| Volatility of Contaminants | High | Low | High | Low |
| Removal Percentage | 98% | 98% | 98% | 98% |
| Safety Level | D | D | D | D |
| Configuration (Packed Tower): | | | | |
| Number of Towers in Series | 1 | 2 | 1 | 2 |
| Packed Tower Diameter (ft) | 2 | 2 | 6 | 6 |
| Packed Tower Height (ft) | 25 | 20 | 25 | 20 |
| Low Profile Stripper Number of Trays | 0 | 0 | 0 | 0 |
| Number of Strippers | 1 | 1 | 1 | 1 |
| Configuration (Low profile tray stack): | | | | |
| Packed Tower Diameter (ft) | N/A | N/A | N/A | N/A |
| Packed Tower Height (ft) | N/A | N/A | N/A | N/A |
| Low Profile Stripper Number of Trays | N/A | N/A | N/A | N/A |
| Number of Strippers | N/A | N/A | N/A | N/A |
| O&M: | | | | |
| Assign Startup Costs | Exclude from estimate | Exclude from estimate | Exclude from estimate | Exclude from estimate |
| Duration (YR) | 2 | 2 | 5 | 5 |
| Treatment Train Systems Maintenance Level | Moderate | Moderate | Moderate | Moderate |
| Sampling Frequency | Monthly | Monthly | Monthly | Monthly |
| | | | | |
| Ex Situ Air Stripping Marked-up Costs | $56,304 | $105,433 | $124,371 | $301,156 |
| | | | | |
| Additional Costs: | | | | |
| O&M | $60,346 | $60,346 | $388,942 | $388,942 |
| Remedial Design (10% or 10K) | $6,756 | $11,598 | $13,681 | $30,116 |
| | | | | |
| TOTAL MARKED-UP COSTS | $123,406 | $177,377 | $526,994 | $720,214 |
| | | | | |
| GALLONS TREATED | 52,560,000 | 52,560,000 | 1,314,000,000 | 1,314,000,000 |
| COST PER GALLON | $0.0023 | $0.0034 | $0.0004 | $0.0005 |
| COST PER 10,000 GALLONS | $23 | $34 | $4 | $5 |

## Stripper Data

| Stripper | Select | Max Liquid Flow | Air Flow | 4-Tray Height | 6-Tray Height | Width | Length | Diameter | Tray Area |
|---|---|---|---|---|---|---|---|---|---|
| **Model** | **Model** | **(gpm)** | **(cfm)** | **(in)** | **(in)** | **(in)** | **(in)** | **(in)** | **(ft2)** |
| EZ-Stacker 2.xp | (•) | 25 | 140 | 83 | 103 | 0 | 0 | 27 | 2 |
| EZ-Stacker 4.xp | ( ) | 40 | 280 | 83 | 103 | 0 | 0 | 37 | 4 |
| EZ-Tray 4.x | ( ) | 50 | 210 | 82 | 102 | 26 | 29 | 0 | 4 |
| EZ-Tray 6.x | ( ) | 65 | 320 | 82 | 102 | 26 | 37 | 0 | 6 |
| EZ-Tray 8.x | ( ) | 75 | 420 | 82 | 102 | 26 | 49 | 0 | 8 |
| EZ-Tray 12.x | ( ) | 120 | 600 | 82 | 102 | 26 | 73 | 0 | 12 |
| EZ-Tray 16.x | ( ) | 150 | 850 | 84 | 104 | 52 | 49 | 0 | 16 |
| EZ-Tray 24.x | ( ) | 250 | 1300 | 84 | 104 | 52 | 73 | 0 | 24 |
| EZ-Tray 36.x | ( ) | 375 | 1900 | 100 | 120 | 100 | 73 | 0 | 36 |
| EZ-Tray 48.x | ( ) | 500 | 2600 | 110 | 130 | 124 | 73 | 0 | 48 |
| EZ-Tray 72.x | ( ) | 750 | 3800 | 110 | 130 | 100 | 146 | 0 | 72 |
| EZ-Tray 96.x | ( ) | 1000 | 5200 | 110 | 130 | 124 | 146 | 0 | 96 |

| QED Air Stripper Model ver. 2.01 | 11/9/2010 |
|---|---|

## Site Data

**Name:** Country Cleaners

**e-mail:** celeste.foster@aecom.com

**Project:** On-site 1

**Units:** English

**Altitude:** 50 ft

**Air Temp:** 50 F

**Flow:** 200 gpm

**Water Temp:** 50 F

**Stripper:** EZ-Tray 24.x - Click for details

**Stripper Air Flow:** 1300 cfm

**Stripper Max Flow:** 250 gpm

## Water Results

| Contaminant | Influent (ppb) | Target (ppb) | 4-Tray Results (ppb) | 4-Tray % Removal | 6-Tray Results (ppb) | 6-Tray % Removal |
|---|---|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 700 | 5 | < 1 | 100.000 | < 1 | 100.000 |

## Air Results

| Contaminant | 4-Tray (ppmV) | 4-Tray (lb/hr) | 6-Tray (ppmV) | 6-Tray (lb/hr) |
|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 2.0161 | 0.07007 | 2.0169 | 0.07010 |

## Notes



*PH-> 1-800-624-2026 or 1-734-995-2547, FX-> 1-734-995-1170. E-mail->info@qedenv.com. WEB->www.qedenv.com.*

*The QED modeler estimates unit performance for the listed contaminants.* ***Results assume -***

1. *dissolved-phase contaminant within a water matrix*
2. *clean stripper air*
3. *no surfactants, oil, grease or other immiscible phase(s) in the influent*
4. *unit operated within the given parameters and as instructed in the O&M manual*

*Stripper performance shall meet or exceed either the required effluent concentration(s) or effluent estimates, whichever is greater, for the conditions supplied and assumes the influent concentrations of each contaminant are less than 25% solubility in water. QED makes no claim of the model's accuracy beyond the 25% solubility in water limit.*

## Contact Us

*Fill out your contact and project information and click Send to have a QED Treatment*

*application specialist contact you.*

| | | | |
|---|---|---|---|
| **Name -** | Country Cleaners | | |
| **Company -** | Company | | |
| **Phone -** | Phone | **Fax -** | Fax |
| **e-mail -** | celeste.foster@aecom.com | **Project -** | On-site 1 |

Application Notes

Send Reset

## Save Data

*Use the following URL to reconstruct your data form for future remodeling with changes. This URL can be saved in any text file for record keeping and later retrieval. This run's URL:*

http://64.9.214.199/cgi-bin/remodel.pl?u=e&tw=50&ta=50&f=200&a=50&s=24.x&n=Count&e=celeste.foster@aecom.com&p=On-si&c=182,700;

| QED Air Stripper Model ver. 2.01 | 11/9/2010 |
|---|---|

## Site Data

**Name:** Country Cleaners

**e-mail:** celeste.foster@aecom.com

**Project:** On-site 2

**Units:** English

**Altitude:** 50 ft

**Air Temp:** 50 F

**Flow:** 1000 gpm

**Water Temp:** 50 F

**Stripper:** EZ-Tray 96.x - Click for details

**Stripper Air Flow:** 5200 cfm

**Stripper Max Flow:** 1000 gpm

## Water Results

| Contaminant | Influent (ppb) | Target (ppb) | 4-Tray Results (ppb) | 4-Tray % Removal | 6-Tray Results (ppb) | 6-Tray % Removal |
|---|---|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 700 | 5 | < 1 | 100.000 | < 1 | 100.000 |

