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REMEDY EVALUATION REPORT FOR GROUNDWATER

Former Thypin Steel, Inc. Facility
Manorhaven, New York

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1.0 INTRODUCTION

Roux Associates, Inc. and its associated firm, Remedial Engineering, P.C., (Roux Associates), on behalf of MBA-Manorhaven, LLC (MBA-Manorhaven), have prepared this Remedy Evaluation Report for OU-1 Groundwater (RER-GW) in accordance with the New York State Department of Environmental Conservation DER-10: Technical Guidance for Site Investigation and Remediation dated May 3, 2012 for the property located at the former Thypin Steel Facility in Manorhaven, New York (Site), see Figure 1. The Site consists of Operable Units 1 and 2. The subject of this RER-GW is Operable Unit 1 (OU-1). The Site is shown on Figure 2. OU-1 is defined as the onsite shallow and intermediate aquifer zones of the project, and OU-2 is defined as the deep aquifer zone and offsite portion. This RER-GW discusses past investigation results, the shallow groundwater remediation completed using air sparge/soil vapor extraction (AS/SVE), the upper intermediate groundwater remediation completed with an In Situ Chemical Oxidation (ISCO) injection program, as well as a contaminate fate and transport modeling and provides recommendations for Site closure. All work was performed in accordance with the Voluntary Cleanup Agreement (VCA) between the New York State Department of Environmental Conservation (NYSDEC) and MBA-Manorhaven, LLC dated January 2, 2001 (Index Agreement No. V00336-1).

1.1 Purpose and Objectives

The purpose of this RER-GW is to provide a summary of all remedial actions completed to date at the Site including extensive and costly remedial investigation activities (as shown on Plate 1) as well as to describe how the primary Site remedial action objectives, which were designed to mitigate the soil, soil vapor and groundwater impacts beneath the Site, in a manner consistent with the anticipated use of the Site for residential purposes, have been accomplished. The primary objectives of the remedial actions, as defined in the Site's Remedial Action Work Plan Report (RAWP) dated August 18, 2005 and Supplemental Membrane Interface Probe Investigation and Remedial Action Work Plan Amendment Report (RAWP Amendment) dated July 11, 2008 (described in Section 4), which were approved by the NYSDEC on May 3, 2006, and September 30, 2008, respectively, are as follows:

- Reduce concentrations of chlorinated volatile organic compounds (CVOCs) in onsite shallow groundwater to NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs), to the extent practicable; and

- Obtain mass reduction of CVOCs onsite and mitigate offsite impacts of CVOCs in the intermediate groundwater zone to NYSDEC AWQSGVs, to the extent practicable, beyond the southwestern Site boundary.

Although the primary remedial approach for intermediate groundwater was modified, as per the RAWP Amendment dated July 11, 2008, the remedial objectives remained to mitigate the groundwater contamination to the extent practicable. The determination of success in achieving remediation to the "extent practicable" is Site–specific. This RER-GW will provide an evaluation on how, for this Site, "extent practicable" has been demonstrated through a number of remedial measures that were deemed appropriate to achieve this success as well as discuss remedial measures that have not yet been implemented. The completed measures included:

- Selection and application of proven remedial technologies (AS/SVE, ISCO) that have been accepted by NYSDEC at similar sites on Long Island to address the same CVOCs present in groundwater at this Site.
- Operation, monitoring, and maintenance of the AS/SVE system for an extended duration to ensure optimization of the effectiveness of the technology.
- Detailed evaluation and pilot study testing of *in situ* technologies to identify the most appropriate technology and application method for this Site.
- Application of a flexible and multi-phased ISCO injection program to account for Site-specific geologic conditions and allow for optimal oxidant dispersion.
- Demonstration through monitoring that contamination has been reduced to asymptotic levels in shallow groundwater zone.
- Demonstration through intertidal sediment sampling that there is no risk to potential beach goers to come in contact with contamination in the shallow subsurface along Manhasset Bay, at the Site.
- Demonstration through monitoring and groundwater modeling that mass reduction in contamination has been achieved, to the extent practicable, in the targeted upper intermediate groundwater zone that will result in future mitigation of offsite impacts beyond the southwestern Site boundary.

The remainder of this document consists of:

Section 2: Background

Section 3: Previous Remedial Investigations

Section 4: Site Conceptual Model

Section 5: Site Remedial Actions

Section 6: BioChlor Fate and Transport Model

Section 7: Engineering Evaluation of Remedy

Section 8: Conclusion and Recommendations

Section 9: References

2.0 BACKGROUND

Relevant Site background information is presented in this section.

2.1 Site Description

The Site is approximately 11 acres in size and is located at 5 Sagamore Hill Drive in the Village of Manorhaven, New York. The Site is bordered to the north by Yennicock Avenue, to the east by Sagamore Hill Drive, and to the west by Manhasset Bay (see Figure 1).

2.2 Site History

The Site is known as the location of the first transatlantic flights from the United States to Europe. In addition to its use as an airport, several manufacturing firms operated at the Site, including firms that worked for the United States government during World War II and the Korean Conflict. These entities include:

- Curtiss Wright (operated a seaplane fleet and a service company)
- American Aeronautical Corporation (manufacturer of seaplanes, a flying school, and as an airplane terminal)
- Marine Airport Corporation (information regarding the type of operations is unavailable)
- In 1943, the United States General Services Administration (GSA) acquired the Site for their use and their tenants included:
  - Grumman Aircraft Engineering Corporation (manufacturer of airplanes and airplane parts)
  - Republic Aviation Corporation (manufacturer of jet fighter bomber wings)
  - Port Washington Metal Products Corporation (PWMPC)

Details prior to 1943 are limited, but the scope of the operations was less extensive compared to later operations. In 1943, Grumman Aircraft Engineering Corporation began operating at the Site. The Grumman facility was operating on a schedule of 24 hours a day, seven days a week. Based on the available information, Grumman ceased operations at the Site in 1946. The Site features shown on a 1945 Plot Plan indicate the presence of 22 buildings and several subsurface structures. Republic Aviation Corporation began operations at the Site in 1951. Republic ceased operations at the Site in 1958. During the same period that Republic was operating, the PWMPC was operating at the Site as a manufacturer of metal heaters (type unknown). As shown in a 1951

Sanborn map, the PWMPC building was present along the northern portion of the Site. No other information regarding the PWMPC operations was available.

In 1958, after the Site had been utilized for more than 40 years for military and commercial operations, the Thypin Realty Company purchased the Site from the United States General Services Administration. The Thypin Steel Company utilized the Site for the storage and cutting of steel products for 30 years. From 1961 through 1985, three manufacturing firms were present at the Site. These firms included a firm that manufactured aluminum doors and windows (name unknown), United Utensils Company, Inc. that manufactured stainless steel and plastic vessels, and Sound Spars that manufactured sail boat masts. The Site has been vacant since 1988. The buildings and aboveground structures were demolished in the early 1990s. A summary of the past and current owners and operators of the Site is provided in the *Site Investigation Results Report* (SIRR) (Roux Associates, 2001).

2.3 Site Hydrogeology

Based on the findings of the Roux Associates investigation completed in 2000, three groundwater units were identified below the Site (Roux Associates, 2001). The three vertical groundwater units that underlie the Site are referred to as the shallow zone, intermediate zone, and deep aquifer.

The shallow and intermediate groundwater zones beneath the Site are part of the same hydrogeologic formation, but are distinguished from each other by the composition of the formation, which affects the spatial distribution of the dissolved CVOC contamination. The shallow zone extends from the water-table (approximately 10 feet below land surface [ft bls]) to 20 ft bls. The composition of the sand within the shallow aquifer zone is relatively uniform but the formation is tighter and denser with depth. The composition of the formation within the shallow aquifer allows for the migration of groundwater and is receptive to traditional remedial technology.

Based upon geologic conditions and analytical data, the interval between 20 ft and 60 ft bls is considered the intermediate zone. The upper intermediate aquifer zone is also composed of sand, but becomes increasingly tighter with depth from the interval 20 ft to 35 ft bls. It has been observed during investigation and injection activities, discussed later in this Report, that

traditional Geoprobe methodology is limited to approximately 30 ft to 35 ft bls before the gradual transition in the formation limits soil boring/injection point advancement. The tightness of the formation and higher organic carbon content within the deeper intermediate aquifer zone limits the migration of contamination and the upper intermediate aquifer zone is more susceptible to remediation than the lower intermediate aquifer zone. Underlying the lower intermediate zone is a silt/clay confining unit that extends to approximately 105 ft bls. Beneath the confining unit, the deep aquifer is present. The following are more detailed summaries of each of the units.

- Fill material is present throughout the Site that ranges from approximately 0.5 ft to 8 ft bls. The fill is characterized as predominately fine to coarse sand, with varying amounts of brick, concrete, asphalt, roofing materials, wood, steel and clay piping, as well as other assorted building structure materials. Underlying the fill material is orange/tan sand, which comprises the shallow zone to a depth of 20 ft bls. The shallow zone monitoring wells are typically screened from 8 to 18 ft bls.

- The soil in the intermediate groundwater zone (approximately 20 ft to 60 ft bls) consists of an orange/tan sand and gray silt/clay. Between 20 and 30 ft bls, the sand strata is medium to fine-grained, becoming relatively tight consisting of finer-grained sand and a higher proportion of silt below 30 ft bls. The original intermediate zone monitoring wells installed in 2001 and observation wells OW-1 and OW-2 are screened from 30 to 50 ft bls. The observation wells installed to monitor the ISCO injection program are screened from 25 to 35 ft bls in the upper intermediate zone.

- Underlying the intermediate zone is a silt/clay unit that is present to approximately 105 ft bls. Underlying this confining unit a sand layer is present to a field-confirmed depth of 125 ft bls and probably extends to approximately 240 ft bls, based on regional data. The deep aquifer monitoring wells are screened from 105 to 125 ft bls.

Based on regional geologic information available for the Manorhaven area, other geologic units exist at depths below 125 ft bls, but were not encountered because the deepest boreholes were terminated at 125 ft bls. More detailed information, including the monitoring well boring logs and additional cross-sections, is provided in the SIRR (Roux Associates, 2001).

Since the shallow and intermediate groundwater zones are not separate aquifers, but rather two zones within the same aquifer, the groundwater flow direction within the two zones is generally consistent and they are discussed below as a whole. Groundwater flows in a southerly direction, with only minor tidal influence (i.e., less than 0.2 feet fluctuation) detected within monitoring wells located along the western portion of the Site, adjacent to Manhasset Bay. Specifically, on the east side of the Site groundwater flows generally to the south during low and

high tide. On the west side of the Site groundwater flow is generally to the south-southwest during low tide. During high tide groundwater flow is generally towards the southwest in the northern and central portions of the Site and bends slightly more to the south near the southern portion of the Site.

3.0 PREVIOUS REMEDIAL INVESTIGATIONS

A summary of the previous environmental investigations and key results is provided in this section.

3.1 Previous Environmental Consultant Investigations

As described in the Remedial Action Completion Report for Groundwater dated November 30, 2009, Soil Mechanics Drilling Corporation (Soil Mechanics) conducted environmental investigations from May of 1989 through October of 1997 and CA Rich Consultants Inc. (CA Rich) conducted environmental investigations from February of 1999 through April of 1999. A brief summary of these investigations included the following activities and results:

Soil Mechanics

- A Phase I Environmental Site Assessment (ESA) was performed in 1989 to characterize the environmental conditions at the Site;
- A drywell excavation and removal program and an underground storage tank (UST) removal program were performed in 1992. After each of the excavations was completed, the excavations were backfilled with clean sand; and
- A water-level measurement study was performed in 1997. It was determined that there were relatively minor tidal and seasonal fluctuations (i.e., less than 0.25 feet) of the water-table present at the Site.

CA Rich

- A Phase I ESA was performed in February of 1999 to characterize the environmental conditions at the Site; and
- A Phase II Environmental Investigation was performed in April of 1999 to further address potential environmental concerns identified during the Phase I ESA. The Phase II Investigation consisted of the excavation of nine test pits (TP-6A through TP-6E and TP-8 through TP-11) from land surface to groundwater and the collection of one groundwater sample near the former plating area. The groundwater quality results near the former plating area indicated that CVOCs were the only constituents detected above the AWQSGVs. No source area for CVOCs was identified during the investigation.

3.2 Multiple Previous Remedial Investigations – Roux Associates

Numerous different phases of investigations were performed by Roux Associates from 1999 to 2012 and included extensive site wide characterizations, follow up studies, pre-design studies, and

remedial action performance monitoring. These investigations were performed by the Volunteer at a cost of over $2,000,000. Several are described below as separate stand alone investigations, while the remainders are incorporated into the remedial performance discussions that follow.

3.2.1 Investigation Work Plan Implementation

Based on the results of the aforementioned previous environmental investigations, Roux Associates conducted preliminary soil and groundwater sampling activities during 1999 and 2000 to further evaluate CVOC contamination beneath the Site and to determine if there was an off-site groundwater source of CVOCs impacting the Site. The scope of work for this investigation included water-level measurements and groundwater sampling from monitoring wells designated as MW-1, MW-2, and MW-3 (water-level measurements were also collected from Manhasset Bay). In addition, groundwater samples were collected from the approximate water-table utilizing Geoprobe methodology. The groundwater quality results confirmed that dissolved CVOC groundwater contamination was present beneath the Site however; no source area was identified for the dissolved CVOC contamination. To document the scope of work, methodology, and protocols for the future Site investigation activities, an Investigation Work Plan (IWP) was prepared and submitted on September 26, 2000 to NYSDEC. The IWP was included as Appendix B of the VCA. The NYSDEC approved the IWP on October 11, 2000. The field portion of the IWP was completed during the fall of 2000 and, based on an evaluation of the soil and groundwater quality data that were generated; a supplemental phase of work was required to achieve the investigation objectives. A supplemental investigation was submitted to the NYSDEC on January 23, 2001, and was approved by the NYSDEC on February 14, 2001. The results of the investigation were submitted to the NYSDEC in Roux Associates' November 16, 2001 *Site Investigation Results Report*.

Because the overall scope of work for the IWP and supplemental investigation was intended to be flexible, modifications, where necessary to meet the project objectives, were made during the course of both field programs. The modifications to the field program were discussed with and approved by the NYSDEC prior to their implementation. Overall, the following activities were completed as part of the extensive remedial investigation:

- Completion of 91 soil borings to facilitate the visual inspection of lithology and the collection and analysis of 41 soil and 50 groundwater samples;

- Completion of a comprehensive Geophysical Survey across a majority of Site that determined the locations needed for test pitting;
- Excavation of 37 test pits;
- Collection and analysis of 46 solid and 5 liquid samples collected from subsurface structures uncovered by the test pitting;
- Installation of 34 monitoring wells installed at various depths, with maximum depths of 125 feet below land surface (ft bls);
- Collection and analysis of 40 soil gas samples collected from temporary points;
- Completion of dense non-aqueous phase liquids (DNAPL) testing utilizing hydrophobic dyes;
- Extensive research into the history of Site development;
- Removal and disposal of over 52 tons of fill material containing elevated levels of chromium;
- Removal and disposal of 11 roll-off containers (20 cubic yards each) of stained wood debris; and
- Removal and disposal of 5 drums of fill material containing elemental mercury.

It should be noted that the mercury appears to have been from an isolated disposal event, probably via the manhole directly above the contaminated location. There is no evidence of mercury anywhere else at the Site nor was it an element of the historic operations. All Investigation sample locations are shown on Plate 1.

During the 2001 remedial investigation, CVOCs were identified as dissolved groundwater contamination present beneath the central and southwestern portion of the Site, within the shallow and intermediate zones. Based on estimates at the time, there was a significant mass (approximately 180 pounds) of total CVOC contamination within the intermediate aquifer that extended across a plume area of approximately 2.6 acres. As a result of historic remedial actions, there was only residual CVOC contamination present within the shallow aquifer zone. A majority of the mass of CVOC contamination was present at depth within the intermediate aquifer. There was no contamination detected within the deep aquifer. Although, the predominant CVOC present within the groundwater was trichloroethene (TCE) other CVOCs of concern have been detected including; tetrachloroethene (PCE), 1,1,1-trichloroethane (TCA), 1,2 dichloroethene (1,2 DCE),

and 1,1 dichloroethane (1,1 DCA). Throughout all of the activities summarized above there was no source of the dissolved CVOC contamination identified anywhere within the Site and as consented to by the NYSDEC, no additional source area investigations were required.

The extensive investigation activities generated a very substantial amount of data that included the Site media characterization (i.e., soil, subsurface building structure material, groundwater, and soil gas), delineation of impacts, and whether any of the identified impacts would pose a current or future risk above a *de minimis* risk level to human health at the Site. The results of the investigation activities indicated that no further investigation activities were necessary in connection with this Site.

Although part of OU-2, investigations have also been conducted beyond the southwestern and southern Site boundary including the Toms Point property. As detailed in Roux Associates' April 26, 2006 Off-Site Groundwater Investigation Report (Roux Associates, 2006a) and October 23, 2006 Indoor Air Investigation Report (Roux Associates, 2006b) and approved by the NYSDEC. These investigations identified that the shallow groundwater aquifer zone had only limited CVOC concentrations and any impacted soil vapor and indoor air quality was related to indoor or outdoor sources at the property and not attributable to the impacted groundwater in the intermediate zone.

3.2.2 Membrane Interface Probe (MIP) Investigation

Additional investigation activities were proposed in 2007 to further delineate the dissolved groundwater contamination within the shallow zone and to obtain additional data for remedial design development within the intermediate aquifer zone. The field investigation activities performed by Roux Associates were completed in two phases in accordance with the Roux Associates' February 27, 2007 *OU-1 Membrane Interface Probe Investigation Scope of Work* (Roux Associates, 2007a) and Roux Associates' October 30, 2007 *Supplemental MIP Investigation Work Plan* (Roux Associates, 2007c). Both phases of the MIP investigation activities were completed in accordance with the above Work Plan and approved by the NYSDEC.

The results of the 2006 and 2007 dissolved groundwater data indicated that a potential source area was present up gradient of the AS/SVE system (AS/SVE system is described in section 6 of this

Report). Although it was concluded by Roux Associates in previous reports and approved by the NYSDEC that no source area was present at the Site, Roux Associates proposed additional investigation activities to further verify that no source area was present. To accomplish this objective, a screening technology utilizing MIP soil borings was proposed. The screening technology has the capability to define the heterogeneity within the geologic formations and identify the relative magnitude of contamination present within these formations simultaneously and in real time. The MIP soil borings were advanced to depth with typical direct push Geoprobe methodology. A total of 41 MIP soil borings were completed from April 2007 through February 2008.

In addition to the completion of the MIP soil borings, additional soil and groundwater sampling activities were completed at the request of the New York State Department of Health (NYSDOH). As part of the SIRR, a comprehensive historical document review was completed including reviews of available Sanborn Insurance Maps, aerial photographs, Site schematics, and other miscellaneous documents. Although a full summary of these findings was presented in the SIRR (Roux Associates, 2001), another review of the documentation was performed to identify potential former operations that may relate to the dissolved CVOC contamination.

No additional dry wells, leaching pools, chemical storage areas, staining (viewed from aerial photographs), or presence of suspect operations was observed during the supplemental review that were not identified in the 2001 investigation. In addition the soil and groundwater samples collected in the vicinity of the former pump house (suspected source area at the time of the investigation) contained relatively low concentrations of CVOCs and no source was identified.

Although no source area was identified, the qualitative results of the MIP investigations indicated the presence of two areas where elevated concentrations of VOCs were present in groundwater up gradient of the existing monitoring well network. One area was located northwest of monitoring well cluster MW-35 (Area 1) and the second area was located northeast of monitoring well cluster MW-33 (Area 2). Area1 and Area 2 are shown on Figure 2. These two areas of elevated concentrations of VOCs were thought to have the potential to impact the shallow groundwater zone. The results of the MIP soil boring investigation and groundwater sampling confirmed that there is a significant mass of CVOC contamination present within the intermediate aquifer.

As concluded in the SIRR and in Roux Associates' *Groundwater Contamination Summary Report* (Roux Associates, 2007b) there have been no indications of CVOC soil contamination within the saturated or unsaturated soil (i.e., above the water-table) beneath the Site.

3.2.3 Intertidal Sediment Sampling

At the request of the NYSDEC in a letter dated June 16, 2011, Roux Associates performed intertidal sediment sampling at two locations along the coast of Manhasset Bay at the Site. As described in the *Intertidal Sediment Sampling Summary Report* (ISS-SR) dated September 9, 2011, the intertidal sediment sampling activities were conducted to better understand the current shallow subsurface sediment conditions (i.e., 0-2 ft bls) at the intertidal zone along the southwest portion of the Site, as a consideration for possible beachgoers. As such, the analytical data was compared to the NYSDEC Part 375 unrestricted use standards. All intertidal sediment sampling activities were conducted in accordance with the Intertidal Sediment Sampling Work Plan dated July 15, 2011, which was approved by the NYSDEC in their email correspondence dated July 20, 2011.

3.2.3.1 Intertidal Sediment Sampling Results

As described in the (ISS-SR), individual VOC and SVOC compounds were either not detected or detected at levels that did not exceed the NYSDEC Part 375 unrestricted use standards in both intertidal sediment samples (i.e., IS-1 and IS-2). Metals were detected in both of the intertidal sediment samples; however, there were no exceedances of the NYSDEC Part 375 unrestricted use standards.

Based on the analytical data collected from both intertidal sediment samples, Roux Associates recommended no further intertidal sediment samples were warranted, which was approved by the NYSDEC in a letter dated October 5, 2011.

4.0 SITE CONCEPTUAL MODEL

The CVOC groundwater contamination at the Site is the result of approximately 70 years of commercial and industrial manufacturing, use by multiple entities other than the Thypin Realty Company, the Thypin Steel Company or MBA Manorhaven, LLC.

According to a 1945 Plot Plan, there apparently existed three 20 ft diameter leaching wells, an unknown number of leaching chambers, and 84 sanitary leaching wells identified in the northwestern portion of the Site. Leaching structures at manufacturing facilities on Long Island during this time period (1940s) were commonly used for the discharge of process wastes to the subsurface. The process wastes from the types of operations conducted during this time period at the Site would likely include metals plating solutions/sludge, chlorinated solvents, anti-corrosion paints (such as zinc chromate paints), and metal-contaminated pickling acids, which are typically used in the manufacturing of airplanes and engine parts. As indicated in section 2.2 of this Report, Republic Aviation Corporation began operations at the Site in 1951 and the Site features of a 1951 Sanborn map are similar to those features of the 1945 Plot Plan, during the tenure of Grumman. Based on the similar nature of their operations, it is likely that Republic utilized the same buildings and subsurface structures (e.g., leaching wells) as Grumman.

No new construction occurred when the Thypin Realty Company took ownership of the Site in 1958, and they utilized the existing buildings from the previous tenants. No fill material was placed at the Site when the Thypin Realty Company took ownership or during the Site usage after 1958. The Thypin Steel Company then began utilizing the Site for the storage and cutting of steel products, which they did for their entire tenure (1958 through 1988) at the Site. According to Mr. Richard Thypin, the cutting operations utilized cutting oils for lubrication, and no plating, painting or metal washing was performed by the Thypin Steel Company. Therefore, there was no need for CVOCs to be stored or used at the Site.

Despite the completion of several intensive Site investigations over a nine year period at significant cost to the Volunteer (including geophysical surveys, test pitting, soil and groundwater sampling and membrane interface probe technology) and review of historical Site usage information (including Sanborn Insurance Maps, aerial photographs, Site schematics, and other miscellaneous documents), the contaminated soil source area of the CVOC contamination in

groundwater has not been identified. This is despite locating, uncovering and investigation numerous subsurface leaching structures. Several explanations are possible to explain the lack of source areas identified. The possibility exists that historical releases occurred to the porous sandy shallow soil and there is no longer any evidence of the release after decades of flushing by rainwater or the exact location was never found with a specific sampling location (all structures were demolished prior to the start of Roux Associates' investigation). It is also possible that the discharges occurred through some of the 84 drywells reportedly removed prior to Roux Associates' involvement or the subsurface structures that were sampled by Roux Associates no longer contained the CVOCs, after decades of flushing by rainwater. The NYSDEC and NYSDOH both agreed, no additional source area investigation was warranted.

There were some exceedances of metals and polycyclic aromatic hydrocarbons (PAHs) identified in soil at the Site. The PAHs and some of the metals appear to be related to the historic fill used to initially develop the Site and the remainder of the metals appears to be related to former manufacturing and plating operations. However, although no source areas were identified, areas of concern marked by persistent, elevated CVOC concentrations in groundwater, have been identified. Although, the predominant CVOC present within the groundwater is trichloroethene (TCE) other CVOCs of concern have been detected including; tetrachloroethene (PCE), 1,1,1 trichloroethane (TCA), 1,2 dichloroethene (1,2 DCE), and 1,1 dichloroethane (1,1 DCA). The majority of the mass and the highest concentrations of CVOCs are located in the Intermediate aquifer zone beneath the Site. This is believed to be due to the fact that the Intermediate zone is a tighter, silty formation and the contamination was more likely to sorb onto the finer grained particles.

The soil gas in parts of the Site was found to contain elevated levels of CVOCs. The source of these CVOCs was believed to be primarily from the off gassing of the shallow groundwater plume prior to remediation.

5.0 SITE REMEDIAL ACTIONS

A summary of Site remedial actions and key results is provided in this section. As described in the Remedial Action Completion Report for Groundwater dated November 30, 2009 and in section 2.5 of this Report, remedial plans were initiated to address the shallow and intermediate aquifer zones beneath the Site. The remedial actions completed at the Site included:

- The installation and monitoring of an AS/SVE system;
- Enhanced reductive dechlorination (ERD) pilot study; and
- *In Situ* chemical oxidation injection (ISCO) program.

All remedial action activities were completed in accordance with the Site's RAWP and RAWP Amendment and are described below.

5.1 Remediation in Shallow Aquifer Zone

The primary focus of the AS/SVE system was to remediate the limited CVOC contamination that was present within the shallow aquifer zone. The AS/SVE system was installed in July 2003 and began operation in August 2003. The AS/SVE system was initially operated until August 2004. During this operational period, the AS/SVE system was effective at reducing CVOC concentrations in monitoring wells MW-31S and MW-33S to the NYSDEC AWQSGVs. As a result, the AS/SVE system was temporarily shut down.

Post shutdown monitoring of shallow groundwater in August 2004 identified elevated TCE concentrations in MW-35S, which was located outside the influence of the AS/SVE system. Since MW-35S had not shown TCE impacts in previous investigations, the AS/SVE system was not designed to remediate that area and would need to be further evaluated and expanded. In June 2005 additional groundwater investigation activities were performed and based on the investigation results, the AS/SVE system was expanded to address the area around MW-35S and other adjacent areas to enhance the overall effectiveness of the AS/SVE system. In accordance with the RAWP, the expanded AS/SVE system was designed, installed, and started up in December 2005. The expanded AS/SVE system operated from December 2005 through October 2008 with the principal objective of remediating shallow groundwater in the vicinity of MW-35S while continuing to mitigate the relatively low residual concentrations in the vicinity of

MW-31S and MW-33S. The expanded AS/SVE system was operated in alternating continuous and pulse modes to optimize air flow to priority zones and to maximize system effectiveness. Based on groundwater results, the AS/SVE system was successful at reducing CVOC concentrations (i.e., TCE) in all shallow monitoring wells within the remediation area to below AWQSGVs or the wells have remained at consistently low asymptotic levels. The system was shutdown in October 2008, following NYSDEC approval.

5.2 Remediation in Intermediate Aquifer Zone

As described in the Remedial Completion Report for Groundwater date September 7, 2009, the initiation of remedial activity within the intermediate aquifer zone included an ERD pilot study, which was proposed to the NYSDEC in a March 2, 2004 letter. The proposed ERD pilot study was approved by the NYSDEC in a letter dated March 29, 2004 and was completed for eight weeks from June 11, 2004 to July 30, 2004. The purpose of the pilot study was to determine Site-specific parameters needed to design a full-scale ERD injection plan for the intermediate zone. Based on the findings of the ERD pilot study as well as MIP investigation (described in Section 3.5 of this Report), the remedial approach for the intermediate aquifer was proposed to be modified. The modification to the remedial approach included the completion of an ISCO injection program in place of the ERD. The modification was presented in the RAWP Amendment (Roux Associates, 2008). The RAWP Amendment proposed the completion of the ISCO injection program to provide a final polishing step for shallow groundwater and to further remediate intermediate groundwater. The NYSDEC approved the RAWP Amendment in correspondence dated September 30, 2008, which included the AS/SVE system shut down (on October 16, 2008). Following AS/SVE system shutdown, designated air sparge wells were re-configured to facilitate ISCO injections, as described below.

5.2.1 ISCO Injection Program

This section provides a summary of the ISCO injection program and additional groundwater sampling conducted at the Site. As described in the ISCO Injection Program Completion Report dated February 5, 2013, and in accordance with the RAWP Amendment, an ISCO injection program was completed in four phases as well as an additional pilot study and additional groundwater sampling between November 2008 and June 2012. The ISCO injection program was to provide a replacement for the ERD technology in the intermediate groundwater zone as was

originally presented in the RAWP as well as the supplement remedy for the shallow groundwater zone. Similarly, the objective of the ISCO injection program was to reduce the mass of CVOC contamination within the groundwater beneath the Site thereby resulting in mitigation of off-Site impacts beyond the Site boundary. The ISCO injection program was an intensive multi-phased remedy using an aggressive oxidant and the latest in equipment technologies. The multitude of ISCO injection point locations are shown on Figure 2. The injection program included:

- Installation of five observation wells (OW-3 through OW-7) prior to the first injection program and two additional observation wells (OW-8 and OW-9) prior to the second injection program;
- Implementation of the ISCO injection pilot study, utilizing the Sidewinder tool (i.e., pressure pulse technology), prior to the third phase injection program;
- Mixture of approximately 24 tons of RegenOx^{TM} oxidant complex with approximately 60,000 gallons of water to form an injection solution;
- Injection of the above oxidant solution within 11 air sparge points (screened from 21 to 23 ft bls) to supplement remediation of the shallow aquifer zone;
- Injection of the above solution within 18 temporary injection points from the interval 15 to 25 ft bls to supplement remediation of the shallow aquifer zone; and
- Injection of the above solution within 139 temporary injection points from the interval 25 to 35 ft bls and two permanent wells (screened from 30 to 50 ft bls) to remediate the intermediate aquifer zone.

The first phase of the ISCO injection program included baseline groundwater monitoring/sampling, and a first phase injection event followed by two months of groundwater monitoring. Based on the review of the groundwater data, it was determined that a second phase injection event would be warranted. The second injection event was completed and subsequently followed by one month of groundwater monitoring. Based on the review of the groundwater data, it was determined that a third phase injection event would be warranted. However, at the request of the NYSDEC, an evaluation of alternative injection methodologies as well as the chemical oxidants was completed prior to the implementation of the third phase injection event. Thus, an ISCO pilot study, utilizing the Sidewinder tool, was completed and subsequently followed by one month of groundwater monitoring. Based on the pilot study results, it was determined that a third injection event would be warranted utilizing the Sidewinder tool. The third injection event was completed and subsequently followed by four months of groundwater monitoring. The third

phase of ISCO injections was designed to target the upper intermediate zone around OW-4, OW-5 and within existing wells MW-34I and MW-35I. At the request of the NYSDEC and based on groundwater data collected during the post third injection event monitoring, a focused fourth injection event was completed followed by four months of groundwater monitoring. The fourth phase of ISCO injections was designed to target the upper intermediate zone around well OW-4 and within MW-35I.

5.2.1.1 Results of ISCO Injection Program

This section provides a summary of the overall results of the ISCO injection program. The CVOC data from the groundwater samples collected from the shallow monitoring wells during the performance monitoring events were either non-detect, or detected at low concentration levels consistent with the baseline sampling round (see Plate 2). The relatively small mass of dissolved CVOC contamination that was originally present within the shallow aquifer zone has been remediated to the AWQSGVs, to the extent practicable, utilizing multiple NYSDEC-approved technologies and no further remedial actions could be performed that would significantly, or cost effectively further remediate the shallow aquifer zone.

The results of the performance monitoring rounds following each phase of the injection program showed an overall decreasing trend throughout some areas of the plume within the upper intermediate zone. The majority of the observation wells contained relatively low concentrations of TCE or a decrease in concentration as follows:

- The TCE concentrations within the groundwater samples collected from OW-3, OW-7, OW-8 and OW-9 following the completion of the second phase of injections were all below 100 micrograms per liter (µg/L), with an average TCE concentration of 52 µg/L.
- The TCE concentration within the groundwater samples collected from OW-4 following the fourth phase of injections decreased from a historical high concentration of 8,900 µg/L to 2,100 µg/L.
- The TCE concentrations within the groundwater samples collected from OW-5 decreased from a historical high concentration of 2,400 µg/L to 160 µg/L.
- The TCE concentrations within the groundwater samples collected from OW-6 following the completion of the ISCO injection pilot study decreased from a historical high concentration of 1,000 µg/L to 18 µg/L.

- The TCE concentrations within the groundwater samples collected from MW-26I following the second phase of injections decreased from a historical high concentration of 1,100 µg/L to 27 µg/L.
- The TCE concentrations within the groundwater samples collected from MW-34I following the fourth phase of injections decreased from a historical high concentration of 7,200 µg/L to 2,900 µg/L.
- The TCE concentrations within the groundwater samples collected from MW-35I following the fourth phase of injections decreased from a historical high concentration of 5,500 µg/L to 410 µg/L.

Overall, the ISCO injection program has been successful in obtaining the mass reduction of CVOCs onsite and mitigation of offsite impacts of CVOCs in the intermediate groundwater zone, which was one of the primary objectives of the remedial actions, as defined in the Site's RAWP and RAWP Amendment (see Plate 3). This is evident in the aforementioned reduction of TCE concentrations, as described above. A summary of the groundwater sampling data for VOCs is summarized in Table 1. A summary of CVOC mass reduction percentages for the wells with historical concentrations above 1,000 µg/L (i.e., OW-4, OW-5, OW-6, MW-26I, MW-34I and MW-35I) are shown below.

Well Designation	TCE Concentration Historical High (µg/L)	TCE Concentration Post Injection Program (µg/L)	Percent Reduction (%)
OW-4	8,900	2,100	76
OW-5	2,400	160	93
OW-6	1,000	18	98
MW-26I	1,100	27	97
MW-34I	7,200	2,900	60
MW-35I	5,500	410	92

However, even though an overall reduction of CVOC concentrations was observed in wells OW-4 and MW-34I as compared to pre-ISCO injection program groundwater results, a static CVOC concentration level was reached in both wells following the second phase of injections. As shown on Plate 3, CVOC concentrations remained relatively unchanged following the third and fourth

phases of injections in OW-4 and MW-34I. As discussed in Section 4 of this Report, this is most likely due to the fact that the lower intermediate aquifer consists of a tighter, silty formation and the contamination was more likely to sorb onto the finer grained particles, which is not coming into contact with the oxidant during injections even when the state of the art Sidewinder tool was utilized. Thus, all phases of the ISCO injection program have not been effective at reducing CVOC concentrations to meet AWQSGVs in most of the upper intermediate and intermediate wells (see Plate 2). The groundwater sample collected from OW-4 following the latest phase (i.e., fourth phase) of the ISCO program contained a TCE concentration of 2,100 µg/L, which is lower than historical (prior to implementation of the ISCO injection program) concentration of 8,900 µg/L, but elevated as compared to the remainder of the upper intermediate aquifer zone. The groundwater sample collected from MW-34I following the third phase of the ISCO program contained a TCE concentration 2,900 µg/L, which is lower than the historical concentration of 7,200 µg/L but elevated as compared to the remainder of the intermediate aquifer zone. As previously mentioned, these elevated concentrations represent a localized area that has been shown to be extremely difficult to treat and is composed of a very tight formation.

5.2.2 Additional Groundwater Sampling

As described in the *Additional Groundwater Sampling for the Southwest Portion of the Site Summary Report* (AGS-SR) dated September 9, 2011, the objectives of the additional groundwater sampling were to better understand current groundwater conditions; to eliminate groundwater analytical data gaps in a portion of the Site located south-southwest of the groundwater observation well OW-6, within the vicinity of wells OW-7, MW-26I and MW-30I (Investigation Area); and to identify the need, if any, for a modification to the scope of work for the third phase of ISCO injections.

A total of four (4) temporary shallow groundwater monitoring wells (shallow wells) and four (4) temporary upper intermediate groundwater monitoring wells (upper intermediate wells) were installed in clusters (i.e., shallow well adjacent to an upper intermediate well) at four locations within the south-southwestern portion of the Site. The locations for the temporary groundwater monitoring wells are shown in Figure 2.

Groundwater samples from each temporary well were collected one week following well development, in accordance with United States Environmental Protection Agency (USEPA) Region I low-flow groundwater sampling procedures (July 30, 1996). All groundwater water samples were sent to TestAmerica Laboratories of Shelton, Connecticut for the analysis of full list volatile organic compounds (VOCs) using USEPA Method 8260B.

5.2.2.1 Additional Groundwater Sampling Results

As indicated in the AGS-SR and approved by the NYSDEC in a letter dated October 5, 2011, although there were exceedances of the NYSDEC AWQSGVs for TCE, the Investigation Area is not considered to be an additional target area for remediation of the upper intermediate zone since the detections were relatively low and represent discontinuous areas. This is further supported by the shallow well sampling data, which indicates that the upper intermediate groundwater zone is not impacting the shallow groundwater zone.

Thus, all temporary groundwater monitoring wells we abandoned on December 8, 2011 in accordance with NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy, dated November 3, 2009.