## Air Results

| Contaminant | 4-Tray (ppmV) | 4-Tray (lb/hr) | 6-Tray (ppmV) | 6-Tray (lb/hr) |
|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 2.5193 | 0.35024 | 2.5212 | 0.35050 |

## Notes



*PH-> 1-800-624-2026 or 1-734-995-2547, FX-> 1-734-995-1170. E-mail->info@qedenv.com. WEB->www.qedenv.com.*

*The QED modeler estimates unit performance for the listed contaminants.* ***Results assume -***

1. *dissolved-phase contaminant within a water matrix*
2. *clean stripper air*
3. *no surfactants, oil, grease or other immiscible phase(s) in the influent*
4. *unit operated within the given parameters and as instructed in the O&M manual*

*Stripper performance shall meet or exceed either the required effluent concentration(s) or effluent estimates, whichever is greater, for the conditions supplied and assumes the influent concentrations of each contaminant are less than 25% solubility in water. QED makes no claim of the model's accuracy beyond the 25% solubility in water limit.*

## Contact Us

*Fill out your contact and project information and click Send to have a QED Treatment*

*application specialist contact you.*

| | | | |
|---|---|---|---|
| **Name -** | Country Cleaners | | |
| **Company -** | Company | | |
| **Phone -** | Phone | **Fax -** | Fax |
| **e-mail -** | celeste.foster@aecom.com | **Project -** | On-site 2 |

Application Notes

Send Reset

## Save Data

*Use the following URL to reconstruct your data form for future remodeling with changes. This URL can be saved in any text file for record keeping and later retrieval. This run's URL:*

http://64.9.214.199/cgi-bin/remodel.pl?u=e&tw=50&ta=50&f=1000&a=50&s=96.x&n=Count&e=celeste.foster@aecom.com&p=On-si&c=182,700;

| QED Air Stripper Model ver. 2.01 | 11/9/2010 |
|---|---|

## Site Data

**Name:** Country Cleaners

**e-mail:** celeste.foster@aecom.com

**Project:** Off-site 1

**Units:** English

**Altitude:** 50 ft

**Air Temp:** 50 F

**Flow:** 650 gpm

**Water Temp:** 50 F

**Stripper:** EZ-Tray 72.x - Click for details

**Stripper Air Flow:** 3800 cfm

**Stripper Max Flow:** 750 gpm

## Water Results

| Contaminant | Influent (ppb) | Target (ppb) | 4-Tray Results (ppb) | 4-Tray % Removal | 6-Tray Results (ppb) | 6-Tray % Removal |
|---|---|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 10 | 5 | < 1 | 100.000 | < 1 | 100.000 |

## Air Results

| Contaminant | 4-Tray (ppmV) | 4-Tray (lb/hr) | 6-Tray (ppmV) | 6-Tray (lb/hr) |
|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 0.0320 | 0.00325 | 0.0320 | 0.00325 |

## Notes



*PH-> 1-800-624-2026 or 1-734-995-2547, FX-> 1-734-995-1170. E-mail->info@qedenv.com. WEB->www.qedenv.com.*

*The QED modeler estimates unit performance for the listed contaminants.*
***Results assume -***

1. *dissolved-phase contaminant within a water matrix*
2. *clean stripper air*
3. *no surfactants, oil, grease or other immiscible phase(s) in the influent*
4. *unit operated within the given parameters and as instructed in the O&M manual*

*Stripper performance shall meet or exceed either the required effluent concentration(s) or effluent estimates, whichever is greater, for the conditions supplied and assumes the influent concentrations of each contaminant are less than 25% solubility in water. QED makes no claim of the model's accuracy beyond the 25% solubility in water limit.*

## Contact Us

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*application specialist contact you.*

| | | | |
|---|---|---|---|
| **Name -** | Country Cleaners | | |
| **Company -** | Company | | |
| **Phone -** | Phone | **Fax -** | Fax |
| **e-mail -** | celeste.foster@aecom.com | **Project -** | Off-site 1 |

Application Notes

Send Reset

## Save Data

*Use the following URL to reconstruct your data form for future remodeling with changes. This URL can be saved in any text file for record keeping and later retrieval. This run's URL:*

```
http://64.9.214.199/cgi-bin/remodel.pl?
u=e&tw=50&ta=50&f=650&a=50&s=72.x&n=Count&e=celeste.foster@aecom.com&
p=Off-s&c=182,10;
```

| QED Air Stripper Model ver. 2.01 | 11/9/2010 |
|---|---|

## Site Data

**Name:** Crystal

**e-mail:** celeste.foster@aecom.com

**Project:** On 1

**Units:** English

**Altitude:** 50 ft

**Air Temp:** 50 F

**Flow:** 500 gpm

**Water Temp:** 50 F

**Stripper:** EZ-Tray 48.x - Click for details

**Stripper Air Flow:** 2600 cfm

**Stripper Max Flow:** 500 gpm

## Water Results

| Contaminant | Influent (ppb) | Target (ppb) | 4-Tray Results (ppb) | 4-Tray % Removal | 6-Tray Results (ppb) | 6-Tray % Removal |
|---|---|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 350 | 5 | < 1 | 100.000 | < 1 | 100.000 |

## Air Results

| Contaminant | 4-Tray (ppmV) | 4-Tray (lb/hr) | 6-Tray (ppmV) | 6-Tray (lb/hr) |
|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 1.2596 | 0.08756 | 1.2606 | 0.08762 |

## Notes



*PH-> 1-800-624-2026 or 1-734-995-2547, FX-> 1-734-995-1170. E-mail->info@qedenv.com. WEB->www.qedenv.com.*

*The QED modeler estimates unit performance for the listed contaminants.* ***Results assume -***

1. *dissolved-phase contaminant within a water matrix*
2. *clean stripper air*
3. *no surfactants, oil, grease or other immiscible phase(s) in the influent*
4. *unit operated within the given parameters and as instructed in the O&M manual*

*Stripper performance shall meet or exceed either the required effluent concentration(s) or effluent estimates, whichever is greater, for the conditions supplied and assumes the influent concentrations of each contaminant are less than 25% solubility in water. QED makes no claim of the model's accuracy beyond the 25% solubility in water limit.*

# QED Air Stripper Model ver. 2.01 | 11/9/2010

## Site Data

**Name:** Crystal

**e-mail:** celeste.foster@aecom.com

**Project:** On 2

**Units:** English

**Altitude:** 50 ft

**Air Temp:** 50 F

**Flow:** 1000 gpm

**Water Temp:** 50 F

**Stripper:** EZ-Tray 96.x - Click for details

**Stripper Air Flow:** 5200 cfm

**Stripper Max Flow:** 1000 gpm

## Water Results

| Contaminant | Influent (ppb) | Target (ppb) | 4-Tray Results (ppb) | 4-Tray % Removal | 6-Tray Results (ppb) | 6-Tray % Removal |
|---|---|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 350 | 5 | < 1 | 100.000 | < 1 | 100.000 |

## Air Results

| Contaminant | 4-Tray (ppmV) | 4-Tray (lb/hr) | 6-Tray (ppmV) | 6-Tray (lb/hr) |
|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 1.2596 | 0.17512 | 1.2606 | 0.17525 |

## Notes



*PH-> 1-800-624-2026 or 1-734-995-2547, FX-> 1-734-995-1170. E-mail->info@qedenv.com. WEB->www.qedenv.com.*

*The QED modeler estimates unit performance for the listed contaminants.* ***Results assume -***

1. *dissolved-phase contaminant within a water matrix*
2. *clean stripper air*
3. *no surfactants, oil, grease or other immiscible phase(s) in the influent*
4. *unit operated within the given parameters and as instructed in the O&M manual*