5.3 Future Remedial Actions

The remedial approach for Site groundwater consisted of several remedial efforts to actively reduce CVOC concentrations. To carry forward the remedial goal of attaining protection of human health and the environmental into the future, the following engineering controls (ECs) and institutional controls (ICs) plan to be instituted at the Site:

Engineering Controls

- Composite cap consisting of building slabs, pavement and a 2-foot soil cap over landscaped areas
- Slab on grade construction for future structures only
- Vapor barrier and sub-slab depressurization system beneath all future structures

Institutional Controls

- Restrict usage of groundwater

- Site use will be zoned restricted residential

5.3.1 Engineering Controls

Engineering controls are defined as any physical barrier or method employed to actively or passively contain, stabilize, or monitor contamination, restrict the movement of contamination to ensure long-term effectiveness of a remedial program, or eliminate potential exposure pathways to contamination.

5.3.1.1 Soil Cap

Future construction plans for the Site will include a 2-foot layer of clean soil to serve as a soil cap in all landscaped areas. All other areas will be developed with residential structures or will be paved. The soil cap will reduce the likelihood of direct contact of residents and future construction/utility workers with soil impacted by Site related chemicals or to groundwater. Therefore, after all construction is completed, buildings, pavement, and the clean soil cap will cover the entire Site to prevent contact with any impacted soil and groundwater.

5.3.1.2 Residential Construction

Engineering controls will be incorporated into the design of the future condominiums. The following features will address the potential for CVOC vapors to migrate into the residences:

1. Slab-On-Grade Construction – To minimize the potential for vapor migration from the subsurface into the residences, each unit will be built without a basement. The slab-on-grade construction will reduce the potential for vapor migration into the first floor of the residence.

2. Vapor Barrier – A vapor barrier will be placed below the slab of each residence constructed at the Site. The vapor barrier will include a polyethylene or similar membrane designed to retard vapors. The vapor barrier will mitigate the potential for CVOCs from migrating into the residences.

3. Sub-Slab Passive Depressurization System (SPDS) – A passive depressurization system will be installed below each of the building slabs and associated vapor barriers in order to provide a mitigative pathway to manage vapor that may accumulate beneath the vapor barriers. This system will be installed for passive operation with the ability to be easily retrofitted for active use, if in the event Site-specific CVOCs are found to be migrating into the residences.

5.3.2 Institutional Controls

Institutional controls are any non-physical means that restrict usage of properties to limit human and environmental exposure, provides notice to potential owners and the public, or prevents actions that interfere with the effectiveness of the remedial program. Institutional controls that are proposed for implementation to protect human health and the safety of future residents and construction personnel include the following:

1. An institutional control will ensure that the soil cap is maintained by restricting future excavations that extend greater than two feet below land surface. Any required excavations within the soil cap (e.g., utility work) will require full repair and restoration of the soil cap. Any excavations extending deeper than the soil cap must be performed by authorized, properly trained construction personnel that are trained on the exposure risk. Workers performing excavations greater than two feet in depth will be required to follow a site-specific Health and Safety Plan (HASP) and the Soil Management Plan (SoMP) requirements and will restore the soil cap.

2. An institutional control will prohibit future use of Site groundwater as drinking water or for use in agriculture of any kind.

5.3.3 Site Management Plan

The Site Management Plan (SMP) will be a comprehensive plan that includes a summary of the contamination remaining at the Site and the controls set in place to manage remaining contamination. An SMP typically includes three separate plans: an Institutional and Engineering Control Plan (IEC); a Monitoring Plan; and an Operations and Maintenance Plan. Given that all active remedial efforts have been completed and the remedial goals will be achieved through IC/ECs, the SMP will consist primarily of the IEC and a Monitoring Plan and Operations and Maintenance Plan are not expected to be applicable for this Site.

The IEC will document the details associated with each of the IC/ECs discussed above for the benefit of future owners/occupants of the Site and will identify the requirements necessary to assure the IC/ECs remain in place. An excavation plan will be prepared to instruct on soil removal, management, and handling practices to be used and soil cap restoration requirements. Annual certification requirements will be also be outlined in the IEC.

6.0 FATE AND TRANSPORT MODEL

An analytical solute transport and natural attenuation model was created as a conservative screening method to assess the potential for contaminant migration towards sensitive receptors and to assess the overall fate and transport of the CVOCs in groundwater beneath the Site. The goal of the modeling efforts was to determine if CVOCs in groundwater beneath the Site may migrate to the nearest public supply wells. Additionally, the modeling efforts were used to assess the influence of natural attenuation on the fate of the contaminant plume over time. However, these simulations were also run with the most conservative model (i.e., no natural attenuation of CVOCs) and give a likely worst case scenario. The fate and transport model simulations and data input sheets are provided in Appendix A.

Two potable water supply wells (N4860 and N6087) were identified as the nearest potential sensitive receptors, existing approximately 2,700 feet to the east-southeast of the Site. N4860 and N6087 are screened within the upper glacial aquifer with screen intervals of 42 to 71 feet below sea level (ft-bsl) and 43 to 72 ft-bsl, respectively (USGS, 1992).

The modeling task was completed using BIOCHLOR (USEPA, 2000), an analytical solute transport model used to predict dissolved-phase plume migration of chlorinated solvents (i.e., CVOCs) and used as a natural attenuation screening tool for chlorinated solvent release sites. The BIOCHLOR software was developed by Groundwater Services, Inc of Houston, Texas for the Air Force Center for Environmental Excellence (AFCEE) and was further customized and tested by members of Battelle Pacific Northwest Laboratory, Richland, Washington (Clement and Sun, 1999). The BIOCHLOR software is programmed in a Microsoft© Excel Spreadsheet and is currently distributed by the USEPA.

The BIOCHLOR model is based on the Domenico analytical solute transport model (Domenico, 1987) and has the ability to simulate 1-Dimensional advection, 3-Dimensional dispersion, linear adsorption, and biotransformation via reductive dechlorination. Reductive dechlorination is assumed to occur under anaerobic conditions and solvent degradation is assumed to follow a first-order decay process. BIOCHLOR includes three model types, including solute transport without decay, solute transport with biotransformation modeled as a sequential first-order decay process,

and solute transport with biotransformation modeled as a sequential first-order decay process with different reaction zones.

As an analytical model, BIOCHLOR assumes simple groundwater flow conditions (i.e., horizontal laminar flow in one direction) and assumes uniform hydrogeologic and environmental conditions (i.e., modeled saturated zone is homogeneous and isotropic). Additionally, BIOCHLOR is primarily designed for simulating the sequential reductive dechlorination of chlorinated ethanes and ethenes, and therefore, the biotransformation feature in BIOCHLOR is appropriate for the CVOCs found at the Site, which degrade via first-order decay. For additional information regarding modeling limitations and a more detailed description of the fundamentals of natural attenuation, users should refer to the BIOCHLOR user's manual (USEPA, 2000).

6.1 Model Parameters

The following section discusses the development of the BIOCHLOR input parameters. The model is based on historical Site data, and recent data collected as part of the remedial efforts at the Site. Where Site specific data is unavailable, typical values from literature sources were used as inputs to the model.

6.1.1 Groundwater Flow

Groundwater flow parameters including hydraulic gradient, hydraulic conductivity and effective porosity are used in the BIOCHLOR model to estimate a seepage velocity. The seepage velocity parameter is used for calculation of advection in the analytical transport model equation. Based on groundwater elevation data collected during the March 16, 2010 comprehensive gauging round, which was the latest and most comprehensive gauging data available, groundwater flow at the Site is generally to the south/south-west direction towards Manhasset Bay (see Figure 3), which is consistent with previous investigation gauging data. The horizontal hydraulic gradient across the Site is approximately 0.0011 ft/ft. In general, groundwater within the shallow aquifer system (i.e., upper glacial aquifer) beneath Manhasset Neck is flowing away from the land mass toward Manhasset Bay on the west side of Manhasset Neck (i.e., the Site's location) and toward Hempstead Harbor on the east side of Manhasset Neck (see Monti, Figures 8 and 14A).

The hydraulic conductivity in the intermediate zone was estimated based upon lithologic data collected during soil boring activities at the Site. As described above in section 2.3, the lithologic data indicates that the intermediate zone of the aquifer is primarily composed of fine sand to silty material. A hydraulic conductivity of 15 ft/day, or 5.3 X 10-3 cm/sec, was selected for use in the model, corresponding to fine sand (Freeze and Cherry, 1979). This value was selected as a conservative value in respect to evaluating potential contaminant migration, because the value is on the higher end of the range of hydraulic conductivities for fine sand.

Effective porosity was also estimated based on the lithologic data. A value of 0.35 was selected to be used in the model, which corresponds to an average value for sandy material (Fetter, 1994).

6.1.2 Dispersion

Dispersion is the process where a dissolved solvent will be spatially distributed longitudinally, transversely, and vertically as a result of mechanical mixing and chemical diffusion in the aquifer. Dispersion is difficult to measure in the field, and therefore is typically estimated based on the length of the contaminant plume observed in field data. Values for horizontal (x), transverse (y), and vertical (z) dispersion were estimated for this model based on a plume length of 250 feet. Plume length is approximate and based on CVOC groundwater concentrations observed south-southeast of Area 1.

As described in section 2.3, lithologic data collected from soil borings indicate that the Site is underlain by a zone of low permeability material. The low permeability material effectively limits the vertical migration of contaminants. The model was assigned a saturated thickness of 25 feet based on the distance from the water table to the top of the low permeability material.

6.1.3 Adsorption

Adsorption to the soil matrix can reduce the concentration of the dissolved contaminants moving through the groundwater. Adsorption is incorporated into the BIOCHLOR model through a retardation factor that can be entered directly or calculated using soil bulk density (rho), organic carbon fraction (foc), and partition coefficient (koc) parameters. For this modeling task, the retardation factor was calculated with values selected based on published literature data. The soil bulk density parameter was assigned a value of 1.6 kg/L based on data provided by the

U.S. Department of Agriculture for loamy sand material. The organic carbon fraction parameter was assigned a value of 0.0002, which is a conservative value based on the values provided in the BIOCHLOR user's manual (EPA, 2000). The values selected for the partition coefficient parameter for each chlorinated solvent were based on values provided in the USEPA technical document titled Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (USEPA, 1998).

6.1.4 Biotransformation

As described above, the BIOCHLOR model utilizes a first-order decay process for dissolved constituents. The rate of biotransformation of dissolved constituents under first-order decay is dependent on the initial concentration of the contaminant and a rate coefficient (λ) parameter for each individual chlorinated solvent. The rate coefficient is calculated based on the half-life on the contaminant in groundwater. For this task, the rate coefficient utilized for each chlorinated solvent was selected based on values provided in the BIOCHLOR user's manual (EPA, 2000). The following values were utilized in the model for the coefficient parameters:

PCE → TCE = 0.70
TCE → DCE = 0.50
DCE → VC = 0.18
VC → ETH = 0.12

The values selected for the rate coefficient are at the low to middle of the range of values provided in the literature, and therefore should be considered conservative values in respect to calculating potential degradation of the chlorinated solvents in the model.

The initial contaminant concentrations used in the model were selected based on review of historical groundwater sampling results. The highest concentration measured historically for each chlorinated solvent at the Site was selected as the initial concentration input to the model for the respective solvent. The initial concentrations input to the model are:

PCE = 0.21 mg/L
TCE = 8.9 mg/L
DCE = 0.32 mg/L
VC = 0.36 mg/L
ETH = 0.00 mg/L

Selecting the highest historical concentration for the initial input value is a conservative method that will yield the highest final concentration value at the end of the model simulation. However, actual concentrations measured in future groundwater samples would likely be less than predicted by the model as a result of past remedial actions at the Site.

6.2 Model Results

Results of the model simulations and the input data sheets for each simulation run are provided in Appendix A. The model was run with simulation times of 10 years, 20 years, and 30 years in order to assess potential migration over time. Results indicate that initial concentrations will decrease by more than an order of magnitude over the 30 year period. Results of the simulations (assuming no decay) indicate that after 30 years, peak TCE concentrations of approximately 0.50 mg/L would be observed at a down gradient distance of approximately 500 feet. Results of the same simulation indicate that non-detect concentrations for all chlorinated solvents would be observed within 1,500 feet of Area 1. As stated above, since the highest concentrations detected were used for the model, 1,500 feet is an overestimation.

As described in section 2.1 of this Report, the Site is bordered by a large body of water (Manhasset Bay) to the west. Based on the groundwater flow direction and the results of the model simulations as well as previous investigation activities, the dissolved phase constituents observed at the Site are likely reaching Manhasset Bay to the south-southwest. However, intertidal sediment sampling along southwest shoreline of Manhasset Bay has indicated that there were no CVOC detections within the shallow subsurface, related to the migration of contaminates from the Site. The contamination reaching Manhasset Bay is not likely to migrate under any adjacent land mass (i.e., Great Neck peninsula) since the groundwater gradient beneath the adjacent land mass indicate groundwater is flowing away from the land mass, toward the surrounding bodies of water, i.e., Manhasset Bay (see Monti, Figures 8 and 14A), Similarly, the results of the model simulation indicate there is no potential for the contamination beneath the Site to impact the public supply wells N4860 and N6087, which are located approximately 2,700 feet to the east-southeast from the Site. As described above, N4860 and N6087 are screened within the upper glacial aquifer with screens interval of 42 to 71 feet below sea level (ft-bsl) and 43 to 72 ft-bsl, respectively (USGS, 1992). However, the model simulation indicates that there will be non-detect concentrations for all chlorinated solvents at a distance of 1,500 feet from Area 1 of the

Site. The groundwater gradient beneath Manhasset Neck will likely prohibit the contamination from migrating toward the wells; since the groundwater is flowing away from the wells, in the direction of the Site (see Monti, Figure 8). More importantly, the fate and transport model also demonstrates that there was no risk of contamination reaching the public supply wells, even before any remedial action took place at the Site.

The maximum capture zone of public supply wells N4860 and N6087 is approximately 1,180 feet (see Figure 4). Thus, the Site is approximately 2,700 feet from the wells and not within the public supply well's radius of influence (ROI). Although, if the Site's groundwater was within the ROI of the public supply wells, the wells would likely be shut down; due to high salinity levels caused by known saltwater intrusion; before the Site's groundwater reached the wells. As indicated in the United States Geological Survey (USGS) *Simulation of Variable-Density Ground-Water Flow and Saltwater Intrusion beneath Manhasset Neck, Nassau County, New York, 1905-2005* report, there has been an extensive saltwater intrusion investigation conducted for the groundwater beneath Manhasset Neck. USGS has identified the area of the public supply wells, which they indicate as saltwater wedge B, as having experienced saltwater intrusion due to historical excessive groundwater pumping (Monti, 2009). Historically, one deep water well (N35), which was located within the well field of N4860 and N6087 was shutdown in 1944 due to elevated chloride concentrations (Monti, 2009).

7.0 ENGINEERING EVALUATION OF REMEDY

To further support the finding that groundwater remediation has been completed fully to the extent practicable and has achieved the approved Remedial Action Objectives, an evaluation of the groundwater remedy using the threshold and balancing criteria provided in 6 NYCRR 375.1.8(f) is presented in this section.

7.1 Overall Protection of Human Health and the Environment

The remedial objectives for the Site were developed specifically to design a remedial program that would afford protection to human health and the environment. The remediation has successfully met these remedial objectives, thus in effect providing protection to human health and the environment.

- Shallow Groundwater Zone – The SVE/AS system and ISCO polishing step successfully reduced CVOC concentrations in the onsite shallow groundwater zone to the extent practicable, with a 90% reduction in contamination levels, to near non-detect levels. CVOC mass reduction evaluation is discussed further in Section 7.5.

- Intermediate Groundwater Zone – The ISCO injection program successfully achieved an 85% mass reduction and reduced CVOC concentrations in the upper intermediate zone with the exception of a localized area near OW-4. No upward migration of contaminants from the intermediate zone to the shallow groundwater zone has been observed. As a result, the shallow groundwater zone acts as a buffer zone and reduces the potential for direct contact with contaminated intermediate groundwater. Additionally, the shallow groundwater creates a buffer zone between the potential source of soil gas (i.e., dissolved CVOC contamination in the deeper intermediate aquifer) and the vadose zone and does not present an exposure pathway for the dissolved contamination to volatilize into soil gas at the water-table, thereby reducing the potential for vapor intrusion into the future residences.

- Offsite – The fate and transport model demonstrates that mass reduction accomplished by the remediation has mitigated a risk for offsite impacts to the nearest public water supply wells. More importantly, the fate and transport model also demonstrates that there was no risk of contamination reaching the public supply wells, even before any remedial action took place at the Site. Intertidal sediment sampling has confirmed that contaminants are not impacting shallow sediment and do not pose a risk to possible beachgoers.

- Future Risk – A Site Management Plan will be established to manage institutional controls (i.e., environmental easement to address residual contamination) and engineering controls (e.g., soil cap, slab on grade to prevent direct contact).

7.2 Compliance with SCGs

The objective of the remediation was to reduce CVOC concentrations in groundwater to NYSDEC's AWQSGVs, to the extent practicable, in the shallow groundwater zone and obtain a mass reduction of CVOCs onsite and mitigate offsite impacts of CVOCs in the intermediate groundwater zone to NYSDEC AWQSGVs, to the extent practicable, beyond the southwestern Site boundary. As stated in NYSDEC DER-10 and 6 NYCRR Subpart 375-1.8(f)(2)(i)(c), conformance with SCGs is required unless good cause exists why conformity should be dispensed with. An acceptable cause listed in DER-10 includes "conformity to such standard or criterion is technically impracticable from an engineering or scientific perspective."

As demonstrated in Section 4.0, several iterations of various remedial technologies have been employed at the Site. Engineering evaluations of multiple potential remedial technologies, research of various oxidants, and use of delivery methods have been completed, tested, and employed over the course of almost 10 years, resulting in significant mass reduction in the shallow and upper intermediate zone. However, due to hydrogeological factors, the cumulative remedial efforts used for CVOC removal to meet the NYSDEC AWQSGV have proven to be technically impracticable from an engineering perspective and have in effect reduced concentrations to the maximum extent practicable.

7.3 Short Term Impacts and Effectiveness

The short term impacts and effectiveness criterion is used to evaluate the potential short term adverse impacts and human exposure during construction and implementation of any remedial actions. Moderate short term risk of exposure exists for construction workers during future condominium construction. The short-term risk of exposure would be minimized through the use of proper personal protective equipment and health and safety monitoring during construction. Additionally, only HAZWOPER trained construction workers will be utilized for placement of the 2-foot clean soil cover.

7.4 Long Term Effectiveness and Permanence

The SVE/AS system was effective in permanently reducing CVOC concentrations in the shallow groundwater zone. The ISCO injections reduced CVOC concentrations in the intermediate groundwater zone to the extent practicable, given the complex hydrogeological conditions.

Residual CVOCs in the intermediate groundwater zone remain at the Site. The fate and transport model, discussed in section 5 for this Report, demonstrates that remaining CVOCs will not migrate towards the nearest public supply wells.

Long-term protection to humans from direct exposure on-Site will rely on the ICs/ECs. The following provides an evaluation of the long term effectiveness of the planned ICs/ECs in accordance with NYSDEC's DER-10.

Engineering Controls

The Site will largely be developed with condominiums constructed on slabs (i.e., no basements). The soil cap placed in all landscaped areas will be maintained to preserve the 2-foot barrier. The Site Management Plan will outline the soil cover inspection requirements including inspection frequency and reporting. A description of condominium design components (i.e., slab on grade construction, vapor barrier, SPDS) will be incorporated in the Site management Plan and will not require future enforcement mechanisms. Each of these engineering controls are viable controls and reliable to meet the remedial goal of protecting human health into the future.

Institutional Controls

The residual CVOC, metals, and PAH contamination and existing underground piping to remain onsite will require an environmental easement that will preserve the use restriction to restricted residential. The Site Management Plan will be recorded with the environmental easement and will provide IC/EC information to all future occupants.

7.5 Reduction of Toxicity, Mobility and Volume

Despite the completion of several intensive site investigations and review of historical site usage information, the source of the CVOC contamination has not been identified. However, areas of concern marked by persistent, elevated CVOC concentrations in groundwater have been identified. Similarly, the extent of remaining CVOC contamination has been fully delineated in the shallow and intermediate groundwater zones. The SVE/AS and ISCO remedies permanently reduced a significant mass of CVOCs from the shallow and intermediate groundwater in the areas of concern. As shown below, these technologies were successful in achieving significant

reductions in the portions of the shallow and upper intermediate groundwater most amenable to remediation.

→ Groundwater Zone	→ Mass Removed	→ Percent Reduction
→ Shallow Groundwater	→ 10 pounds	→ 90%
→ Upper Intermediate Groundwater	→ 19 pounds	→ 85%

As discussed in Section 5.6, the fate and transport model has determined that dissolved phase contaminants would migrate towards Manhasset Bay in a south-southwest direction in the intermediate groundwater zone and unlikely to impact any neighboring properties. Although the remediation resulted in a limited effectiveness in reducing mobility, dissolved phase contaminants are within the intermediate zone, which is approximately 30 feet bls, and does not pose a direct exposure risk to human health at the shoreline of Manhasset Bay, as demonstrated by the intertidal sediment sampling results. Further, the fate and transport model indicates that concentrations will decrease by more than an order of magnitude over a 30 year period.

7.6 Implementability

The implementability criterion evaluates the feasibility of a remedy based on the ability to operate the technology, reliability of the technology, ability to monitor effectiveness, the administrative feasibility, and availability of services. The various remedial technologies employed at the Site were each found to be highly implementable, are widely used technologies for addressing the contaminants of concern, and proved to be successful in reducing the mass of contaminants at the Site to the extent practicable.

The planned institutional and engineering controls are technically and administratively feasible. Moderate administrative effort would be required to implement the planned institutional and engineering controls. Future construction of a soil cap and incorporation of the SPDS and vapor barriers into the building construction design is equally easily implementable, with trained workers and material widely available.

7.7 Cost Effectiveness

Exhaustive investigative and remedial efforts have been performed at this Site. Over the last decade, the Site has undergone significant investigation, remedial alternative evaluations, and remediation at a cost of more than $3,500,000 to the Volunteer, MBA-Manorhaven (who is not the responsible party). The implementation of multiple remedial technologies to best address the varying depths and hydrogeological conditions, use of varying oxidant delivery methods to target known areas of impact, and continual modification to both the shallow and intermediate groundwater zones remedies to optimize CVOC concentration reduction performance resulted in the expenditure of approximately $1,000,000.

The ISCO injection program was completed within the upper portion of the intermediate aquifer, where the formation is somewhat permeable (in most locations) to allow for the dispersion of oxidant. However, based on the extremely tight soil conditions at depth it is certain that deeper injections would be completed at a much higher cost per pound of contamination mitigated. Within the deeper intermediate aquifer, the formation is excessively tight and composed of finer materials with higher percentage of total organic carbon. This will make penetrating the formation very difficult and would require more oxidant to overcome the additional natural carbon content of the formation. These factors in addition to the number of injection rows required to disperse the oxidant throughout the aquifer would require substantial additional costs. It is estimated that the average unit rate to remediate the remaining mass of the CVOC contamination would be 2 or 3 times higher than the $20,000 per pound cost to remediate the upper intermediate aquifer zone (i.e., $40,000 to $60,000 per pound). The estimated cost to remediate the contamination within the intermediate aquifer zone would be more than an additional $8,500,000 and it is certain that a small mass of residual contamination would still remain after the additional injection programs.

Based on the excessive anticipated future cost, it is Roux Associates and MBA-Manorhaven's opinion that it is not practicable to implement additional remedial actions within the intermediate aquifer that would have limited effectiveness.

8.0 CONCLUSIONS AND RECOMMENDATIONS

As presented in this Report, exhaustive investigative and remedial efforts have been performed at this Site. Over the last decade, the Site has undergone significant investigation, remedial alternative evaluations, and remediation at a cost of more than $3,000,000 to the Volunteer, MBA-Manorhaven (who is not the responsible party). Exhaustive investigation activities were performed to identify a source of the CVOC contamination. No source was ever identified after multiple investigations were performed under the oversight of the NYSDEC/NYSDOH. As previously mentioned, the Site groundwater has been effectively remediated, to the extent practicable, using multiple NYSDEC-approved technologies. Based on the results of the AS/SVE system operation and ISCO injection program, the objectives of the RAWP have been achieved.

The AS/SVE system, which operated under various configurations for six years, was effective in reducing the CVOC concentrations within the shallow aquifer zone. Based on a comparison of the data from the 2001 SIRR and groundwater sampling data collected following the shutdown of the AS/SVE system, approximately 10 lbs. of total CVOC mass was removed from the shallow aquifer by the AS/SVE system. There was only a limited mass of CVOC contamination present within the shallow aquifer zone prior to remediation and following the operation of the AS/SVE system, approximately 90% of the CVOC contamination with the shallow aquifer was removed to the maximum capability of the AS/SVE technology.

With the application of the ISCO program, elevated concentrations of CVOCs specifically within the shallow aquifer and upper portions of the intermediate aquifer have been targeted and remediated, to the extent practicable, by a proven technology as approved by the NYSDEC. The flexible and multi-phased approach effectively dispersed the oxidant within the targeted treatment zone and the mass of contamination has been reduced in the groundwater beneath the Site. As such, the remaining dissolved CVOC contamination within the intermediate aquifer will not present an exposure pathway capable of impacting future occupants under the contemplated use of the Site. The relatively clean shallow groundwater creates a buffer zone between the potential source of soil gas (i.e., dissolved CVOC contamination in the deeper intermediate aquifer) and the vadose zone and does not present an exposure pathway for the dissolved contamination to volatilize into soil gas at the water-table. Further attempts to remediate the intermediate groundwater zone would be very costly and would not provide further benefit in regard to meeting

the site-specific remedial objectives. Furthermore, as discussed in section 5, the Fate and Transport modeling has shown that if left untreated, the CVOCs will not impact the nearby public supply wells or any adjacent land mass, which is supported by the groundwater flow gradients beneath the Site and Manhasset Neck. As per the model simulation, CVOC concentrations will be non-detect at a distance of 1,500 feet from Area 1 of the Site and the wells are located approximately 2,700 feet east-southeast of the Site. Similarly, intertidal sediment sampling results indicate that contamination migrating into Manhasset Bay are not affecting the shallow subsurface and potential beachgoers.

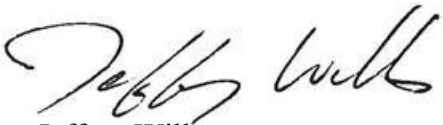
Based on the excessive costs it is Roux Associates and MBA-Manorhaven's opinion that it is not practicable to implement additional remedial actions within the intermediate aquifer that would have limited effectiveness. Furthermore, as discussed above and in sections 5 and 7 of this Report, the groundwater modeling has shown that if left untreated (even before remediation) the CVOCs in will not impact the nearby public supply wells or any adjacent land mass.

The remedial actions completed to date compromise all pre-construction remedial measures as outlined in the NYSDEC-approved RAWP and RAWP Amendment. The implementation of future remedial actions (i.e., soil cap, environmental easement and Site Management Plan) to provide for the protection of public health and the environment under the conditions of the contemplated use of the Site for residential purposes would be performed as Site development takes place.

Based on the implementation of the AS/SVE system and the ISCO injection program, Roux Associates conclude that the remediation has achieved the remedial groundwater objectives of the RAWP and RAWP Amendment, to the extent practicable, and no further remediation is warranted except for implementing the aforementioned future remedial actions (i.e., soil cap, environmental easement and Site Management Plan) during Site development.

Respectfully submitted,

ROUX ASSOCIATES, INC.



Jeffrey Wills
Project Hydrogeologist/
Project Manager

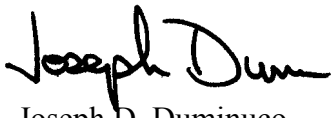


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TABLE

1. Summary of Volatile Organic Compounds in Groundwater

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MW-2	MW-2	MW-24	MW-24	MW-24	MW-24	MW-26I	MW-26I
		Sample Date:	2/26/2008	3/16/2010	12/1/2008 baseline 1	2/2/2009	3/12/2009 baseline 2	3/16/2010	12/23/2008 baseline 1	2/11/2009
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	1.5 J	2.6 J
1,2,4-Trichlorobenzene	5		NA	5 U	NA	NA	NA	5 U	NA	NA
1,2-Dibromoethane	--		5 U	5 U	NA	NA	NA	5 U	NA	NA
1,2-Dichlorobenzene	3		NA	5 U	NA	NA	NA	5 U	NA	NA
1,2-Dichloroethane	0.6		NA	5 U	5 U	5 U	5 U	5 U	5 U	10 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
1,3-Dichlorobenzene	3		NA	5 U	NA	NA	NA	5 U	NA	NA
1,4-Dichlorobenzene	3		NA	5 U	NA	NA	NA	5 U	NA	NA
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U
Acetone	50		10 U	3.1 J	10 U	2.4 J	10 U	10 U	10 U	20 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Bromomethane	5		5 U *	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Chloromethane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
cis-1,2-Dichloroethene	5		1 J	3 J	5 U	5 U	5 U	5 U	**170**	**270**
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Cyclohexane	--		NA	5 U	NA	NA	NA	5 U	NA	NA
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Dibromochloropropane	--		NA	5 U	NA	NA	NA	5 U	NA	NA
Dichlorodifluoromethane	5		NA	5 U	NA	NA	NA	5 U	NA	NA
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Freon 113	--		NA	5 U	NA	NA	NA	5 U	NA	NA
Isopropylbenzene	5		NA	5 U	NA	NA	NA	5 U	NA	NA
Methyl acetate	--		NA	5 U	NA	NA	NA	5 U	NA	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-2 2/26/2008	MW-2 3/16/2010	MW-24 12/1/2008 baseline 1	MW-24 2/2/2009	MW-24 3/12/2009 baseline 2	MW-24 3/16/2010	MW-26I 12/23/2008 baseline 1	MW-26I 2/11/2009
Methylcyclohexane	--		NA	5 U	NA	NA	NA	5 U	NA	NA
Methylene chloride	5		5 U	5 U	5 U	0.8 J B	5 U	5 U	5 U	10 U
MTBE	10		NA	5 U	NA	NA	NA	5 U	NA	NA
Styrene	5		5 U	5 U	5 U *	5 U	5 U	5 U	5 U	10 U
Tetrachloroethene	5		2.9 J	**5.4**	5 U	2.5 J	5 U	5 U	1.5 J	2.2 J
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	1 J	4.2 J
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Trichloroethene	5		**7**	**9.2**	2.4 J	**6.2**	4 J	1.8 J	**620**	**1100**
Trichlorofluoromethane	5		NA	5 U	NA	NA	NA	5 U	NA	NA
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U

NYSDEC - New York State Department of Environmental Conservation
AWQSGVs - Ambient Water-Quality Standards and Guidance Values
µg/L -Micrograms per liter
J - Estimated Value
U - Compound was analyzed for but not detected
* - Laboratory Control Sample (LCS) or Laboratory Control Sample Duplicate (LCSD) exceeds the control limits
DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-26I 3/11/2009 baseline 2	MW-26I 3/16/2010	MW-26S 12/23/2008 baseline 1	MW-26S DUP 12/23/2008	MW-26S 2/2/2009	MW-26S 3/11/2009 baseline 2	MW-26S 3/16/2010
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		1.4 J	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	5		NA	5 U	NA	NA	NA	NA	5 U
1,2-Dibromoethane	--		NA	5 U	NA	NA	NA	NA	5 U
1,2-Dichlorobenzene	3		NA	5 U	NA	NA	NA	NA	5 U
1,2-Dichloroethane	0.6		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		NA	5 U	NA	NA	NA	NA	5 U
1,4-Dichlorobenzene	3		NA	5 U	NA	NA	NA	NA	5 U
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		10 U	10 U	10 U	10 U	1.8 J	1.2 J B	10 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**97**	**6.3**	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		NA	5 U	NA	NA	NA	NA	5 U
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		NA	5 U	NA	NA	NA	NA	5 U
Dichlorodifluoromethane	5		NA	5 U	NA	NA	NA	NA	5 U
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		NA	5 U	NA	NA	NA	NA	5 U
Isopropylbenzene	5		NA	5 U	NA	NA	NA	NA	5 U
Methyl acetate	--		NA	5 U	NA	NA	NA	NA	5 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MW-26I	MW-26I	MW-26S	MW-26S DUP	MW-26S	MW-26S	MW-26S
		Sample Date:	3/11/2009	3/16/2010	12/23/2008	12/23/2008	2/2/2009	3/11/2009	3/16/2010
			baseline 2		baseline 1			baseline 2	
Methylcyclohexane	--		NA	5 U	NA	NA	NA	NA	5 U
Methylene chloride	5		5 U	5 U	5 U	5 U	0.8 J B	5 U	5 U
MTBE	10		NA	5 U	NA	NA	NA	NA	5 U
Styrene	5		5 U	5 U	5 U	5 U	5 U	5 U *	5 U
Tetrachloroethene	5		0.91 J	5 U	1.4 J	1.2 J	1.8 J	1.1 J	1.1 J
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		0.81 J	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**440**	**27**	5 U	5 U	5 U	0.86 J	5 U
Trichlorofluoromethane	5		NA	5 U	NA	NA	NA	NA	5 U
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U

NYSDEC - New York State Department of Environmental Conservation
AWQSGVs - Ambient Water-Quality Standards and Guidance Values
µg/L -Micrograms per liter
J - Estimated Value
U - Compound was analyzed for but not detected
* - Laboratory Control Sample (LCS) or Laboratory Control Sample Dupl
DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-29S 2/26/2008	MW-29S 3/16/2010	MW-30I 12/23/2008 baseline 1	MW-30I 2/11/2009	MW-30I 3/12/2009 baseline 2	MW-30S 12/23/2008 baseline 1	MW-30S 2/2/2009	MW-30S 3/12/2009 baseline 2
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	5		NA	5 U	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	--		5 U	5 U	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	3		NA	5 U	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.6		NA	5 U	5 U	5 U *	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		5 U *	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		NA	5 U	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	3		NA	5 U	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		10 U	10 U	10 U	10 U	10 U	10 U	2.3 J	10 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		5 U *	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		5 U	5 U	5 U	**5.4**	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		NA	5 U	NA	NA	NA	NA	NA	NA
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		NA	5 U	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	5		NA	5 U	NA	NA	NA	NA	NA	NA
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		NA	5 U	NA	NA	NA	NA	NA	NA
Isopropylbenzene	5		NA	5 U	NA	NA	NA	NA	NA	NA
Methyl acetate	--		NA	5 U	NA	NA	NA	NA	NA	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-29S 2/26/2008	MW-29S 3/16/2010	MW-30I 12/23/2008 baseline 1	MW-30I 2/11/2009	MW-30I 3/12/2009 baseline 2	MW-30S 12/23/2008 baseline 1	MW-30S 2/2/2009	MW-30S 3/12/2009 baseline 2
Methylcyclohexane	--		NA	5 U	NA	NA	NA	NA	NA	NA
Methylene chloride	5		5 U	5 U	5 U	5 U	5 U	5 U	0.88 J B	5 U
MTBE	10		NA	5 U	NA	NA	NA	NA	NA	NA
Styrene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	0.88 J	5 U
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		5 U	5 U	**12**	**88**	**16**	1.8 J	1.7 J	4.5 J
Trichlorofluoromethane	5		NA	5 U	NA	NA	NA	NA	NA	NA
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

NYSDEC - New York State Department of Environmental Conservation
AWQSGVs - Ambient Water-Quality Standards and Guidance Values
µg/L -Micrograms per liter
J - Estimated Value
U - Compound was analyzed for but not detected
* - Laboratory Control Sample (LCS) or Laboratory Control Sample Dupl
DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MW-30S	MW-31I	MW-31I	MW-31I	MW-31S	MW-31S	MW-31S	MW-31S
		Sample Date:	3/16/2010	11/24/2008 baseline 1	2/11/2009	3/12/2009 baseline 2	11/24/2008 baseline 1	2/2/2009	3/12/2009 baseline 2	3/16/2010
1,1,1-Trichloroethane	5		5 U	5 U	**4.1 J**	5 U	**24**	**31**	**25**	**3.4 J**
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	**7**	**7.3**	**7.8**	1.6 J
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	1.1 J	1.4 J	1.8 J	5 U
1,2,4-Trichlorobenzene	5		5 U	NA	NA	NA	NA	NA	NA	5 U
1,2-Dibromoethane	--		5 U	NA	NA	NA	NA	NA	NA	5 U
1,2-Dichlorobenzene	3		5 U	NA	NA	NA	NA	NA	NA	5 U
1,2-Dichloroethane	0.6		5 U	5 U	5 U *	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		5 U	NA	NA	NA	NA	NA	NA	5 U
1,4-Dichlorobenzene	3		5 U	NA	NA	NA	NA	NA	NA	5 U
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		10 U	10 U	10 U	10 U	10 U	2.3 J	10 U	10 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		5 U	5 U	2.4 J	5 U	**31**	**31**	**34**	**11**
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		1 J	NA	NA	NA	NA	NA	NA	5 U
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		5 U	NA	NA	NA	NA	NA	NA	5 U
Dichlorodifluoromethane	5		5 U	NA	NA	NA	NA	NA	NA	5 U
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		5 U	NA	NA	NA	NA	NA	NA	5 U
Isopropylbenzene	5		**1.3 J**	NA	NA	NA	NA	NA	NA	5 U
Methyl acetate	--		5 U	NA	NA	NA	NA	NA	NA	5 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MW-30S	MW-31I	MW-31I	MW-31I	MW-31S	MW-31S	MW-31S	MW-31S
		Sample Date:	3/16/2010	11/24/2008 baseline 1	2/11/2009	3/12/2009 baseline 2	11/24/2008 baseline 1	2/2/2009	3/12/2009 baseline 2	3/16/2010
Methylcyclohexane	--		**1.3 J**	NA	NA	NA	NA	NA	NA	5 U
Methylene chloride	5		5 U	5 U	5 U	5 U	5 U	0.85 J B	5 U	5 U
MTBE	10		5 U	NA	NA	NA	NA	NA	NA	5 U
Styrene	5		5 U	5 U *	5 U	5 U	5 U *	5 U	5 U	5 U
Tetrachloroethene	5		5 U	5 U	2.4 J	5 U	**52**	**55**	**48**	**14**
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	0.87 J	1 J	1.2 J	5 U
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		0.63 J	0.91 J	**12**	0.89 J	**78**	**84**	**81**	**22**
Trichlorofluoromethane	5		5 U	NA	NA	NA	NA	NA	NA	5 U
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