*Stripper performance shall meet or exceed either the required effluent concentration(s) or effluent estimates, whichever is greater, for the conditions supplied and assumes the influent concentrations of each contaminant are less than 25% solubility in water. QED makes no claim of the model's accuracy beyond the 25% solubility in water limit.*

| QED Air Stripper Model ver. 2.01 | 11/9/2010 |
|---|---|

## Site Data

**Name:** Crystal

**e-mail:** celeste.foster@aecom.com

**Project:** Off

**Units:** English

**Altitude:** 50 ft

**Air Temp:** 50 F

**Flow:** 700 gpm

**Water Temp:** 50 F

**Stripper:** EZ-Tray 72.x - Click for details

**Stripper Air Flow:** 3800 cfm

**Stripper Max Flow:** 750 gpm

## Water Results

| Contaminant | Influent (ppb) | Target (ppb) | 4-Tray Results (ppb) | 4-Tray % Removal | 6-Tray Results (ppb) | 6-Tray % Removal |
|---|---|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 15 | 5 | < 1 | 100.000 | < 1 | 100.000 |

## Air Results

| Contaminant | 4-Tray (ppmV) | 4-Tray (lb/hr) | 6-Tray (ppmV) | 6-Tray (lb/hr) |
|---|---|---|---|---|
| tetrachloroethylene (PERC,PCE) | 0.0517 | 0.00525 | 0.0517 | 0.00526 |

## Notes



*PH-> 1-800-624-2026 or 1-734-995-2547, FX-> 1-734-995-1170. E-mail->info@qedenv.com. WEB->www.qedenv.com.*

*The QED modeler estimates unit performance for the listed contaminants.* ***Results assume -***

1. *dissolved-phase contaminant within a water matrix*
2. *clean stripper air*
3. *no surfactants, oil, grease or other immiscible phase(s) in the influent*
4. *unit operated within the given parameters and as instructed in the O&M manual*

*Stripper performance shall meet or exceed either the required effluent concentration(s) or effluent estimates, whichever is greater, for the conditions supplied and assumes the influent concentrations of each contaminant are less than 25% solubility in water. QED makes no claim of the model's accuracy beyond the 25% solubility in water limit.*

## Contact Us

*Fill out your contact and project information and click Send to have a QED Treatment*

*application specialist contact you.*

| | | | |
|---|---|---|---|
| **Name -** | Crystal | | |
| **Company -** | Company | | |
| **Phone -** | Phone | **Fax -** | Fax |
| **e-mail -** | celeste.foster@aecom.com | **Project -** | Off |

Application Notes

Send Reset

## Save Data

*Use the following URL to reconstruct your data form for future remodeling with changes. This URL can be saved in any text file for record keeping and later retrieval. This run's URL:*

http://64.9.214.199/cgi-bin/remodel.pl?
u=e&tw=50&ta=50&f=700&a=50&s=72.x&n=Cryst&e=celeste.foster@aecom.com&
p=Off&c=182,15;

**Delta Cooling Towers, Inc.**
41 Pine Street
Rockaway, New Jersey 07866-0315
Telephone 973-586-2201x116
Fax 973-586-2243
Email: sales@deltacooling.com
Web Address: www.deltacooling.com

**Delta Cooling Towers**

VANGUARD®

October 28, 2010

**Claire Hunt**
claire.hunt@aecom.com

**AECOM**
100 Red Schoolhouse Road, Suite B-1
Chestnut Ridge , NY 10977-6715
T 845.425.4980 x21 F 845.425.4989
www.aecom.com

Subject: Delta Project # B10-056

Dear Ms. Hunt,

Thank you for the opportunity to submit this Delta Air Stripper proposal for your consideration. In response to your request, Delta recommends the following equipment for this application.

THIS SCOPE IS TYPICAL FOR ALL 9 OPTIONS. IT IS BASED ON OPTION#1 BUT CAN BE APPLIED TO ALL OTHER 8…

**Option #1 - Design Basis - (1) Tower at 200gpm per Tower @ 50°F**

| Design Contaminant | Required Removal Efficiency | Calculated Removal Efficiency |
|---|---|---|
| PCE | 99.3% | 99.3%+ |

**Packed Tower Air Stripping System**

Delta recommends One (1) of our Vanguard® Model ∆S3-250DF air strippers for the subject application. The stripper is a 36" diameter Fiberglass column with 25'-0" of DeltaPAK® Structured Packing, shop installed prior to shipment. The tower shell will be fabricated from NSF Approved FRP and will include the necessary wall re-distribution rings and shell body flanges.

***NOTE: All internals are pre-installed by Delta Prior to Shipment.***

The other items included in Delta Cooling Towers, Inc.'s scope of supply for this project are (per tower):

- The tower will include One (1) 1.0hp TEFC 230/460/3/60 blower/motor assembly designed for 1,070cfm @ 3.5"w.c.
- The blower will be supplied with the intake filter, inlet louver, air flow

measuring station, blower inlet and outlet flexible connections, and ductwork from the blower to the tower. All ductwork material is Aluminum.

- The tower column will be provided with the flanges, nozzles, connections and manways.
- The tower will also be supplied with the required internals; FRP packing support plates, PVC mist eliminators, and PVC / Stainless Steel inlet distribution systems.
- A 3.5” Schedule 80 PVC influent pipe terminating at a flange approximately 5’-0” above the base of the stripper, and a 4” effluent flanged end FRP nozzle connection (side discharge).
- Blower Pressure Switch.
- Filter housing and packing bed differential pressure gauges
- Basic NEMA 3R Control Panel
- Design of the tower anchor bolts is by Delta Cooling Towers, Inc., the supply and installation of the bolts required are by others.
- All the necessary drawings, submittals for approval and O&M manuals.

The following items are specifically **excluded** for this proposal:

- Offloading or installation labor.
- Insulation Materials of any Type.
- Anchor Bolts.
- Controls or Instrumentation other than specifically listed above.
- Any and all taxes.

**The total net price for the One (1) FRP air stripping tower is $(See Spreadsheet), FOB Philippi, W.V., Freight PP&A.** Shipment can be made approximately 10 weeks after receipt of “Approved” submittals and authorization to proceed with fabrication. Please allow 2 weeks for preparation of submittals. Price is exclusive of any and all taxes.

***Please feel free to contact the undersigned with any questions or comments. Thank you for your interest in Delta and its products, and for the opportunity to be of service.***