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DUP - Duplicate
- - No NYSDEC AWQSGV available
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NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MW-33I	MW-33I	MW-33I	MW-33S	MW-33S	MW-33S	MW-33S
		Sample Date:	11/24/2008	2/11/2009	3/12/2009	11/24/2008	2/2/2009	3/12/2009	3/16/2010
			baseline 1		baseline 2	baseline 1		baseline 2	
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	5		NA	NA	NA	NA	NA	NA	5 U
1,2-Dibromoethane	--		NA	NA	NA	NA	NA	NA	5 U
1,2-Dichlorobenzene	3		NA	NA	NA	NA	NA	NA	5 U
1,2-Dichloroethane	0.6		5 U	5 U *	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		NA	NA	NA	NA	NA	NA	5 U
1,4-Dichlorobenzene	3		NA	NA	NA	NA	NA	NA	5 U
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		10 U	10 U	10 U	10 U	2.7 J	10 U	10 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		5 U *	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	1 J	5 U
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		NA	NA	NA	NA	NA	NA	5 U
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		NA	NA	NA	NA	NA	NA	5 U
Dichlorodifluoromethane	5		NA	NA	NA	NA	NA	NA	5 U
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U *	5 U	5 U
Freon 113	--		NA	NA	NA	NA	NA	NA	5 U
Isopropylbenzene	5		NA	NA	NA	NA	NA	NA	5 U
Methyl acetate	--		NA	NA	NA	NA	NA	NA	5 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-33I 11/24/2008 baseline 1	MW-33I 2/11/2009	MW-33I 3/12/2009 baseline 2	MW-33S 11/24/2008 baseline 1	MW-33S 2/2/2009	MW-33S 3/12/2009 baseline 2	MW-33S 3/16/2010
Methylcyclohexane	--		NA	NA	NA	NA	NA	NA	5 U
Methylene chloride	5		5 U *	5 U	5 U	5 U	0.8 J B	5 U	5 U
MTBE	10		NA	NA	NA	NA	NA	NA	5 U
Styrene	5		5 U	5 U	5 U	5 U *	5 U *	5 U	5 U
Tetrachloroethene	5		5 U	5 U	5 U	5 U	5 U *	5 U	5 U
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		5 U	2.3 J	0.79 J	**5.9**	**8.7**	**8.7**	**8.9**
Trichlorofluoromethane	5		NA	NA	NA	NA	NA	NA	5 U
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U

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Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-34I 11/24/2008 baseline 1	MW-34I 2/11/2009	MW-34I 3/11/2009 baseline 2	MW-34I 3/16/2010	MW-34I 10/13/2011 baseline 3	MW-34I 1/6/2012	MW-34I 3/2/2012
1,1,1-Trichloroethane	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
1,1,2,2-Tetrachloroethane	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
1,1,2-Trichloroethane	1		5 U	100 U	**1.9 J**	**1.4 J**	5 U	10 U	10 U
1,1-Dichloroethane	5		5 U	100 U	**5.2**	2.6 J	5 U	10 U	**5.4 J**
1,1-Dichloroethene	5		4.5 J	**53 J**	**58**	**42**	**8.9**	**21**	**20**
1,2,4-Trichlorobenzene	5		NA	NA	NA	5 U	NA	NA	10 U
1,2-Dibromoethane	--		NA	NA	NA	5 U	NA	NA	10 U
1,2-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA	10 U
1,2-Dichloroethane	0.6		5 U	100 U *	5 U	5 U	5 U	10 U	10 U
1,2-Dichloropropane	1		5 U	100 U	5 U	5 U	5 U	10 U	10 U
1,3-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA	10 U
1,4-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA	10 U
2-Butanone (MEK)	50		10 U	200 U	10 U	10 U	50 U	50 U	50 U
2-Hexanone	50		10 U	200 U	10 U	10 U	50 U	50 U	50 U
4-Methyl-2-pentanone	--		10 U	200 U	10 U	10 U	50 U	50 U	50 U
Acetone	50		10 U	200 U	2.3 J B	10 U	50 U	50 U	40 J
Benzene	1		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Bromodichloromethane	50		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Bromoform	50		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Bromomethane	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Carbon disulfide	60		5 U	100 U	5 U	5 U	5 U	10 U	1.6 J
Carbon tetrachloride	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Chlorobenzene	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Chloroethane	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Chloroform	7		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Chloromethane	--		5 U	100 U	5 U	5 U	5 U	10 U	10 U
cis-1,2-Dichloroethene	5		**24**	**180**	**230 J**	**170 J**	**75**	**120**	**96**
cis-1,3-Dichloropropene	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Cyclohexane	--		NA	NA	NA	5 U	NA	NA	10 U
Dibromochloromethane	50		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Dibromochloropropane	--		NA	NA	NA	5 U	NA	NA	10 U
Dichlorodifluoromethane	5		NA	NA	NA	5 U	NA	NA	10 U
Ethylbenzene	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Freon 113	--		NA	NA	NA	5 U	NA	NA	10 U
Isopropylbenzene	5		NA	NA	NA	5 U	NA	NA	10 U
Methyl acetate	--		NA	NA	NA	5 U	NA	NA	20 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-34I 11/24/2008 baseline 1	MW-34I 2/11/2009	MW-34I 3/11/2009 baseline 2	MW-34I 3/16/2010	MW-34I 10/13/2011 baseline 3	MW-34I 1/6/2012	MW-34I 3/2/2012
Methylcyclohexane	--		NA	NA	NA	5 U	NA	NA	10 U
Methylene chloride	5		5 U	17 J	5 U	5 U	5 U	10 U	10 U
MTBE	10		NA	NA	NA	5 U	NA	NA	10 U
Styrene	5		5 U *	100 U	5 U *	5 U	5 U	10 U	10 U *
Tetrachloroethene	5		5 U	100 U	1.3 J	5 U	5 U	10 U	1.8 J
Toluene	5		5 U	100 U	5 U	5 U	5 U	10 U	10 U
trans-1,2-Dichloroethene	5		5 U	100 U	**6.7**	**5.3**	2.5 J	4.8 J	3 J
trans-1,3-Dichloropropene	--		5 U	100 U	5 U	5 U	5 U	10 U	10 U
Trichloroethene	5		**590**	**5700**	**7200**	**4600**	**1800**	**3200**	**2700**
Trichlorofluoromethane	5		NA	NA	NA	5 U	NA	NA	10 U
Vinyl chloride	2		**1.6 J**	**24 J**	**36**	**17**	**3.8 J**	**14**	**15**
Xylenes (total)	5		5 U	100 U	5 U	5 U	15 U	30 U	30 U

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DUP - Duplicate
- - No NYSDEC AWQSGV available
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NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** **Sample Date:**	MW-34I DUP 3/2/2012	MW-34I 3/30/2012	MW-34S 11/24/2008 baseline 1	MW-34S 2/2/2009	MW-34S 3/11/2009 baseline 2	MW-34S 3/16/2010	MW-35I 11/24/2008 baseline 1
1,1,1-Trichloroethane	5		10 U	0.28 J	5 U	5 U	5 U *	5 U	5 U
1,1,2,2-Tetrachloroethane	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		10 U	**1.2**	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		**5.3 J**	4.3	5 U	5 U	5 U	5 U	1.7 J
1,1-Dichloroethene	5		**19**	**21**	5 U	5 U	5 U	5 U	2.4 J
1,2,4-Trichlorobenzene	5		10 U	NA	NA	NA	NA	5 U	NA
1,2-Dibromoethane	--		10 U	NA	NA	NA	NA	5 U	NA
1,2-Dichlorobenzene	3		10 U	NA	NA	NA	NA	5 U	NA
1,2-Dichloroethane	0.6		10 U	1 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		10 U	1 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		10 U	NA	NA	NA	NA	5 U	NA
1,4-Dichlorobenzene	3		10 U	NA	NA	NA	NA	5 U	NA
2-Butanone (MEK)	50		50 U	5 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	50		50 U	5 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		50 U	5 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		50 U	5 U	10 U	2.3 J	1.2 J B	10 U	10 U
Benzene	1		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		10 U	0.26 J	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		10 U	1 U	5 U *	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**87**	**130**	5 U	5 U	5 U	5 U	**9.5**
cis-1,3-Dichloropropene	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		10 U	NA	NA	NA	NA	5 U	NA
Dibromochloromethane	50		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		10 U	NA	NA	NA	NA	5 U	NA
Dichlorodifluoromethane	5		10 U	NA	NA	NA	NA	5 U	NA
Ethylbenzene	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		10 U	NA	NA	NA	NA	5 U	NA
Isopropylbenzene	5		10 U	NA	NA	NA	NA	5 U	NA
Methyl acetate	--		20 U	NA	NA	NA	NA	5 U	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-34I DUP 3/2/2012	MW-34I 3/30/2012	MW-34S 11/24/2008 baseline 1	MW-34S 2/2/2009	MW-34S 3/11/2009 baseline 2	MW-34S 3/16/2010	MW-35I 11/24/2008 baseline 1
Methylcyclohexane	--		10 U	NA	NA	NA	NA	5 U	NA
Methylene chloride	5		10 U	1 U	5 U *	0.95 J B	5 U	5 U	5 U
MTBE	10		10 U	NA	NA	NA	NA	5 U	NA
Styrene	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U *
Tetrachloroethene	5		2.3 J	1.4	5 U	5 U	5 U	5 U	1.5 J
Toluene	5		10 U	1 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		**5.6 J**	4.1	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	--		10 U	1 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**2500**	**3300 E**	5 U	5 U	5 U	5 U	**3600**
Trichlorofluoromethane	5		10 U	NA	NA	NA	NA	5 U	NA
Vinyl chloride	2		**13**	**17**	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		30 U	3 U	5 U	5 U	5 U	5 U	5 U

NYSDEC - New York State Department of Environmental Conservation
AWQSGVs - Ambient Water-Quality Standards and Guidance Values
µg/L -Micrograms per liter
J - Estimated Value
U - Compound was analyzed for but not detected
* - Laboratory Control Sample (LCS) or Laboratory Control Sample Dupl
DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-35I 2/11/2009	MW-35I 3/11/2009 baseline 2	MW-35I 3/16/2010	MW-35I 9/22/2010 baseline pilot	MW-35I 11/3/2010	MW-35I 11/17/2010	MW-35I 10/13/2011 baseline 3
1,1,1-Trichloroethane	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		20 U	**1.1 J**	**1.8 J**	5 U	**1.1 J**	0.92 J	0.99 J
1,1-Dichloroethane	5		20 U	1.7 J	2.3 J	1.3 J	1.3 J	1.2 J	1.3 J
1,1-Dichloroethene	5		20 U	3.5 J	1.8 J	**5.2**	2.4 J	2.2 J	2 J
1,2,4-Trichlorobenzene	5		NA	NA	5 U	5 U	5 U	5 U	NA
1,2-Dibromoethane	--		NA	NA	5 U	5 U	5 U	5 U	NA
1,2-Dichlorobenzene	3		NA	NA	5 U	5 U	5 U	5 U	NA
1,2-Dichloroethane	0.6		20 U *	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		20 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		NA	NA	5 U	5 U	5 U	5 U	NA
1,4-Dichlorobenzene	3		NA	NA	5 U	5 U	5 U	5 U	NA
2-Butanone (MEK)	50		40 U	10 U	10 U	10 U	10 U	10 U	50 U
2-Hexanone	50		40 U	10 U	10 U	10 U	10 U	10 U	50 U
4-Methyl-2-pentanone	--		40 U	10 U	10 U *	10 U	10 U	10 U	50 U
Acetone	50		40 U	10 U	10 U	10 U	10 U	10 U	50 U
Benzene	1		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		20 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**10 J**	**12**	**11**	**5.8**	**8.1**	**8.9**	**7.2**
cis-1,3-Dichloropropene	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		NA	NA	5 U	5 U	5 U	5 U	NA
Dibromochloromethane	50		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		NA	NA	5 U	5 U	5 U	5 U	NA
Dichlorodifluoromethane	5		NA	NA	5 U	5 U *	5 U	5 U	NA
Ethylbenzene	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		NA	NA	5 U	5 U	5 U	5 U	NA
Isopropylbenzene	5		NA	NA	5 U	5 U	5 U	5 U	NA
Methyl acetate	--		NA	NA	5 U	5 U *	5 U	5 U	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-35I 2/11/2009	MW-35I 3/11/2009 baseline 2	MW-35I 3/16/2010	MW-35I 9/22/2010 baseline pilot	MW-35I 11/3/2010	MW-35I 11/17/2010	MW-35I 10/13/2011 baseline 3
Methylcyclohexane	--		NA	NA	5 U	5 U	5 U	5 U	NA
Methylene chloride	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
MTBE	10		NA	NA	2.2 J	1.8 J	1 J	1.1 J	NA
Styrene	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5		20 U	1.5 J	1.1 J	5 U	5 U	5 U	5 U
Toluene	5		20 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		20 U	5 U	**1 J**	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	--		20 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**2900**	**3700**	**3800**	**1500**	**2600**	**2000**	**2200**
Trichlorofluoromethane	5		NA	NA	5 U	5 U	5 U	5 U	NA
Vinyl chloride	2		20 U	**1.8 J**	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		20 U	5 U	5 U	5 U	5 U	5 U	15 U

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DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-35I 3/2/2012	MW-35I 3/30/2012	MW-35I 9/21/2012	MW-35S 11/24/2008 baseline 1	MW-35S 2/2/2009	MW-35S DUP 2/2/2009	MW-35S 3/11/2009 baseline 2
1,1,1-Trichloroethane	5		10 U	0.41 J	1.3	5 U	5 U	5 U	5 U *
1,1,2,2-Tetrachloroethane	5		10 U	2 U	1 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		10 U	0.91 J	1 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		1.3 J	1.2 J	0.35 J	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		10 U	1.7 J	1.3	5 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	5		10 U	NA	1 U	NA	NA	NA	NA
1,2-Dibromoethane	--		10 U	NA	1 U	NA	NA	NA	NA
1,2-Dichlorobenzene	3		10 U	NA	1 U	NA	NA	NA	NA
1,2-Dichloroethane	0.6		10 U	2 U	1 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		10 U	2 U	1 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		10 U	NA	1 U	NA	NA	NA	NA
1,4-Dichlorobenzene	3		10 U	NA	1 U	NA	NA	NA	NA
2-Butanone (MEK)	50		50 U	10 U	5 U	10 U	4.2 J	4.1 J	10 U
2-Hexanone	50		50 U	10 U	5 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		50 U	10 U	5 U	10 U	10 U	10 U	10 U
Acetone	50		50 U	10 U	5 U	10 U	16	15 B	10 U
Benzene	1		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Bromoform	50		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Bromomethane	5		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Chloroethane	5		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Chloroform	7		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Chloromethane	--		10 U	2 U	1 U	5 U *	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**11**	**8.8**	**21**	4.4 J	1.9 J	1.8 J	**6.7**
cis-1,3-Dichloropropene	5		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Cyclohexane	--		10 U	NA	1 U	NA	NA	NA	NA
Dibromochloromethane	50		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		10 U	NA	1 U	NA	NA	NA	NA
Dichlorodifluoromethane	5		10 U	NA	1 U	NA	NA	NA	NA
Ethylbenzene	5		10 U	2 U	1 U	5 U	5 U *	5 U	5 U
Freon 113	--		10 U	NA	1 U	NA	NA	NA	NA
Isopropylbenzene	5		10 U	NA	1 U	NA	NA	NA	NA
Methyl acetate	--		20 U	NA	2 U	NA	NA	NA	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-35I 3/2/2012	MW-35I 3/30/2012	MW-35I 9/21/2012	MW-35S 11/24/2008 baseline 1	MW-35S 2/2/2009	MW-35S DUP 2/2/2009	MW-35S 3/11/2009 baseline 2
Methylcyclohexane	--		10 U	NA	1 U	NA	NA	NA	NA
Methylene chloride	5		10 U	2 U	1 U	5 U *	5 U	0.82 J B	5 U
MTBE	10		10 U	NA	0.3 J	NA	NA	NA	NA
Styrene	5		10 U	2 U	1 U	5 U	5 U *	5 U *	5 U
Tetrachloroethene	5		2.2 J	1.5 J	3.3	5 U	5 U *	5 U	5 U
Toluene	5		10 U	2 U	1 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		10 U	0.71 J	0.65 J	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	--		10 U	2 U	1 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**2100**	**2600**	**410**	**41**	**24**	**25**	**85**
Trichlorofluoromethane	5		10 U	NA	1 U	NA	NA	NA	NA
Vinyl chloride	2		10 U	0.36 J	0.4 J	5 U	5 U	5 U	5 U
Xylenes (total)	5		30 U	6 U	3 U	5 U	5 U	5 U	5 U

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Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-35S 3/16/2010	OW-1 9/22/2010 baseline pilot	OW-1 11/3/2010	OW-1 11/17/2010	OW-2 9/22/2010 baseline pilot	OW-2 11/3/2010	OW-2 11/17/2010
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dibromoethane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichlorobenzene	3		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	0.6		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-Dichlorobenzene	3		5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		4.1 J	**20**	**21**	**25**	5 U	5 U	5 U
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dichlorodifluoromethane	5		5 U	5 U *	5 U	5 U	5 U *	5 U	5 U
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Isopropylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methyl acetate	--		5 U	5 U *	5 U	5 U	5 U *	5 U	5 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-35S 3/16/2010	OW-1 9/22/2010 baseline pilot	OW-1 11/3/2010	OW-1 11/17/2010	OW-2 9/22/2010 baseline pilot	OW-2 11/3/2010	OW-2 11/17/2010
Methylcyclohexane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene chloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
MTBE	10		5 U	5 U	5 U	0.33 J	2.8 J	5 U	5 U
Styrene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**48**	**240**	**160**	**220**	**54**	**11**	**7.9**
Trichlorofluoromethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U

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AWQSGVs - Ambient Water-Quality Standards and Guidance Values
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- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-3 11/24/2008 baseline 1	OW-3 2/11/2009	OW-3 2/11/2009	OW-3 3/12/2009 baseline 2	OW-3 6/9/2009	OW-3 3/16/2010	OW-4 11/24/2008 baseline 1
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		1.9 J	5 U	5 U	5 U	5 U	5 U	**22**
1,2,4-Trichlorobenzene	5		NA	NA	NA	NA	NA	5 U	NA
1,2-Dibromoethane	--		NA	NA	NA	NA	NA	5 U	NA
1,2-Dichlorobenzene	3		NA	NA	NA	NA	NA	5 U	NA
1,2-Dichloroethane	0.6		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		NA	NA	NA	NA	NA	5 U	NA
1,4-Dichlorobenzene	3		NA	NA	NA	NA	NA	5 U	NA
2-Butanone (MEK)	50		10 U	3.7 J *	1.9 J	10 U	10 U	10 U	10 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		10 U	10 U	10 U	9.2 J	3 J *	10 U	10 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		5 U	0.85 J	0.98 J	5 U	5 U	5 U	5 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		5 U	5 U *	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**5.7**	5 U	5 U	5 U	1.7 J	2.1 J	**360 J**
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		NA	NA	NA	NA	NA	5 U	NA
Dibromochloromethane	50		5 U	**0.64 J**	**0.81 J**	5 U	5 U	5 U	5 U
Dibromochloropropane	--		NA	NA	NA	NA	NA	5 U	NA
Dichlorodifluoromethane	5		NA	NA	NA	NA	NA	5 U	NA
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		NA	NA	NA	NA	NA	5 U	NA
Isopropylbenzene	5		NA	NA	NA	NA	NA	5 U	NA
Methyl acetate	--		NA	NA	NA	NA	NA	5 U	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-3 11/24/2008 baseline 1	OW-3 2/11/2009	OW-3 2/11/2009	OW-3 3/12/2009 baseline 2	OW-3 6/9/2009	OW-3 3/16/2010	OW-4 11/24/2008 baseline 1
Methylcyclohexane	--		NA	NA	NA	NA	NA	5 U	NA
Methylene chloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
MTBE	10		NA	NA	NA	NA	NA	5 U	NA
Styrene	5		5 U *	5 U	5 U *	5 U	5 U	5 U	5 U *
Tetrachloroethene	5		5 U	1.3 J	5 U	5 U	5 U	5 U	1.2 J
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	**6.2**
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**110**	**8.4**	**7.5**	**28**	**57**	**49**	**7400**
Trichlorofluoromethane	5		NA	NA	NA	NA	NA	5 U	NA
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	**21**
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U

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DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-4 11/24/2008	OW-4 2/2/2009	OW-4 3/11/2009 baseline 2	OW-4 6/9/2009	OW-4 3/16/2010	OW-4 DUP 3/16/2010	OW-4 10/13/2011 baseline 3
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
1,1,2-Trichloroethane	1		5 U	5 U	**1.4 J**	**1.5 J**	5 U	5 U	2 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
1,1-Dichloroethene	5		**21**	4.1 J	**25**	**39**	**5.4**	**5.7**	4.8
1,2,4-Trichlorobenzene	5		NA	NA	NA	NA	5 U	5 U	NA
1,2-Dibromoethane	--		NA	NA	NA	NA	5 U	5 U	NA
1,2-Dichlorobenzene	3		NA	NA	NA	NA	5 U	5 U	NA
1,2-Dichloroethane	0.6		5 U	5 U	5 U	5 U	5 U	5 U	2 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	2 U
1,3-Dichlorobenzene	3		NA	NA	NA	NA	5 U	5 U	NA
1,4-Dichlorobenzene	3		NA	NA	NA	NA	5 U	5 U	NA
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	10 U	20 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	20 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U *	10 U	20 U
Acetone	50		10 U	1.9 J	10 U	10 U	10 U	10 U	20 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Chloromethane	--		5 U	5 U	5 U	5 U	5 U	5 U	2 U
cis-1,2-Dichloroethene	5		**320 J**	**97**	**280 J**	**200 J**	**97**	**98**	**81**
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Cyclohexane	--		NA	NA	NA	NA	5 U	5 U	NA
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Dibromochloropropane	--		NA	NA	NA	NA	5 U	5 U	NA
Dichlorodifluoromethane	5		NA	NA	NA	NA	5 U	5 U	NA
Ethylbenzene	5		5 U	5 U *	5 U	5 U	5 U	5 U	2 U
Freon 113	--		NA	NA	NA	NA	5 U	5 U	NA
Isopropylbenzene	5		NA	NA	NA	NA	5 U	5 U	NA
Methyl acetate	--		NA	NA	NA	NA	5 U	5 U	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-4 11/24/2008	OW-4 2/2/2009	OW-4 3/11/2009 baseline 2	OW-4 6/9/2009	OW-4 3/16/2010	OW-4 DUP 3/16/2010	OW-4 10/13/2011 baseline 3
Methylcyclohexane	--		NA	NA	NA	NA	5 U	5 U	NA
Methylene chloride	5		5 U	0.79 J B	5 U	5 U	5 U	5 U	2 U
MTBE	10		NA	NA	NA	NA	1.8 J	1.8 J	NA
Styrene	5		5 U *	5 U *	5 U	5 U	5 U	5 U	2 U
Tetrachloroethene	5		1.2 J	5 U *	1.1 J	5 U	5 U	5 U	0.57 J
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	2 U
trans-1,2-Dichloroethene	5		**5.8**	1.9 J	**10**	**10**	3.6 J	3.6 J	2.8
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	2 U
Trichloroethene	5		**6700**	**1600**	**7900**	**8900**	**2500**	**2600**	**960**
Trichlorofluoromethane	5		NA	NA	NA	NA	5 U	5 U	NA
Vinyl chloride	2		**18**	**6.4**	**18**	**17**	**4.7 J**	**5.1**	**4.7**
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	6 U

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- - No NYSDEC AWQSGV available
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NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	OW-4 DUP	OW-4	OW-4 DUP	OW-4	OW-4	OW-4 DUP	OW-4
		Sample Date:	10/13/2011	1/6/2012	1/6/2012	3/2/2012	3/30/2012	3/30/2012	9/21/2012
1,1,1-Trichloroethane	5		5 U	10 U	10 U	5 U	0.21 J	0.17 J	5 U
1,1,2,2-Tetrachloroethane	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
1,1,2-Trichloroethane	1		5 U	10 U	10 U	5 U	0.25 J	0.27 J	5 U
1,1-Dichloroethane	5		5 U	10 U	10 U	5 U	0.14 J	0.19 J	5 U
1,1-Dichloroethene	5		4.2 J	**7.8 J**	**7.1 J**	5	**6.6**	**6.5**	**6.3**
1,2,4-Trichlorobenzene	5		NA	NA	NA	5 U	NA	NA	5 U
1,2-Dibromoethane	--		NA	NA	NA	5 U	NA	NA	5 U
1,2-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA	5 U
1,2-Dichloroethane	0.6		5 U	10 U	10 U	5 U	1 U	1 U	5 U
1,2-Dichloropropane	1		5 U	10 U	10 U	5 U	1 U	1 U	5 U
1,3-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA	5 U
1,4-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA	5 U
2-Butanone (MEK)	50		50 U	50 U	50 U	25 U	5 U	5 U	25 U
2-Hexanone	50		50 U	50 U	50 U	25 U	5 U	5 U	25 U
4-Methyl-2-pentanone	--		50 U	50 U	50 U	25 U	5 U	5 U	25 U
Acetone	50		50 U	50 U	50 U	25 U	5 U	5 U	25 U
Benzene	1		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Bromodichloromethane	50		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Bromoform	50		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Bromomethane	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Carbon disulfide	60		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Carbon tetrachloride	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Chlorobenzene	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Chloroethane	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Chloroform	7		5 U	10 U	10 U	5 U	0.2 J	0.16 J	5 U
Chloromethane	--		5 U	10 U	10 U	5 U	1 U	1 U	5 U
cis-1,2-Dichloroethene	5		**76**	**190**	**180**	**120**	**140**	**140**	**140**
cis-1,3-Dichloropropene	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Cyclohexane	--		NA	NA	NA	5 U	NA	NA	5 U
Dibromochloromethane	50		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Dibromochloropropane	--		NA	NA	NA	5 U	NA	NA	5 U
Dichlorodifluoromethane	5		NA	NA	NA	5 U	NA	NA	5 U
Ethylbenzene	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Freon 113	--		NA	NA	NA	5 U	NA	NA	5 U
Isopropylbenzene	5		NA	NA	NA	5 U	NA	NA	5 U
Methyl acetate	--		NA	NA	NA	10 U	NA	NA	10 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-4 DUP 10/13/2011	OW-4 1/6/2012	OW-4 DUP 1/6/2012	OW-4 3/2/2012	OW-4 3/30/2012	OW-4 DUP 3/30/2012	OW-4 9/21/2012
Methylcyclohexane	--		NA	NA	NA	5 U	NA	NA	5 U
Methylene chloride	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
MTBE	10		NA	NA	NA	5 U	NA	NA	5 U
Styrene	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Tetrachloroethene	5		5 U	10 U	10 U	0.59 J	0.62 J	0.63 J	5 U
Toluene	5		5 U	10 U	10 U	5 U	1 U	1 U	5 U
trans-1,2-Dichloroethene	5		2.9 J	**6.8 J**	4.8 J	4.8 J	4.9	4.9	3.7 J
trans-1,3-Dichloropropene	--		5 U	10 U	10 U	5 U	1 U	1 U	5 U
Trichloroethene	5		**850**	**2700**	**2700**	**1600**	**1800 E**	**1800 E**	**2100**
Trichlorofluoromethane	5		NA	NA	NA	5 U	NA	NA	5 U
Vinyl chloride	2		5 U	**3.9 J**	**4 J**	5 U	0.54 J	0.55 J	**2.2 J**
Xylenes (total)	5		15 U	30 U	30 U	15 U	3 U	3 U	15 U

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DUP - Duplicate
- - No NYSDEC AWQSGV available
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Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-4 DUP 9/21/2012	OW-5 11/24/2008 baseline 1	OW-5 2/11/2009	OW-5 3/11/2009 baseline 2	OW-5 6/9/2009	OW-5 3/16/2010	OW-5 10/13/2011 baseline 3
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,1-Dichloroethane	5		5 U	5 U	5 U	1.4 J	5 U	5 U	0.29 J
1,1-Dichloroethene	5		**6.3**	1.8 J	**17**	**37**	5 U	4.6 J	1.4
1,2,4-Trichlorobenzene	5		5 U	NA	NA	NA	NA	5 U	NA
1,2-Dibromoethane	--		5 U	NA	NA	NA	NA	5 U	NA
1,2-Dichlorobenzene	3		5 U	NA	NA	NA	NA	5 U	NA
1,2-Dichloroethane	0.6		5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	1 U
1,3-Dichlorobenzene	3		5 U	NA	NA	NA	NA	5 U	NA
1,4-Dichlorobenzene	3		5 U	NA	NA	NA	NA	5 U	NA
2-Butanone (MEK)	50		25 U	10 U	10 U *	10 U	10 U	10 U	10 U
2-Hexanone	50		25 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		25 U	10 U	10 U	10 U	10 U	10 U *	10 U
Acetone	50		25 U	10 U	10 U	10 U	3 J *	10 U	10 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	1.1 J	5 U	1 U
Bromoform	50		5 U	5 U	5 U	5 U	3.2 J	5 U	1 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Chloroform	7		5 U	5 U	5 U	5 U	**1 J**	5 U	1 U
Chloromethane	--		5 U	5 U	5 U *	5 U	5 U	5 U	1 U
cis-1,2-Dichloroethene	5		**150**	**5.2**	**48**	**100**	**1.9 J**	**26**	**7**
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Cyclohexane	--		5 U	NA	NA	NA	NA	5 U	NA
Dibromochloromethane	50		5 U	5 U	5 U	5 U	**2 J**	5 U	1 U
Dibromochloropropane	--		5 U	NA	NA	NA	NA	5 U	NA
Dichlorodifluoromethane	5		5 U	NA	NA	NA	NA	5 U	NA
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Freon 113	--		5 U	NA	NA	NA	NA	5 U	NA
Isopropylbenzene	5		5 U	NA	NA	NA	NA	5 U	NA
Methyl acetate	--		10 U	NA	NA	NA	NA	5 U	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-4 DUP 9/21/2012	OW-5 11/24/2008 baseline 1	OW-5 2/11/2009	OW-5 3/11/2009 baseline 2	OW-5 6/9/2009	OW-5 3/16/2010	OW-5 10/13/2011 baseline 3
Methylcyclohexane	--		5 U	NA	NA	NA	NA	5 U	NA
Methylene chloride	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
MTBE	10		5 U	NA	NA	NA	NA	5 U	NA
Styrene	5		5 U	5 U *	5 U *	5 U	5 U	5 U	1 U
Tetrachloroethene	5		5 U	5 U	1.1 J	1.9 J	5 U	5 U	0.49 J
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	1 U
trans-1,2-Dichloroethene	5		4 J	5 U	0.85 J	3.3 J	5 U	5 U	0.44 J
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	1 U
Trichloroethene	5		**2300**	**98**	**1100**	**2400**	**66**	**770**	**170**
Trichlorofluoromethane	5		5 U	NA	NA	NA	NA	5 U	NA
Vinyl chloride	2		**2.1 J**	**1 J**	**11**	**31**	5 U	**1.4 J**	1 U
Xylenes (total)	5		15 U	5 U	5 U	5 U	5 U	5 U	3 U

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NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	OW-5	OW-5	OW-6	OW-6	OW-6	OW-6	OW-6	OW-6
		Sample Date:	3/2/2012	3/30/2012	11/24/2008 baseline 1	2/11/2009	3/11/2009 baseline 2	6/9/2009	3/16/2010	9/22/2010 baseline pilot
1,1,1-Trichloroethane	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		1 U	0.23 J	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		1.5	1.2	1.6 J	4.9 J	**5.8**	**6.4**	**6.8**	5 U
1,2,4-Trichlorobenzene	5		1 U	NA	NA	NA	NA	NA	5 U	5 U
1,2-Dibromoethane	--		1 U	NA	NA	NA	NA	NA	5 U	5 U
1,2-Dichlorobenzene	3		1 U	NA	NA	NA	NA	NA	5 U	5 U
1,2-Dichloroethane	0.6		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		1 U	NA	NA	NA	NA	NA	5 U	5 U
1,4-Dichlorobenzene	3		0.27 J	NA	NA	NA	NA	NA	5 U	5 U
2-Butanone (MEK)	50		5 U	5 U	10 U	10 U *	10 U	10 U	10 U	10 U
2-Hexanone	50		5 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		5 U	5 U	10 U	10 U	10 U	10 U	10 U *	10 U
Acetone	50		12	5 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	1		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		0.17 J	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		0.48 J	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		0.12 J	0.1 J	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		1 U	1 U	5 U	5 U *	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**8.6**	**7.6**	**14**	**33**	**37**	**42**	**83**	**13**
cis-1,3-Dichloropropene	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		1 U	NA	NA	NA	NA	NA	5 U	5 U
Dibromochloromethane	50		0.43 J	0.22 J	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		1 U	NA	NA	NA	NA	NA	5 U	5 U
Dichlorodifluoromethane	5		1 U	NA	NA	NA	NA	NA	5 U	5 U *
Ethylbenzene	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		1 U	NA	NA	NA	NA	NA	5 U	5 U
Isopropylbenzene	5		1 U	NA	NA	NA	NA	NA	5 U	5 U
Methyl acetate	--		2 U	NA	NA	NA	NA	NA	5 U	5 U *

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-5 3/2/2012	OW-5 3/30/2012	OW-6 11/24/2008 baseline 1	OW-6 2/11/2009	OW-6 3/11/2009 baseline 2	OW-6 6/9/2009	OW-6 3/16/2010	OW-6 9/22/2010 baseline pilot
Methylcyclohexane	--		1 U	NA	NA	NA	NA	NA	5 U	5 U
Methylene chloride	5		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
MTBE	10		1 U	NA	NA	NA	NA	NA	5 U	5 U
Styrene	5		1 U *	1 U	5 U *	5 U *	5 U	5 U	5 U	5 U
Tetrachloroethene	5		0.3 J	0.21 J	5 U	1 J	0.96 J	1.1 J	5 U	5 U
Toluene	5		0.28 J	0.18 J	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		0.38 J	0.28 J	5 U	5 U	0.78 J	0.97 J	1.7 J	5 U
trans-1,3-Dichloropropene	--		1 U	1 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**180**	**160**	**290**	**1000**	**1000**	**800**	**970**	**140**
Trichlorofluoromethane	5		1 U	NA	NA	NA	NA	NA	5 U	5 U
Vinyl chloride	2		0.83 J	0.58 J	5 U	**2.2 J**	**2 J**	**3.5 J**	**1.1 J**	5 U
Xylenes (total)	5		3 U	3 U	5 U	5 U	5 U	5 U	5 U	5 U

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µg/L -Micrograms per liter
J - Estimated Value
U - Compound was analyzed for but not detected
* - Laboratory Control Sample (LCS) or Laboratory Control Sample Dupl
DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-6 11/3/2010	OW-6 11/17/2010	OW-7 11/24/2008 baseline 1	OW-7 2/11/2009	OW-7 3/11/2009 baseline 2	OW-7 DUP 3/11/2009	OW-7 6/9/2009
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	5		5 U	5 U	NA	NA	NA	NA	NA
1,2-Dibromoethane	--		5 U	5 U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	3		5 U	5 U	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.6		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		5 U	5 U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	3		5 U	5 U	NA	NA	NA	NA	NA
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U *	10 U	10 U	10 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		5.1 J	5.2 J	10 U	10 U	1 J B	10 U	10 U *
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		5 U	5 U	5 U	5 U *	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		1.8 J	1.4 J	**12**	**120**	**33**	**39**	**16**
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		5 U	5 U	NA	NA	NA	NA	NA
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		5 U	5 U	NA	NA	NA	NA	NA
Dichlorodifluoromethane	5		5 U	5 U	NA	NA	NA	NA	NA
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		5 U	5 U	NA	NA	NA	NA	NA
Isopropylbenzene	5		5 U	5 U	NA	NA	NA	NA	NA
Methyl acetate	--		5 U	5 U	NA	NA	NA	NA	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-6 11/3/2010	OW-6 11/17/2010	OW-7 11/24/2008 baseline 1	OW-7 2/11/2009	OW-7 3/11/2009 baseline 2	OW-7 DUP 3/11/2009	OW-7 6/9/2009
Methylcyclohexane	--		5 U	5 U	NA	NA	NA	NA	NA
Methylene chloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
MTBE	10		5 U	5 U	NA	NA	NA	NA	NA
Styrene	5		5 U	5 U	5 U *	5 U *	5 U *	5 U *	5 U
Tetrachloroethene	5		5 U	5 U	5 U	0.88 J	5 U	5 U	5 U
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		5 U *	5 U	5 U	1.7 J	5 U	5 U	5 U
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**22**	**18**	**10**	**110**	**39**	**45**	**16**
Trichlorofluoromethane	5		5 U	5 U	NA	NA	NA	NA	NA
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U