Sincerely,

*Joseph B. Homza, Jr.*

Joseph B. Homza, Jr.
Vice President – Municipal Products Division

AECOM Budget Project
Delta Project Number B10-056
10/28/2010

| Site Name | Country On-Site A | Country On-Site B | Country On-Site C | Country Supply Well 1 | Country Supply Well 2 | Crystal On-Site A | Crystal On-Site B | Crystal On-Site C | Crystal Supply Well 1 |
|---|---|---|---|---|---|---|---|---|---|
| Flow Rate (GPM) | 200 | 1000 | 5000 | 650 | 1500 | 500 | 1000 | 5000 | 700 |
| Temperature (°F) | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| PCE Removal Efficiency Required | 99.30% | 99.30% | 99.30% | 50.00% | 50.00% | 98.60% | 98.60% | 98.60% | 66.70% |
| PCE Removal Efficiency Calculated | 99.3%+ | 99.3%+ | 99.3%+ | 90%+ | 90%+ | 98.6%+ | 98.6%+ | 98.6%+ | 90%+ |
| Tower Model | S3-250DF | S7-250DF | S10-260DF | S6-120DF | S8-120DF | S4.5-230DF | S7-210DF | S10-220DF | S6-120DF |
| Number of Towers | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
| Diameter | 36" | 84" | 120" | 72" | 96" | 54" | 84" | 120" | 72" |
| Packing Depth | 25'-0" | 25'-0" | 26'-0" | 12'-0" | 12'-0" | 23'-0" | 21'-0" | 22'-0" | 12'-0" |
| Blower HP | 1 | 5 | 10 | 3 | 7.5 | 2 | 5 | 10 | 3 |
| Blower Air Flow (CFM) | 1,070 | 5,350 | 13,670 | 3,475 | 8,025 | 2,675 | 5,350 | 13,670 | 3,745 |
| Inlet Pipe Size | 3.5" | 8" | 12" | 6" | 10" | 6" | 8" | 12" | 8" |
| Outlet Pipe Size | 4" | 10" | 14" | 8" | 12" | 8" | 10" | 14" | 8" |
| NEMA 3RControl Panel Included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Pumping Included | No | No | No | No | No | No | No | No | No |
| Freight | PP&A | PP&A | PP&A | PP&A | PP&A | PP&A | PP&A | PP&A | PP&A |
| | | | (each) | | | | | (each) | |
| BUDGET PRICE | $65,000 | $110,000 | $160,000 | $90,000 | $100,000 | $75,000 | $100,000 | $150,000 | $90,000 |

Delta Cooling Towers, Inc.

41 Pine Street · P.O. Box 315 · Rockaway, NJ 07866-0315
Phone: 973.586.2201 · Fax: 973.586.2243
Website: http://www.deltacooling.com

**Delta-Pak®** Structured Packing.

The PVC **Delta-Pak®** structured packing is a proprietary product, which offers unusually low air static pressure losses and provides high mass transfer efficiency.

The honeycomb-like construction allows for high air velocities for applications that demand it, and defers water loading "flooding points" well beyond typical maximum levels of random type packings.

**Delta-Pak®** structured packing is installed in homogeneous circular layers of nominal 12" and 6" high layers. The packing layers only weight about 2 lb/cu. ft. and can be easily handled.

**Delta-Pak®** structured packing can be cleaned chemically, as long as the limits of PVC corrosion and chemical resistance is respected.

If replacement of **Delta-Pak®** packing becomes necessary, the layers can be removed through the top of the air stripper column. The water distribution system can be removed to allow for packing removal. When the air stripper column is supplied as flanged sections, each packed section can be disassembled and lowered for easy access at grade level. The packing layers can be compressed in the radial direction if tight clearances are encountered, and will "spring back" to its original shape.

**Do not step directly on the packing surface.** Crushing of the edges of the PVC corrugations will inhibit proper air flow and water distribution, and as a result reduce performance.

If it is necessary to stand on the packing surface use a piece of plywood or similar protection to distribute weight over a greater surface. Maximum weight distribution is 80 lbs/sq. ft.

Do not stand on any packing inside a stripping tower unless it is absolutely necessary and unless proper judgment is exercised regarding the supporting capability of the packing.

Delta Cooling Towers, Inc.

41 Pine Street · P.O. Box 315 · Rockaway, NJ 07866-0315
Phone: 973.586.2201 · Fax: 973.586.2243
Website: http://www.deltacooling.com

Packing. **Delta-Pak**®, used in all standard stripper models, is a high performance structured packing constructed of Type 1 PVC material protected against UV degradation.

Applicable data below is for air - water atmospheric system:

| | |
|---|---|
| Surface area: | 90 sq. ft./cu.ft. |
| Void space: | Higher than 98% |
| Open cross-section: | Higher than 98% |
| Maximum air flow before flooding, at 20 gpm/sq.ft.: | 750 scfm/sq.ft. or higher |
| Static pressure loss at 20 gpm/sq.ft. and 500 scfm/ sq.ft. air flow: | 0.10 in. W.C./ft. or lower |
| Orientation of corrugation: | Vertical ("see - through") |
| Nominal corrugation size: | Approx. 3/4 in. |
| "Channelling" characteristics: | No channeling occurs. Packing construction prevents any radial transfer of mass, due to its spirally wound configuration. Transfer in tangential direction is negligible. No redistribution devices are required. |
| "Clogging" and "fouling" characteristics: | The absence of any horizontally orientated surfaces reduces accumulation of precipitates and deposition of suspended solids. Most solids including precipitates pass freely through vertical corrugations. |
| Standard packing layer heights: | 12.6 in. and 6.3 in. |

Delta Cooling Towers, Inc.

**41 Pine Street · P.O. Box 315 · Rockaway, NJ 07866-0315**
**Phone: 973.586.2201 · Fax: 973.586.2243**
**Website: http://www.deltacooling.com**

## DELTA-PAK® STRUCTURED PACKING BENEFITS

HIGH IRON OR CALCIUM CONTENT

Concentrations of dissolved iron in ground water (in excess of 2 mg/l) has the potential to foul process equipment. High iron content water will combine with dissolved oxygen and precipitate, causing pumps, infiltration galleries, feed lines and packing media to foul.

Precipitation occurs primarily at the nozzle or inlet distribution area of an air stripper, where water mixes with the counter flowing air stream. Iron and calcium precipitate accumulates and hardens on all surfaces of packing. This precipitate will subsequently need to be removed, which is most effectively and economically removed in place. When properly cleaned, the particulate which sloughs off upper sections of random packings and may tend to "hang up" at lower levels of the packing bed. This accumulation, if not managed, can lead towards performance failure, media failure or even worse tower structural failure.

**Delta-Pak**® structured packing, since it does not have horizontal or angled surfaces, resists iron precipitate accumulation and therefore will operate efficiently for much longer periods between requiring chemical cleaning. In past applications **Delta-Pak**® structured packing has successfully performed four to six times longer than random packing it has replaced before having to be cleaned. The particulate which sloughs off the packing will flush straight through the media to the sump.

**Delta-Pak**® structured packing is recommended for applications where high iron or calcium levels are present in the process flow. Although the degree of fouling and frequency of required cleaning is site specific, it is generally recommended that
**Delta-Pak**® structured packing be used for iron or calcium levels above 2 mg/l.

# RegenOx™

## CHEMICAL OXIDATION REDEFINED...

*RegenOx™ is an advanced in situ chemical oxidation technology* designed to treat organic contaminants including high concentration source areas in the saturated and vadose zones*

## PRODUCT FEATURES:

- Rapid and sustained oxidation of target compounds
- Easily applied with readily available equipment
- Destroys a broad range of contaminants
- More efficient than other solid oxidants
- Enhances subsequent bioremediation
- Avoids detrimental impacts to groundwater aquifers

*RegenOx product application*

## HOW IT WORKS:

RegenOx maximizes in situ performance using a solid alkaline oxidant that employs a sodium percarbonate complex with a multi-part catalytic formula. The product is delivered as two parts that are combined and injected into the subsurface using common drilling or direct-push equipment. Once in the subsurface, the combined product produces an effective oxidation reaction comparable to that of Fenton's Reagent without a violent exothermic reaction. RegenOx safely, effectively and rapidly destroys a wide range of contaminants in both soil and groundwater (Table 1).

## ACHIEVES RAPID OXIDATION VIA A NUMBER OF MECHANISMS

RegenOx directly oxidizes contaminants while its unique catalytic complex generates a suite of highly charged, oxidative free radicals that are responsible for the rapid destruction of contaminants. The mechanisms by which RegenOx operates are:

- Surface- Mediated Oxidation: (see Figure 1 and description below)
- Direct Oxidation: $C_2Cl_4 + 2\ Na_2CO_3 \bullet 3\ H_2O_2 + 2\ H_2O \longleftrightarrow 2CO_2 + 4\ NaCl + 4\ H_2O + 2\ H_2CO_3$
- Free Radical Oxidation:
  - Perhydroxyl Radical ($HO_2\bullet$)
  - Hydroxyl Radical ($OH\bullet$)
  - Superoxide Radical ($O_2\bullet$)

Figure 1. RegenOx™ Surface-Mediated Oxidation

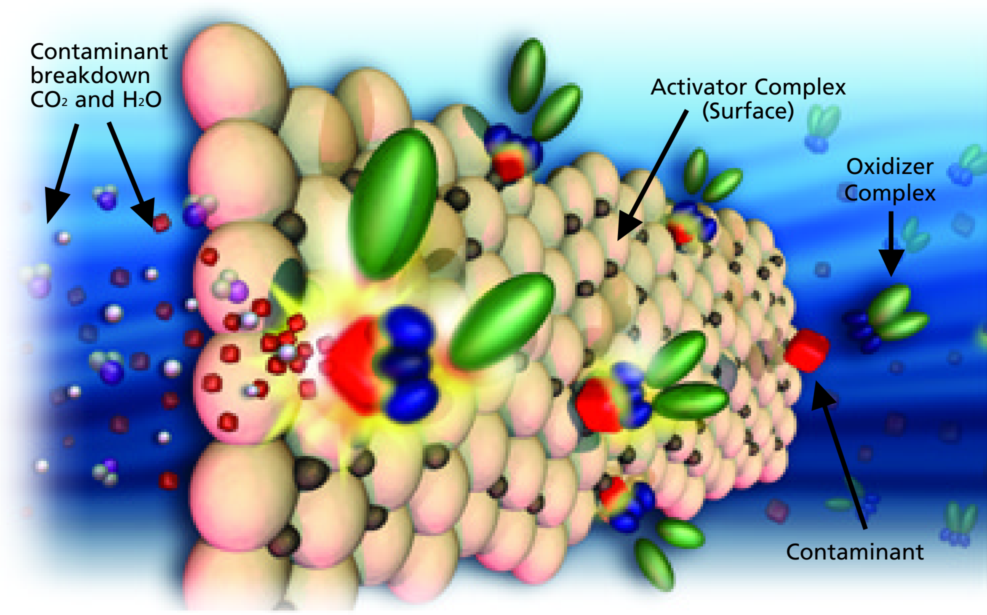


Figure 1. Surface-Mediated Oxidation is responsible for the majority of RegenOx contaminant destruction. This process takes place in two stages. First, the RegenOx activator complex coats the subsurface. Second, the oxidizer complex and contaminant react with the activator complex surface destroying the contaminant.

* Patent applied for

# RegenOx™

## From Mass Reduction to Bioremediation:

RegenOx™ is an effective and rapid contaminant mass reduction technology. A single injection will remove significant amounts of target contaminants from the subsurface. Strategies employing multiple Regenox injections coupled with follow-on accelerated bioremediation can be used to treat highly contaminated sites to regulatory closure. In fact, RegenOx was designed specifically to allow for a seamless transition to low-cost accelerated bioremediation using any of Regenesis controlled release compounds.

## Significant Longevity:

RegenOx has been shown to destroy contaminants for periods of up to one month.

## Product Application Made Safe and Easy:

RegenOx produces minimal heat and as with all oxidants proper health and safety procedures must be followed. The necessary safety guidance accompanies all shipments of RegenOx and additional resources are available on request. Through the use of readily available, highly mobile, direct-push equipment and an array of pumps, RegenOx has been designed to be as easy to install as other Regenesis products like ORC® and HRC®.

## Effective on a Wide Range of Contaminants:

RegenOx has been rigorously tested in both the laboratory and the field on petroleum hydrocarbons (aliphatics and aromatics), gasoline oxygenates (e.g., MTBE and TAME), polyaromatic hydrocarbons (e.g., naphthalene and phenanthrene) and chlorinated hydrocarbons (e.g., PCE, TCE, TCA).

## Oxidant Effectiveness vs. Contaminant Type:

Table 1

| Contaminant | RegenOx™ | Fenton's Reagent | Permanganate | Persulfate | Activated Persulfate | Ozone |
|---|---|---|---|---|---|---|
| Petroleum Hydrocarbons | A | A | B | B | B | A |
| Benzene | A | A | D | B | B | A |
| MTBE | A | B | B | C | B | B |
| Phenols | A | A | B | C | B | A |
| Chlorinated Ethenes (PCE, TCE, DCE, VC) | A | A | A | B | A | A |
| Chlorinated Ethanes (TCA, DCA) | A | B | C | D | C | B |
| Polycyclic Aromatic Hydrocarbons (PAHs) | A | A | B | B | A | A |
| Polychlorinated Biphenyls (PCBs) | B | C | D | D | D | B |
| Explosives (RDX, HMX) | A | A | A | A | A | A |

*Based on laboratory kinetic data, thermodynamic calculations, and literature reports.*

### Oxidant Effectiveness Key:

A = Short half life, low free energy (most energetically favored), most complete
B = Intermediate half life, low free energy, intermediate degree of completion
C = Intermediate half life, intermediate free energy, low degree of completion
D = Long half life, high free energy (least favored), very low degree of completion

REGENESIS
Advanced Technologies for Groundwater Resources
1011 Calle Sombra / San Clemente / California 92673-6244
Tel: 949/366-8000 / Fax: 949/366-8090 / www.regenesis.com

3-D MicroEmulsion™

HRC ADVANCED®

# ACHIEVE WIDE-AREA, RAPID AND SUSTAINED REDUCTIVE DECHLORINATION WITH CONTINUOUS DISTRIBUTION AND STAGED HYDROGEN RELEASE

## PRODUCT FEATURES

- **Three Stage Electron Donor Release – Immediate, Mid-Range and Long- Term Hydrogen Production**
  Provides free lactic acid, controlled release lactic acid and long release fatty acids for effective hydrogen production for periods of of up to 3 to 5 years.

- **Low-Cost**
  3-D Microemulsion is 25¢ to 42¢ per pound as applied.

- **Maximum and Continuous Distribution via Micellar Transport**
  Unlike oil products, 3DMe forms micelles which are mobile in groundwater and significantly enhance electron donor distribution after injection.

- **Wide-Area/High Volume Microemulsion Application**
  High volume application increases contact with contaminants and reduces number of injection points required for treatment – minimizes overall project cost.

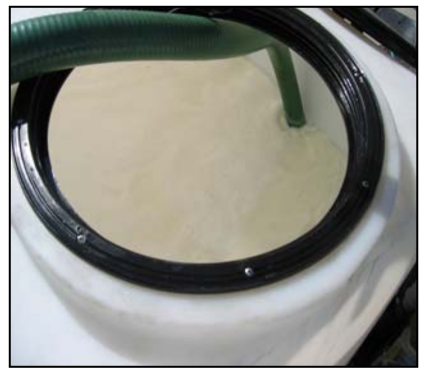

Photo 1. 3DMe™ prior to injection

## PRODUCT COMPOSITION

3-D Microemulsion (3DMe)™ formerly known as HRC Advanced™ has a molecular structure specifically designed to maximize the cost-effective anaerobic treatment of contaminants in subsurface soils and ground water. This structure (patent pending) is composed of free lactic acid, controlled-release lactic acid (polylactate) and certain fatty acid components which are esterified to a carbon backbone molecule of glycerin..