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NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-7 3/16/2010	OW-8 4/28/2009 baseline 2	OW-8 DUP 4/28/2009	OW-8 6/9/2009	OW-8 3/16/2010	OW-9 4/28/2009 baseline 2	OW-9 6/9/2009	OW-9 3/16/2010
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	1.1 J	5 U	5 U	5 U
1,2,4-Trichlorobenzene	5		5 U	NA	NA	NA	5 U	NA	NA	5 U
1,2-Dibromoethane	--		5 U	NA	NA	NA	5 U	NA	NA	5 U
1,2-Dichlorobenzene	3		5 U	NA	NA	NA	5 U	NA	NA	5 U
1,2-Dichloroethane	0.6		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	3		5 U	NA	NA	NA	5 U	NA	NA	5 U
1,4-Dichlorobenzene	3		5 U	NA	NA	NA	5 U	NA	NA	5 U
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	50		10 U	10 U	10 U	10 U	10 U	10 U	8.5 J	10 U
Benzene	1		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U *	5 U
Chloroform	7		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	5		**26**	**10**	**11**	**8.3**	**17**	**86**	**87**	**12**
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cyclohexane	--		5 U	NA	NA	NA	5 U	NA	NA	5 U
Dibromochloromethane	50		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloropropane	--		5 U	NA	NA	NA	5 U	NA	NA	5 U
Dichlorodifluoromethane	5		5 U	NA	NA	NA	5 U	NA	NA	5 U
Ethylbenzene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Freon 113	--		5 U	NA	NA	NA	5 U	NA	NA	5 U
Isopropylbenzene	5		5 U	NA	NA	NA	5 U	NA	NA	5 U
Methyl acetate	--		5 U	NA	NA	NA	5 U	NA	NA	5 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	OW-7 3/16/2010	OW-8 4/28/2009 baseline 2	OW-8 DUP 4/28/2009	OW-8 6/9/2009	OW-8 3/16/2010	OW-9 4/28/2009 baseline 2	OW-9 6/9/2009	OW-9 3/16/2010
Methylcyclohexane	--		5 U	NA	NA	NA	5 U	NA	NA	5 U
Methylene chloride	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
MTBE	10		5 U	NA	NA	NA	5 U	NA	NA	5 U
Styrene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5		5 U	1.9 J	1.8 J	2 J	3.2 J	5 U	1.1 J	5 U
Toluene	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	5 U	0.94 J	1.4 J	5 U
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5		**18**	**160**	**170**	**98**	**140**	**20**	**23**	1.8 J
Trichlorofluoromethane	5		5 U	NA	NA	NA	5 U	NA	NA	5 U
Vinyl chloride	2		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

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DUP - Duplicate
- - No NYSDEC AWQSGV available
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NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	FB-122308	FB-020209	FB-042809	FB-031610	FB-101311	FB-010612
		Sample Date:	12/23/2008	2/2/2009	4/28/2009	3/16/2010	10/13/2011	1/6/2012
			Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
1,1,1-Trichloroethane	5		5 U	5 U	5 U	5 U	1 U	1 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	1		5 U	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	5		5 U	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethene	5		5 U	5 U	5 U	5 U	1 U	1 U
1,2,4-Trichlorobenzene	5		NA	NA	NA	5 U	NA	NA
1,2-Dibromoethane	--		NA	NA	NA	5 U	NA	NA
1,2-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA
1,2-Dichloroethane	0.6		5 U	5 U	5 U	5 U	1 U	1 U
1,2-Dichloropropane	1		5 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA
1,4-Dichlorobenzene	3		NA	NA	NA	5 U	NA	NA
2-Butanone (MEK)	50		10 U	10 U	10 U	10 U	10 U	5 U
2-Hexanone	50		10 U	10 U	10 U	10 U	10 U	5 U
4-Methyl-2-pentanone	--		10 U	10 U	10 U	10 U	10 U	5 U
Acetone	50		10 U	1.9 J B	10 U	10 U	10 U	5 U
Benzene	1		5 U	5 U	5 U	5 U	1 U	1 U
Bromodichloromethane	50		5 U	5 U	5 U	5 U	1 U	1 U
Bromoform	50		5 U	5 U	5 U	5 U	1 U	1 U
Bromomethane	5		5 U	5 U	5 U	5 U	1 U	1 U
Carbon disulfide	60		5 U	5 U	5 U	5 U	1 U	1 U
Carbon tetrachloride	5		5 U	5 U	5 U	5 U	1 U	1 U
Chlorobenzene	5		5 U	5 U	5 U	5 U	1 U	1 U
Chloroethane	5		5 U	5 U	5 U	5 U	1 U	1 U
Chloroform	7		5 U	5 U	2.9 J	5 U	1 U	0.2 J
Chloromethane	--		5 U	5 U	5 U	5 U	1 U	1 U
cis-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	1 U	1 U
cis-1,3-Dichloropropene	5		5 U	5 U	5 U	5 U	1 U	1 U
Cyclohexane	--		NA	NA	NA	5 U	NA	NA
Dibromochloromethane	50		5 U	5 U	5 U	5 U	1 U	1 U
Dibromochloropropane	--		NA	NA	NA	5 U	NA	NA
Dichlorodifluoromethane	5		NA	NA	NA	5 U	NA	NA
Ethylbenzene	5		5 U	5 U	5 U	5 U	1 U	1 U
Freon 113	--		NA	NA	NA	5 U	NA	NA
Isopropylbenzene	5		NA	NA	NA	5 U	NA	NA
Methyl acetate	--		NA	NA	NA	5 U	NA	NA

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	FB-122308 12/23/2008 Field Blank	FB-020209 2/2/2009 Field Blank	FB-042809 4/28/2009 Field Blank	FB-031610 3/16/2010 Field Blank	FB-101311 10/13/2011 Field Blank	FB-010612 1/6/2012 Field Blank
Methylcyclohexane	--		NA	NA	NA	5 U	NA	NA
Methylene chloride	5		5 U	0.83 J B	5 U	5 U	1 U	2.5
MTBE	10		NA	NA	NA	5 U	NA	NA
Styrene	5		5 U	5 U *	5 U	5 U	1 U	1 U
Tetrachloroethene	5		5 U	5 U	5 U	5 U	1 U	1 U
Toluene	5		5 U	5 U	5 U	5 U	1 U	1 U
trans-1,2-Dichloroethene	5		5 U	5 U	5 U	5 U	1 U	1 U
trans-1,3-Dichloropropene	--		5 U	5 U	5 U	5 U	1 U	1 U
Trichloroethene	5		5 U	5 U	5 U	5 U	1 U	1 U
Trichlorofluoromethane	5		NA	NA	NA	5 U	NA	NA
Vinyl chloride	2		5 U	5 U	5 U	5 U	1 U	1 U
Xylenes (total)	5		5 U	5 U	5 U	5 U	3 U	3 U

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Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	FB-030212 3/2/2012 Field Blank	FB-033012 3/30/2012 Field Blank	FB-092112 9/21/2012 Field Blank	Trip Blank 10/13/2011	Trip Blank 1/6/2012	Trip Blank 3/2/2012
1,1,1-Trichloroethane	5		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
1,1,2-Trichloroethane	1		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
1,1-Dichloroethene	5		1 U	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	5		1 U	NA	1 U	NA	NA	1 U
1,2-Dibromoethane	--		1 U	NA	1 U	NA	NA	1 U
1,2-Dichlorobenzene	3		1 U	NA	1 U	NA	NA	1 U
1,2-Dichloroethane	0.6		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
1,3-Dichlorobenzene	3		1 U	NA	1 U	NA	NA	1 U
1,4-Dichlorobenzene	3		1 U	NA	1 U	NA	NA	1 U
2-Butanone (MEK)	50		5 U	5 U	5 U	10 U	5 U	5 U
2-Hexanone	50		5 U	5 U	5 U	10 U	5 U	5 U
4-Methyl-2-pentanone	--		5 U	5 U	5 U	10 U	5 U	5 U
Acetone	50		5 U	5 U	5 U	10 U	5 U	5 U
Benzene	1		1 U	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	50		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
Bromomethane	5		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
Carbon tetrachloride	5		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
Chloroethane	5		1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	7		1 U	0.22 J	0.2 J	1 U	1 U	1 U
Chloromethane	--		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
cis-1,3-Dichloropropene	5		1 U	1 U	1 U	1 U	1 U	1 U
Cyclohexane	--		1 U	NA	1 U	NA	NA	1 U
Dibromochloromethane	50		1 U	1 U	1 U	1 U	1 U	1 U
Dibromochloropropane	--		1 U	NA	1 U	NA	NA	1 U
Dichlorodifluoromethane	5		1 U	NA	1 U	NA	NA	1 U
Ethylbenzene	5		1 U	1 U	1 U	1 U	1 U	1 U
Freon 113	--		1 U	NA	1 U	NA	NA	1 U
Isopropylbenzene	5		1 U	NA	1 U	NA	NA	1 U
Methyl acetate	--		2 U	NA	2 U	NA	NA	2 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	FB-030212 3/2/2012 Field Blank	FB-033012 3/30/2012 Field Blank	FB-092112 9/21/2012 Field Blank	Trip Blank 10/13/2011	Trip Blank 1/6/2012	Trip Blank 3/2/2012
Methylcyclohexane	--		1 U	NA	1 U	NA	NA	1 U
Methylene chloride	5		2.1	2.1	1.8	1 U	1 U	2
MTBE	10		1 U	NA	1 U	NA	NA	1 U
Styrene	5		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
Toluene	5		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
trans-1,3-Dichloropropene	--		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
Trichlorofluoromethane	5		1 U	NA	1 U	NA	NA	1 U
Vinyl chloride	2		1 U	1 U	1 U	1 U	1 U	1 U
Xylenes (total)	5		3 U	3 U	3 U	3 U	3 U	3 U

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AWQSGVs - Ambient Water-Quality Standards and Guidance Values
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J - Estimated Value
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DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** **Sample Date:**	Trip Blank 3/30/2012	Trip Blank 9/21/2012
1,1,1-Trichloroethane	5		1 U	1 U
1,1,2,2-Tetrachloroethane	5		1 U	1 U
1,1,2-Trichloroethane	1		1 U	1 U
1,1-Dichloroethane	5		1 U	1 U
1,1-Dichloroethene	5		1 U	1 U
1,2,4-Trichlorobenzene	5		NA	1 U
1,2-Dibromoethane	--		NA	1 U
1,2-Dichlorobenzene	3		NA	1 U
1,2-Dichloroethane	0.6		1 U	1 U
1,2-Dichloropropane	1		1 U	1 U
1,3-Dichlorobenzene	3		NA	1 U
1,4-Dichlorobenzene	3		NA	1 U
2-Butanone (MEK)	50		5 U	5 U
2-Hexanone	50		5 U	5 U
4-Methyl-2-pentanone	--		5 U	5 U
Acetone	50		5 U	5 U
Benzene	1		1 U	1 U
Bromodichloromethane	50		1 U	1 U
Bromoform	50		1 U	1 U
Bromomethane	5		1 U	1 U
Carbon disulfide	60		1 U	1 U
Carbon tetrachloride	5		1 U	1 U
Chlorobenzene	5		1 U	1 U
Chloroethane	5		1 U	1 U
Chloroform	7		0.25 J	0.17 J
Chloromethane	--		1 U	1 U
cis-1,2-Dichloroethene	5		1 U	1 U
cis-1,3-Dichloropropene	5		1 U	1 U
Cyclohexane	--		NA	1 U
Dibromochloromethane	50		1 U	1 U
Dibromochloropropane	--		NA	1 U
Dichlorodifluoromethane	5		NA	1 U
Ethylbenzene	5		1 U	1 U
Freon 113	--		NA	1 U
Isopropylbenzene	5		NA	1 U
Methyl acetate	--		NA	2 U

Table 1. Summary of Volatile Organic Compounds in Groundwater, MBA-Manorhaven, Manorhaven, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** **Sample Date:**	Trip Blank 3/30/2012	Trip Blank 9/21/2012
Methylcyclohexane	--		NA	1 U
Methylene chloride	5		2.3	1.9
MTBE	10		NA	1 U
Styrene	5		1 U	1 U
Tetrachloroethene	5		1 U	1 U
Toluene	5		1 U	1 U
trans-1,2-Dichloroethene	5		1 U	1 U
trans-1,3-Dichloropropene	--		1 U	1 U
Trichloroethene	5		1 U	1 U
Trichlorofluoromethane	5		NA	1 U
Vinyl chloride	2		1 U	1 U
Xylenes (total)	5		3 U	3 U

NYSDEC - New York State Department of Environmental Conservation
AWQSGVs - Ambient Water-Quality Standards and Guidance Values
µg/L -Micrograms per liter
J - Estimated Value
U - Compound was analyzed for but not detected
* - Laboratory Control Sample (LCS) or Laboratory Control Sample Dupl
DUP - Duplicate
- - No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
NA - Compound was not analyzed by laboratory

FIGURES

1. Site Location Map
2. ISCO Injection Point Locations
3. Water-Level Elevation and Generalized Groundwater Flow Direction Shallow Zone (Low Tide) March 16, 2010
4. Estimated Radius of Influence of Nearest Public Supply Well N4860

QUADRANGLE LOCATION

N

0 2000'

SOURCE:
USGS; 1979. Hicksville, New York
7.5 Minute Topographic Quadrangle

Title:

SITE LOCATION MAP

FORMER THYPIN STEEL FACILITY
MANORHAVEN, NEW YORK

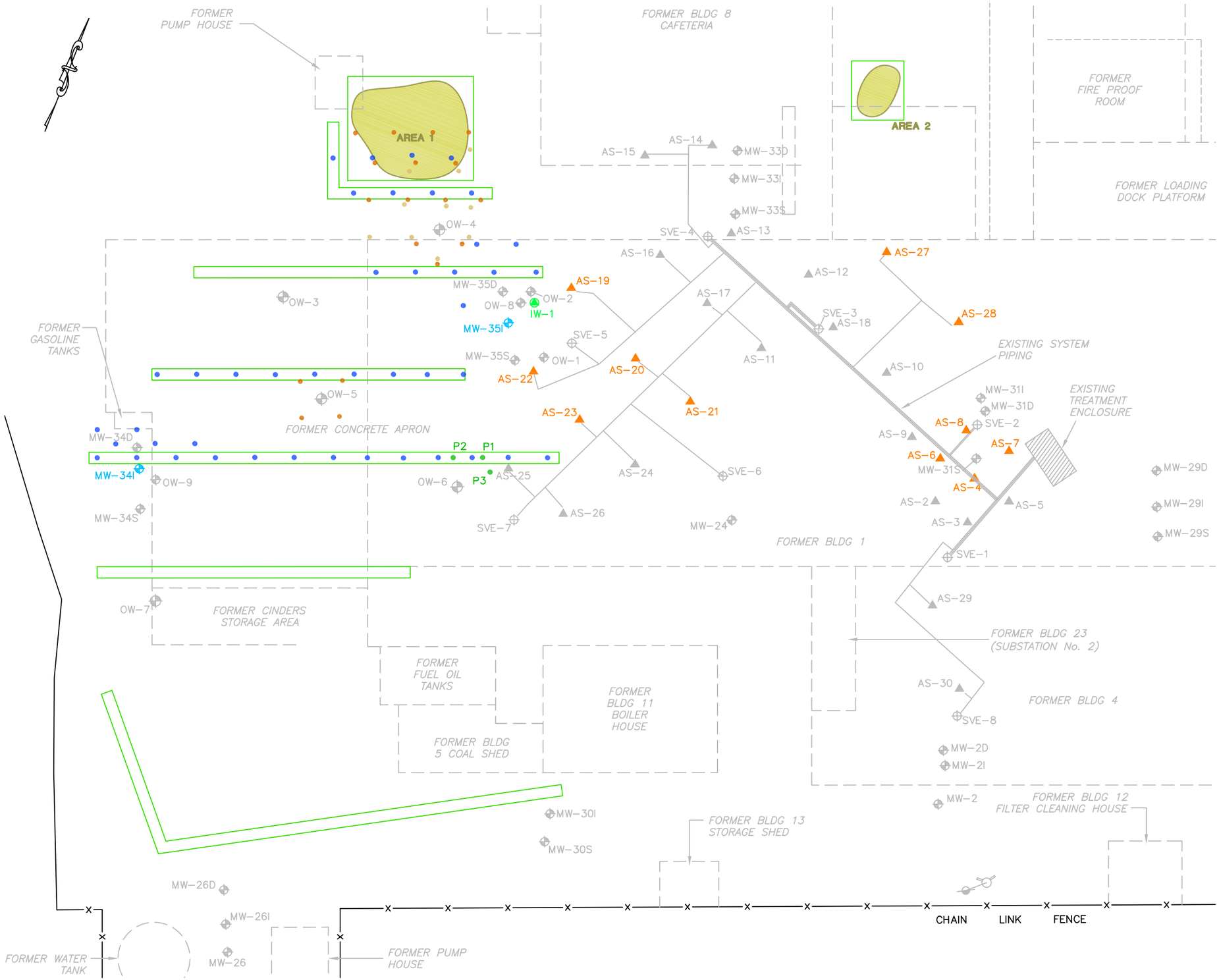
Prepared for:

MBA-MANORHAVEN, LLC
PRINCETON, NEW JERSEY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: J.W.	Date: 17AUG11	FIGURE
Prepared by: C.P.	Scale: 1:25000	1
Project Mgr.: C.P.	Office: NY	
File No.: MBA0129404.CDR	Project No.: 77101Y	

N:\PROJECTS\MBA771Y\MBA01Y\294\MBA0129404.CDR



LEGEND

- MW-35I — LOCATION AND DESIGNATION OF EXISTING WELL SAMPLED
  - WELL DEPTH DESIGNATIONS:
    - D – DEEP
    - I – INTERMEDIATE
    - S – SHALLOW
- MW-23 — LOCATION AND DESIGNATION OF EXISTING MONITORING WELL
- AS-12 — LOCATION AND DESIGNATION OF AIR SPARGE WELL
- AS-21 — LOCATION AND DESIGNATION OF AIR SPARGE WELL USED FOR FIRST PHASE OF INJECTIONS
- SVE-1 — LOCATION AND DESIGNATION OF SOIL VAPOR EXTRACTION WELL
- IW-1 — LOCATION AND DESIGNATION OF EXISTING INJECTION WELL
- LOCATION OF INJECTION POINT SECOND PHASE OF INJECTIONS
- LOCATION OF INJECTION POINT ISCO PILOT STUDY
- LOCATION OF INJECTION POINT THIRD PHASE OF INJECTIONS
- LOCATION OF INJECTION POINT FOURTH PHASE OF INJECTIONS
- AREAS OF IMPACT BASED ON MIP RESULTS
- LOCATION OF INJECTION POINTS FIRST ROUND OF INJECTIONS

SOURCE

BUILDING FOOTPRINT OBTAINED FROM LOCKWOOD GREENE ENGINEERS, INC. PLANCOR 999 PLOT PLAN AND THYPIN STEEL CO., INC. ADVERTISING BROCHURE.