3DMe produces a sequential, staged release of its electron donor components. The immediately available, free lactic acid, is fermented rapidly while the controlled release lactic acid is metabolized at a more controlled rate. The fatty acids are converted to hydrogen over a mid to long-range timeline giving 3DMe an exceptionally long electron donor release profile (Figure 1). This staged fermentation provides an immediate, mid-range and very long-term, controlled-release supply of hydrogen (electron donor) to fuel the reductive dechlorination process.

Typical 3DMe single application longevity is rated to between 3 and 5 years. With 5 years occurring under optimal conditions, e.g. low permeability, low consumption environments.

### Figure 1. 3-D Microemulsion™ Release Profile

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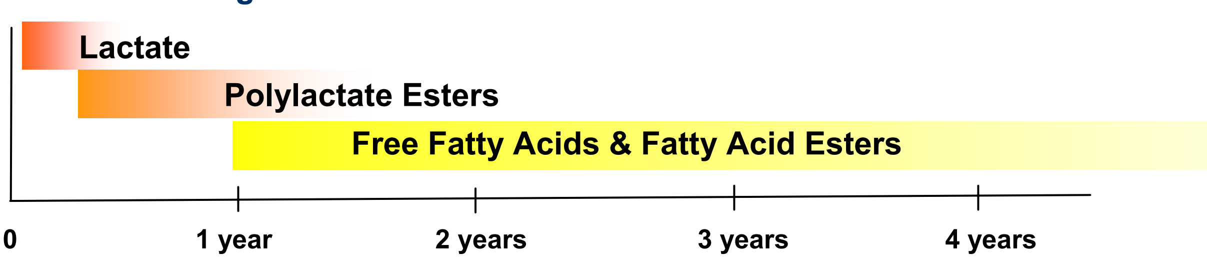



REGENESIS

Advanced Technologies for Groundwater Resources

## APPLICATION AND DISTRIBUTION

3DMe applications can be configured in several different ways including: **grids, barriers and excavations.** The material itself can be applied to the subsurface through the use of **direct-push injection, hollow-stem auger, existing wells** or **re-injection wells.**

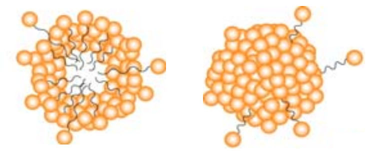
3DMe is typically applied in high-volumes as an emulsified, micellar suspension (microemulsion). The microemulsion is easily pumped into the subsurface and is produced on-site by mixing specified volumes of water and delivered 3DMe concentrate. Detailed preparation and installation instructions are available at www.regenesis.com.

3DMe is usually applied throughout the entire vertical thickness of the determined treatment area. Once injected, the emulsified material moves out into the subsurface pore spaces via micellar transport, eventually coating most all available surfaces. Over time the released soluble components of 3D Microemulsion are distributed within the aquifer via the physical process of advection and the concentration driven forces of diffusion.

**More on Micelles**

Micelles (Figure 2.) are groups (spheres) of molecules with the hydrophilic group facing out to the water and the "tails" or lipophilic moiety facing in. They are formed during the 3-D Microemulsion emulsification process and provide the added benefit of increased distribution via migration to areas of lower concentration.

*Figure 2: Micelle Representation*



## MORE ON APPLICATIONS

3DMe is typically applied in large volumes and is easily injected using widely available, non-specialized remediation equipment.

3-D Microemulsion is delivered in 55 gallon drums, 300 gallon totes, tankers or buckets.

The microemulsion is easily prepared on-site and applied in high volumes for adequate subsurface distribution.

The material can is easily applied through existing wells or direct push-points.

## PERFORMANCE

**Case Study #1**

A site in Massachusetts showed high levels of PCE and its daughter products TCE and cis-DCE which had been consistently present for more than two years. 3DMe was applied in a grid configuration around monitoring well #16. In Figure 3, the contaminant concentration results indicate a rapid decrease in the parent product PCE and evidence of reductive dechlorination as demonstrated by the relative increases in daughter products TCE and cis-DCE.

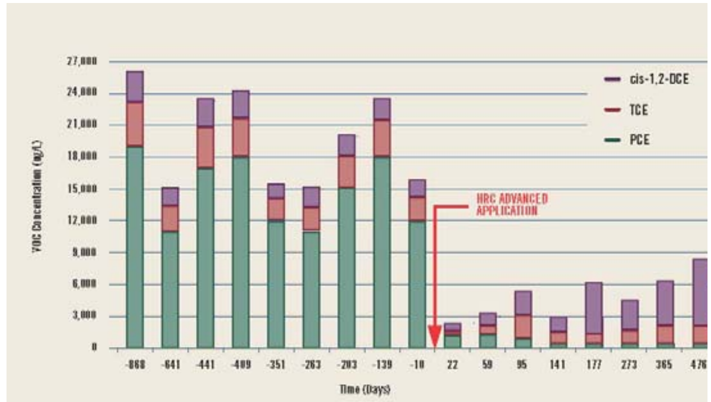



FIGURE 3: MW-16 CONTAMINANT CONCENTRATION DATA

Figure 3. MW-16 Contaminant Concentration Data

**Case Study #2**

A site in Florida was characterized with PCE Contamination Approaching 225 ug/L. 1080 pounds of HRC Advanced was applied in a grid configuration through 16 direct-push points, with about 5 feet between each point and at a rate of approximately 5 lbs. per vertical foot. Monitoring in well 103 at 75 days post-3DMe injection indicated that PCE was reduced by 67% then leveled off for about 75 days then dropped another 22% for a total of 89% reduction over a 275 day period. TOC levels remain elevated at 17-19 mg/L after 275 days and daughter products remain at low levels (Figure 4).

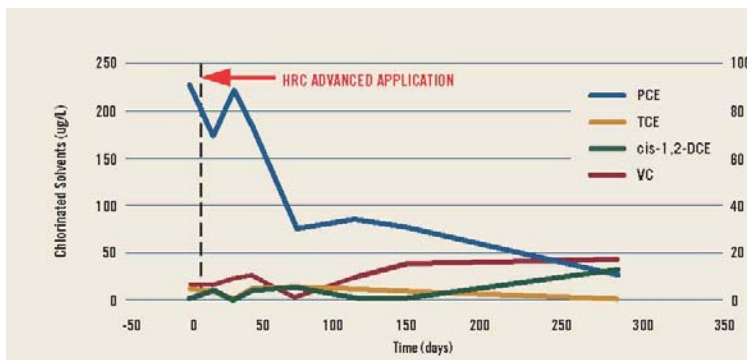



FIGURE 4: MW-103 CONTAMINANT CONCENTRATION DATA

Figure 4. MW-103 Contaminant Concentration Data

For more information on 3-D Microemulsion, contact you local representative or call 949-366-8000.
You can also visit our website at www.regenesis.com.

## ...Me Barrier Treatment Summary Page - Consultant Output

...genesis Technical Support: USA (949) 366-8000 www.regenesis.com

**Location:** downgradient barrier
**Consultant:** AECOM

### Aquifer Characteristics

| | | |
|---|---|---|
| Soil Type | silty sand | |
| Effective Porosity | 0.2 | |
| Hydraulic Conductivity | 10 | ft/day |
| Hydraulic Gradient | 0.005 | ft/ft |
| Seepage Velocity | 91.3125 | ft/yr |

### Design Assumptions

| | | |
|---|---|---|
| Length of Barrier | 100 | ft |
| Thickness of Application | 30 | ft |
| Dissolved Contaminant Mass | 3.42 | lbs/yr |
| Mass of Competing Electron Acceptors | 222.32 | lbs/yr |

# 3DMe Barrier Treatment Summary Page - Consultant Output

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

**Site Name:**
**Location:**
**Consultant:**

## Direct Push Injection Application

| **Me-Related** | | |
|---|---|---|
| ncentrate Mass | 1,230 | lbs |
| ncentrate Volume | 148 | gals |

| **Base 10:1 Emulsion Formulation** | | |
|---|---|---|
| 3DMe Concentrate Volume | 148 | gals |
| Water Volume | 1,474 | gals |
| Emulsion Total Volume | 1,622 | gals |

| **Recommended Emulsion Formulation** | | |
|---|---|---|
| Additional Water Volume | 9,150 | gals |
| Total Water Volume (base+recommended) | 10,624 | gals |
| Total Mass of Recommended Emulsion | 89,891 | lbs |
| Total Volume of Recommended Emulsion | 10,772 | gals |
| Percentage of Effective Pore Space Used | 12.0% | |

| **Application-Related** | | |
|---|---|---|
| Number of Direct Push Injection Points | 9 | points |
| Mass of 3DMe 10:1 Base Emulsion per Point | 1,503 | lbs/point |
| Volume of 3DMe 10:1 Base Emulsion per Point | 180.2 | gals/point |
| Mass of 3DMe 10:1 Base Emulsion per Lineal Foot | 50 | lbs/ft |
| Volume of Recommended Emulsion per Point | 1,197 | gals/point |
| Volume of Recommended Emulsion per Foot | 39.9 | gals/ft |
| Estimated Application Rate | 5 | gpm |
| Estimated Application Time per Point | 8 | min/point |

| **Purchasing-Related Information** | | |
|---|---|---|
| Number of Buckets of 3DMe Concentrate | 41 | buckets |
| Estimated Number of Pallets | 2 | pallets |
| Total Required Volume of Water | 10,624 | gals |
| Mass of 10:1 Base Emulsion | 13,530 | lbs |
| Unit Price ($/lb) of 10:1 Base Emulsion | $ 0.41 | |
| Material Cost at 10:1 Base Emulsion (total) | $ 5,547 | |
| Sales Tax | $ - | |
| Shipping Estimate | $ - | Call Regenesis For Quote |

# 3DMe Barrier Treatment Summary Page - Consultant Output

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

**Site Name:**
**Location:**
**Consultant:**

## Fixed Well Application

| | | |
|---|---|---|
| **3DMe-Related** | | |
| Concentrate Mass | 1,230 | lbs |
| Concentrate Volume | 148 | gals |
| **Base 10:1 Emulsion Formulation** | | |
| 3DMe Concentrate Volume | 148 | gals |
| Water Volume | 1,474 | gals |
| Emulsion Total Volume | 1,622 | gals |
| **Recommended Emulsion Formulation** | | |
| Additional Water Volume | 9,150 | gals |
| Total Water Volume (base+recommended) | 10,624 | gals |
| Total Mass of Recommended Emulsion | 89,891 | lbs |
| Total Volume of Recommended Emulsion | 10,772 | gals |
| Percentage of Effective Pore Space Used | 12.0% | |
| **Application-Related** | | |
| nber of Wells | 9 | wells |
| ss of 3DMe 10:1 Base Emulsion per Well | 1,503 | lbs/well |
| ume of 3DMe 10:1 Base Emulsion per Well | 180.2 | gals/well |
| ss of 3DMe 10:1 Base Emulsion per Lineal Foot | 50 | lbs/ft |
| ume of Recommended Emulsion per Well | 1,197 | gals/well |
| Volume of Recommended Emulsion per Foot | 39.9 | gals/ft |
| Estimated Application Rate | 10 | gpm |
| Estimated Application Time per Point | 12 | min/point |
| **Purchasing-Related Information** | | |
| Number of Buckets of 3DMe Concentrate | 41 | buckets |
| Estimated Number of Pallets | 2 | pallets |
| Total Required Volume of Water | 10,624 | gals |
| Mass of 10:1 Base Emulsion | 13,530 | lbs |
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# 3DMe Barrier Treatment Summary Page - Contractor Output

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

**Site Name:**
**Location:**
**Consultant:**

## Direct Push Application

| | | |
|---|---|---|
| **Aquifer-Related Information** | | |
| Soil Type | silty sand | |
| **Application Dimensions** | | |
| Length of Barrier | 100 | ft |
| Thickness of Application | 30 | ft |
| | | |
| **3DMe-Related Information** | | |
| 3DMe Concentrate Mass | 1,230 | lbs |
| Number of Buckets of 3DMe Concentrate | 41 | buckets |
| Estimated Number of Pallets | 2 | pallets |
| Base 10:1 Vol:Vol Emulsion Water Requirement | 1,474 | gals |
| Additional Water Needed to Make Emulsion | 9,150 | gals |
| Total Volume of Water Required | 10,624 | gals |
| | | |
| **Application-Related Information** | | |
| Number of Rows in Barrier | 1 | rows |
| Spacing Within Rows | 12 | ft |
| Spacing Between Rows | 10 | ft |
| Number of Direct Push Injection Points | 9 | points |
| Volume of 3DMe As Applied, Emulsion per Point | 1,197 | gals/point |
| Volume of 3DMe As Applied, Emulsion per Foot | 39.9 | gals/ft |
| Estimated Application Rate | 5 | gals/minute |
| Estimated Application Time per Point | 8 | min/point |
| | | |
| **Purchasing-Related Information** | | |
| Number of Buckets of 3DMe Concentrate | 41 | buckets |
| Estimated Number of Pallets | 2 | pallets |
| Total Required Volume of Water | 10,624 | gals |

# 3DMe Barrier Treatment Summary Page - Contractor Output

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

**Site Name:**
**Location:**

## ...ted Well Application

| | | |
|---|---|---|
| **Aquifer-Related Information** | | |
| Soil Type | silty sand | |
| **Application Dimensions** | | |
| Length of Barrier | 100 | ft |
| Thickness of Application | 30 | ft |
| **3DMe-Related Information** | | |
| 3DMe Concentrate Mass | 1,230 | lbs |
| Number of Buckets of 3DMe Concentrate | 41 | buckets |
| Estimated Number of Pallets | 2 | pallets |
| Base 10:1 Vol:Vol Emulsion Water Requirement | 1,474 | gals |
| Additional Water Needed to Make Emulsion | 9,150 | gals |
| Total Volume of Water Required | 10,624 | gals |
| **Application-Related Information** | | |
| Number of Rows in Barrier | 1 | rows |
| Spacing Within Rows | 12 | ft |
| Spacing Between Rows | 10 | ft |
| Number of Injection Wells | 9 | wells |
| Volume of 3DMe As Applied, Emulsion per Well | 1,197 | gals/well |
| Volume of 3DMe As Applied, Emulsion per Foot | 39.9 | gals/ft |
| Estimated Application Rate | 10 | gals/minute |
| Estimated Application Time per Well | 12 | min/well |
| **Purchasing-Related Information** | | |
| Number of Buckets of 3DMe Concentrate | 41 | buckets |
| Estimated Number of Pallets | 2 | pallets |
| Total Required Volume of Water | 10,624 | gals |

## )Me Grid Treatment Summary Page - Consultant Output

genesis Technical Support: USA (949) 366-8000 www.regenesis.com

untry cleaner Hintington NY

**Location:** Area around cleaner

**Consultant:** aecom

### Aquifer Characteristics

| | | |
|---|---|---|
| Soil Type | silty sand | |
| Total Porosity | 0.4 | |
| Effective Porosity | 0.2 | |
| Hydraulic Conductivity | 10 | ft/day |
| Hydraulic Gradient | 0.005 | ft/ft |
| Seepage Velocity | 91.3 | ft/yr |
| Pore Volume | 58,800 | $ft^3$ |
| Pore Volume | 439,855 | gals |

### Design Assumptions

| | | |
|---|---|---|
| Area of Application | 4,900 | $ft^2$ |
| Thickness of Application | 30 | ft |
| Dissolved Contaminant Mass | 2.68 | lbs |
| Adsorbed Contaminant Mass | 12.68 | lbs |
| Mass of Competing Electron Acceptors | 330.37 | lbs |

# 3DMe Grid Treatment Summary Page - Consultant Output

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

**Site Name:** Country cleaner Hintington NY
**Location:** Area around cleaner
**Consultant:** aecom

## Direct Push Injection Application

**3DMe-Related**

| | | |
|---|---|---|
| Concentrate Mass | 6,030 | lbs |
| Concentrate Volume | 723 | gals |

**Base 10:1 Emulsion Formulation**

| | | |
|---|---|---|
| 3DMe Concentrate Volume | 723 | gals |
| Water Volume | 7,226 | gals |
| Emulsion Total Volume | 7,949 | gals |
| Effective Pore Space Displaced | 3.6% | % |

**Recommended Emulsion Formulation**

| | | |
|---|---|---|
| Additional Water Volume | 849 | gals |
| Total Water Volume (base+recommended) | 8,074 | gals |
| Total Mass of Recommended Emulsion | 73,412 | lbs |
| Total Volume of Recommended Emulsion | 8,797 | gals |

**Application-Related**

| | | |
|---|---|---|
| Number of Direct Push Injection Points | 25 | points |
| Mass of 3DMe 10:1 Base Emulsion per Point | 2653 | lbs/point |
| Volume of 3DMe 10:1 Base Emulsion per Point | 318 | gals/point |
| Mass of 3DMe 10:1 Base Emulsion per Lineal Foot | 88.4 | lbs/ft |
| Volume of Recommended Emulsion per Point | 352 | gals/point |
| Volume of Recommended Emulsion per Foot | 12 | gals/ft |
| Estimated Application Rate | 5 | gpm |
| Estimated Application Time per Point | 9 | min/point |

**Purchasing-Related Information**

| | | |
|---|---|---|
| Number of Buckets of 3DMe Concentrate | 201 | buckets |
| Estimated Number of Pallets | 6 | pallets |
| Total Required Volume of Water | 8,074 | gals |
| Mass of 10:1 Base Emulsion | 66,330 | lbs |
| Unit Price ($/lb) of 10:1 Base Emulsion | $ 0.41 | |
| Material Cost at 10:1 Base Emulsion (total) | $ 27,195 | |
| Sales Tax | $ - | |
| Shipping Estimate | $ - | Call Regenesis For Quote |

# 3DMe Grid Treatment Summary Page - Consultant Output

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

**Site Name:** Country cleaner Hintington NY
**Location:** Area around cleaner
**Consultant:** aecom

## Fixed Well Application

| | | |
|---|---|---|
| **3DMe-Related** | | |
| Concentrate Mass | 6,030 | lbs |
| Concentrate Volume | 723 | gals |
| **Base 10:1 Emulsion Formulation** | | |
| 3DMe Concentrate Volume | 723 | gals |
| Water Volume | 7,226 | gals |
| Emulsion Total Volume | 7,949 | gals |
| Effective Pore Space Displaced | 3.6% | % |
| **Recommended Emulsion Formulation** | | |
| Additional Water Volume | 849 | gals |
| Total Water Volume (base+recommended) | 8,074 | gals |
| Total Mass of Recommended Emulsion | 73,412 | lbs |
| Total Volume of Recommended Emulsion | 8,797 | gals |
| **Application-Related** | | |
| Number of Wells | 25 | wells |
| Mass of 3DMe 10:1 Base Emulsion per Well | 2653 | lbs/well |
| ume of 3DMe 10:1 Base Emulsion per Well | 318 | gals/well |
| ss of 3DMe 10:1 Base Emulsion per Lineal Foot | 88.4 | lbs/ft |
| ume of Recommended Emulsion per Well | 352 | gals/well |
| ume of Recommended Emulsion per Foot | 12 | gals/ft |
| Estimated Application Rate | 10 | gpm |
| Estimated Application Time per Well | 4 | min/well |
| **Purchasing-Related Information** | | |
| Number of Buckets of 3DMe Concentrate | 201 | buckets |
| Estimated Number of Pallets | 6 | pallets |
| Total Required Volume of Water | 8,074 | gals |
| Mass of 10:1 Base Emulsion | 66,330 | lbs |
| Unit Price ($/lb) of 10:1 Base Emulsion | $ 0.41 | |
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# 3DMe Grid Treatment Summary Page - Contractor Output

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

**Site Name:** Country cleaner Hintington NY
**Location:** Area around cleaner
**Consultant:** aecom

## Direct Push Application

| | | |
|---|---|---|
| **Aquifer-Related Information** | | |
| Soil Type | silty sand | |
| Area of Application | 4,900 | $ft^2$ |
| **Application Dimensions** | | |
| Length | 70 | ft |
| Width | 70 | ft |
| Thickness | 30 | ft |
| **3DMe-Related Information** | | |
| 3DMe Concentrate Mass | 6,030 | lbs |
| Number of Buckets of 3DMe Concentrate | 201 | buckets |
| Estimated Number of Pallets | 6 | pallets |
| Base 10:1 Emulsion Water Requirement | 7,226 | gals |
| Additional Water Needed to Make Recom. Emulsion | 849 | gals |
| Total Volume of Water Required | 8,074 | gals |
| **Application-Related Information** | | |
| Spacing Within Rows | 15 | ft |
| Spacing Between Rows | 15 | ft |
| Number of Direct Push Injection Points | 25 | points |
| Volume of 3DMe As Applied, Emulsion per Point | 352 | gals/point |
| Volume of 3DMe As Applied, Emulsion per Foot | 12 | gals/ft |
| Estimated Application Rate | 5 | gals/minute |
| Estimated Application Time Per Point | 9 | mins/point |
| **Purchasing-Related Information** | | |
| Number of Buckets of 3DMe Concentrate | 201 | buckets |
| Estimated Number of Pallets | 6 | pallets |
| Total Required Volume of Water | 8,074 | gals |
| Mass of 10:1 Base Emulsion | 66,330 | lbs |
| Unit Price ($/lb) of 10:1 Base Emulsion | $ 0.41 | |
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# 3DMe Grid Treatment Summary Page - Contractor Output

genesis Technical Support: USA (949) 366-8000 www.regenesis.com

untry cleaner Hintington NY

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## Fixed Well Application

| | | |
|---|---|---|
| **Aquifer-Related Information** | | |
| Soil Type | silty sand | |
| Area of Application | 4,900 | $ft^2$ |
| **Application Dimensions** | | |
| Length | 70 | ft |
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| Thickness | 30 | ft |
| **3DMe-Related Information** | | |
| 3DMe Concentrate Mass | 6,030 | lbs |
| Number of Buckets of 3DMe Concentrate | 201 | buckets |
| Estimated Number of Pallets | 6 | pallets |
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| Additional Water Needed to Make Recom. Emulsion | 849 | gals |
| Total Volume of Water Required | 8,074 | gals |
| **Application-Related Information** | | |
| Spacing Within Rows | 15 | ft |
| Spacing Between Rows | 15 | ft |
| Number of Injection Wells | 25 | points |
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