40' 0 40'

Title:

INJECTION POINT LOCATIONS

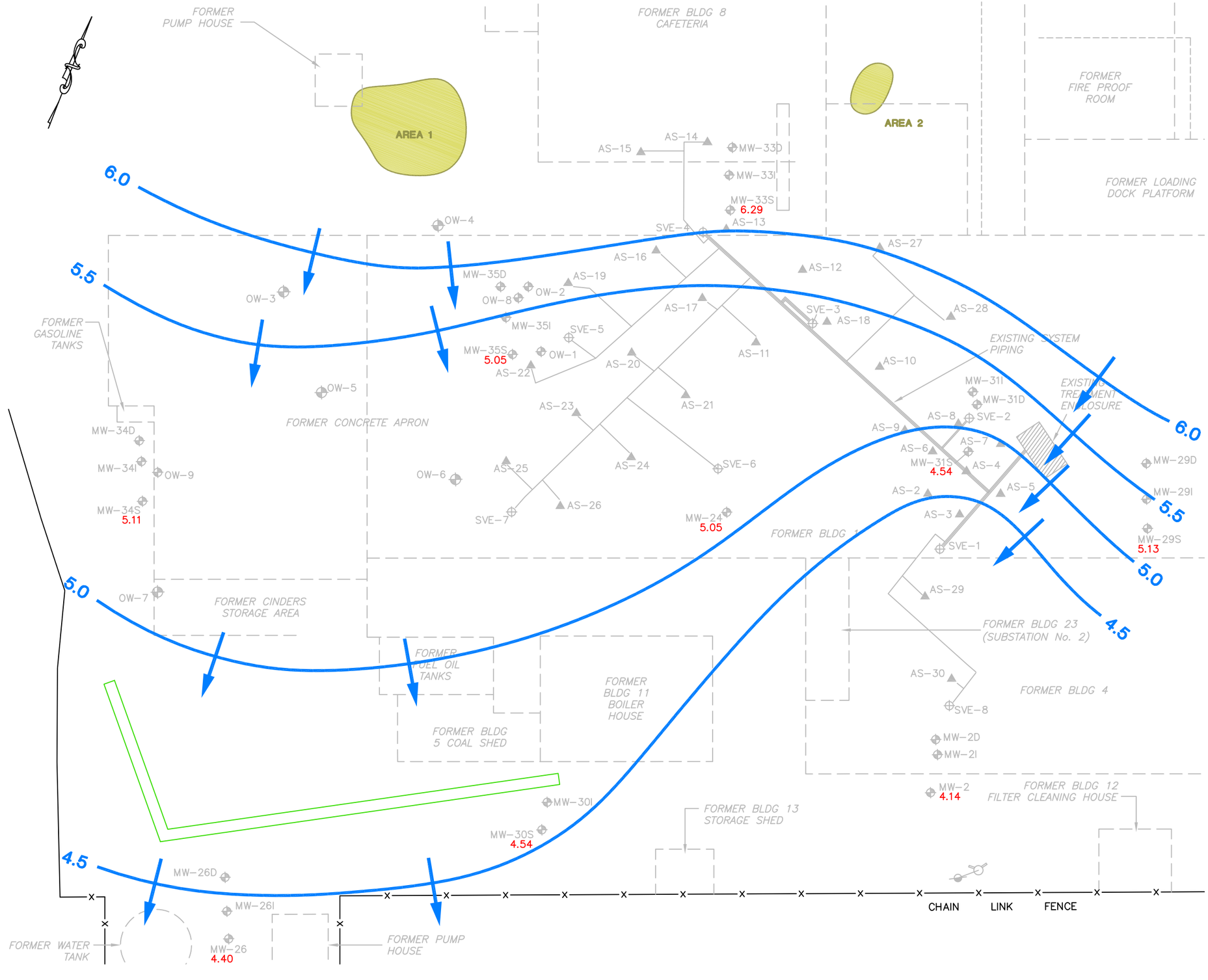
FORMER THYPIN STEEL FACILITY
MANORHAVEN, NEW YORK

Prepared For:
MBA–MANORHAVEN, LLC
PRINCETON, NEW JERSEY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: J.W.	Date: 17JAN13	FIGURE 2
Prepared by: J.A.D.	Scale: AS SHOWN	
Project Mgr: C.P.	Project: 0771.0001Y000	
File: 0771.0001Y327.01.DWG		

V:\CAD\PROJECTS\0771Y\0001Y\327\0771.0001Y327.01.DWG



LEGEND

- FORMER BUILDING (BLDG) FOOTPRINT
- MW-1 — LOCATION AND DESIGNATION OF EXISTING WELL SAMPLED
  - WELL DEPTH DESIGNATIONS:
    - D – DEEP
    - I – INTERMEDIATE
    - S – SHALLOW
- AS-12 — LOCATION AND DESIGNATION OF AIR SPARGE WELL
- SVE-1 — LOCATION AND DESIGNATION OF SOIL VAPOR EXTRACTION WELL
- AREAS OF IMPACT BASED ON MIP RESULTS
- HYDRANT
- UTILITY POLE
- 4.54 — WATER–LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL
- 4.5 — LINE OF EQUAL WATER–LEVEL ELEVATION RELATIVE TO MEAN SEA LEVEL
- ESTIMATED DIRECTION OF GROUNDWATER FLOW

SOURCE

BUILDING FOOTPRINT OBTAINED FROM LOCKWOOD GREENE ENGINEERS, INC. PLANCOR 999 PLOT PLAN AND THYPIN STEEL CO., INC. ADVERTISING BROCHURE.

40' 0 40'

Title: **WATER-LEVEL ELEVATIONS AND GENERALIZED GROUNDWATER FLOW DIRECTION SHALLOW ZONE (LOW TIDE) MARCH 16, 2010**

FORMER THYPIN STEEL FACILITY
MANORHAVEN, NEW YORK

Prepared For:
MBA–MANORHAVEN, LLC
PRINCETON, NEW JERSEY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: J.W.	Date: 17JAN13	FIGURE 3
Prepared by: J.A.D.	Scale: AS SHOWN	
Project Mgr: C.P.	Project: 0771.0001Y000	
File: 0771.0001Y327.02.DWG		

V:\CAD\PROJECTS\0771Y\0001Y\327\0771.0001Y327.02.DWG

V:\GIS\Projects\0771Y\0001Y

Legend

- APPROXIMATE SITE BOUNDARY
- PUBLIC SUPPLY WELL
- ESTIMATED RADIUS OF INFLUENCE

N

0 500 Feet

Title:

ESTIMATED RADIUS OF INFLUENCE OF NEAREST PUBLIC SUPPLY WELL N 4860

FORMER THYPIN STEEL FACTORY
MANORHAVEN, NEW YORK

Prepared For: MBA-MANORHAVEN, LLC
PRINCETON, NEW JERSEY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: J.W.	Date: 18JAN2013	FIGURE 4
Prepared by: B.P.	Scale: 1 in = 500 ft	
Project Mgr: B.P.	Project: 0771.0001Y	
File No: 0771.0001Y327.101.MXD		

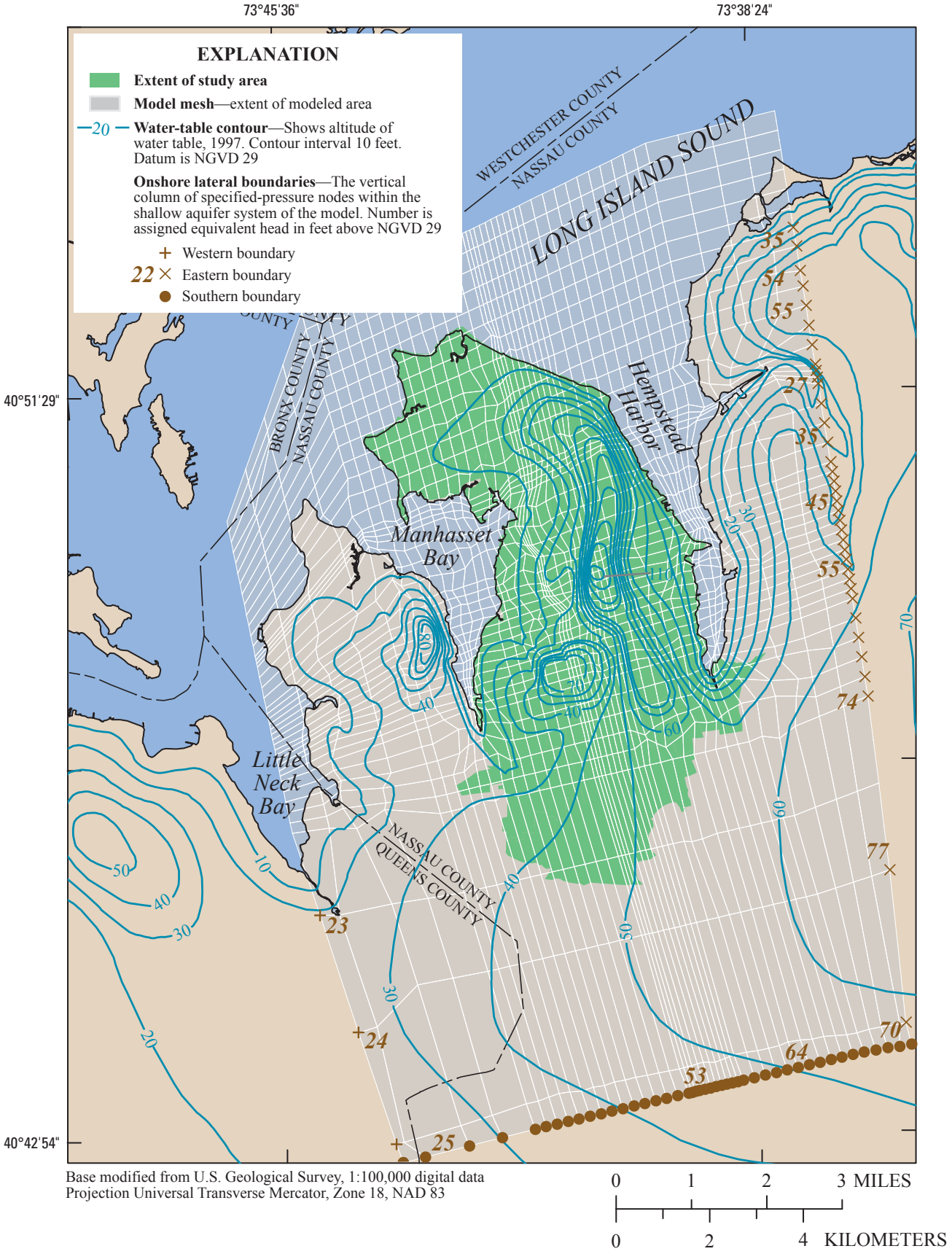
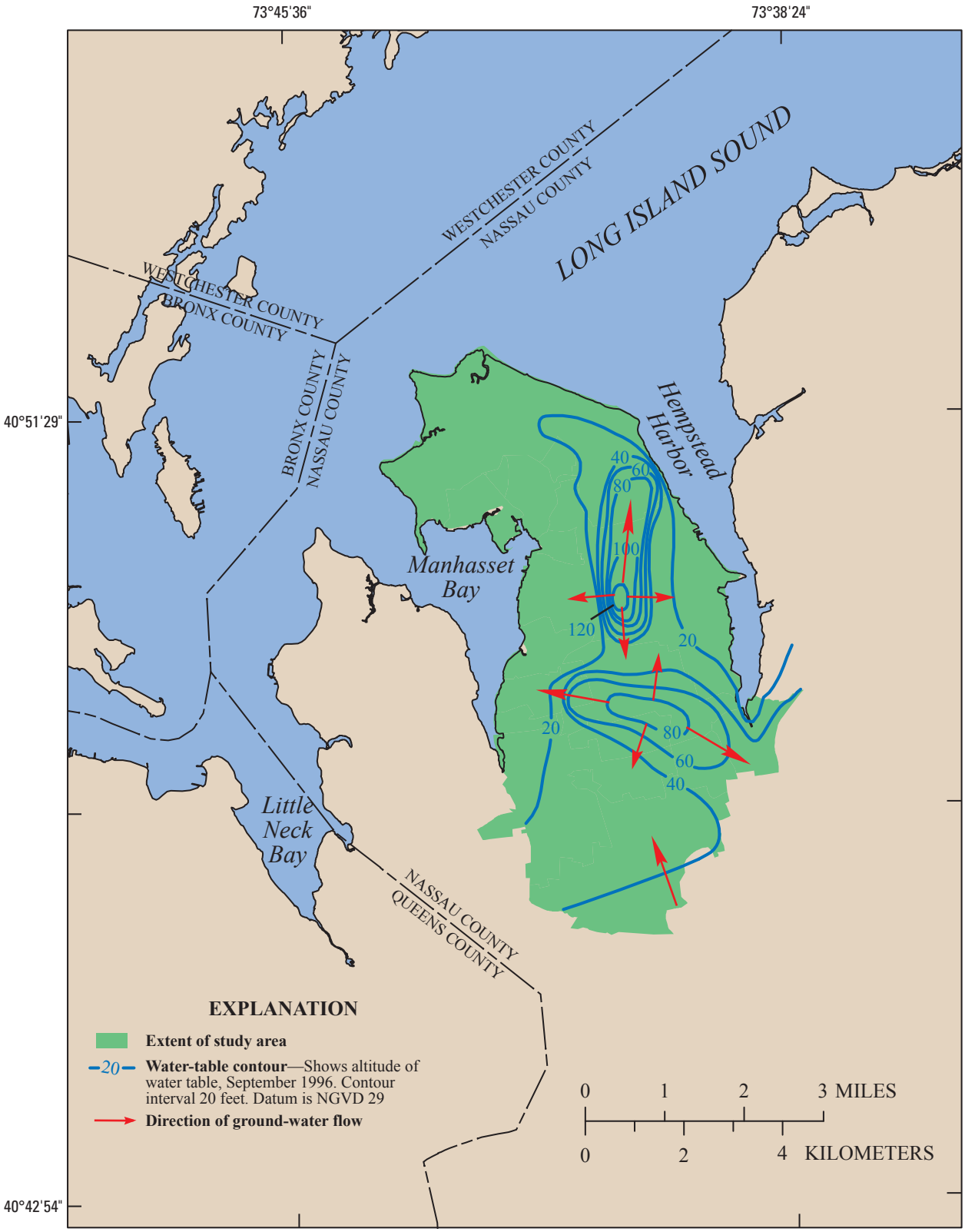


Figure 14A. Equivalent head values assigned to onshore lateral boundaries as specified-pressure nodes for the shallow-aquifer system of the Manhasset Neck model, Nassau County, N.Y., 1997 water-table contours.



Base modified from U.S. Geological Survey, 1:100,000 digital data
Projection Universal Transverse Mercator, Zone 18, NAD 83

Figure 8. Water-table altitude beneath Manhasset Neck, Nassau County, N.Y., September 1996. (Modified from Stumm and others, 2002, fig. 28.)

APPENDIX A

Fate and Transport Model Simulations
and Input Data Sheets

APPENDIX A
10 Years

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

MBA-Manorhaven
May 2010
Run Name

Data Input Instructions:

115 or 0.02
1. Enter value directly....or
2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	27.2	(ft/yr)
or		or	
Hydraulic Conductivity	K	5.0E-03	(cm/sec)
Hydraulic Gradient	i	0.0021	(ft/ft)
Porosity	n	0.4	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	12.5	(ft)
Transverse Dispersivity*	alpha y	1.3	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	250	(ft)

3. ADSORPTION

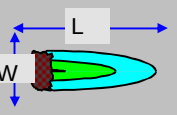
Retardation Factor*	R	1.0	(-)
or		or	
Soil Bulk Density	rho	1.7	(kg/l)
Partition Coefficient	Koc	100	(L/kg)
FractionOrganicCarbon	foc	1.0E-5	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	2.8E+0	(per yr)
or		or	
Solute Half-Life	t-half	0.25	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO	1.65	(mg/L)
Delta Nitrate*	NO3	0.7	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	22.4	(mg/L)
Observed Methane*	CH4	6.6	(mg/L)

5. GENERAL

Modeled Area Length*	2000	(ft)
Modeled Area Width*	200	(ft)
Simulation Time*	10	(yr)



6. SOURCE DATA

Source Thickness in Sat.Zone* 40 (ft)

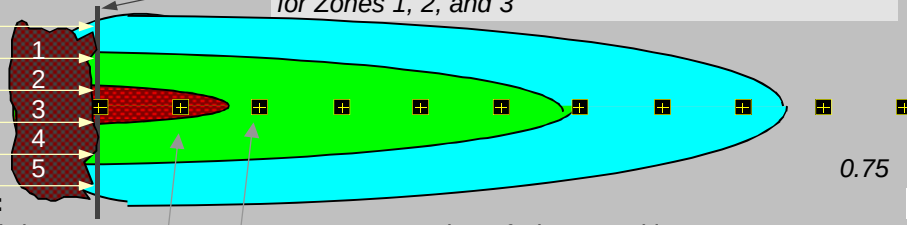
Source Zones:

Width* (ft)	Conc. (mg/L)*
50	2
50	5
50	7
50	5
50	2

Source Halflife (see Help):

40	200 (yr)
Inst. React.	1st Order
Soluble Mass	3000 (Kg)
In Source NAPL, Soil	

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	Concentration (mg/L)
0	
200	
400	
600	
800	
1000	
1200	
1400	
1600	
1800	
2000	

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN — **View Output**

RUN ARRAY — **View Output**

Help | Recalculate

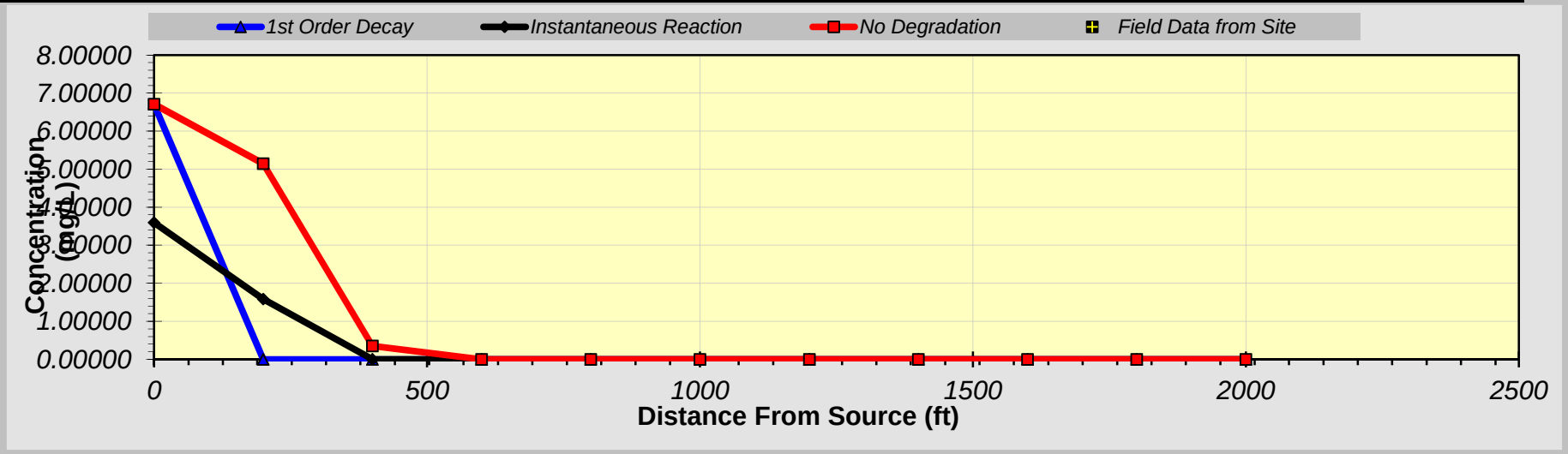
Paste Example Dataset

Restore Formulas for Vs,

APPENDIX A
10 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft) 0	200	400	600	800	1000	1200	1400	1600	1800	2000
No Degradation	6.705	5.143	0.352	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	6.705	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	3.595	1.585	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Calculate

Time: 10 Years

Return to

Recalculate This

APPENDIX A
10 Years

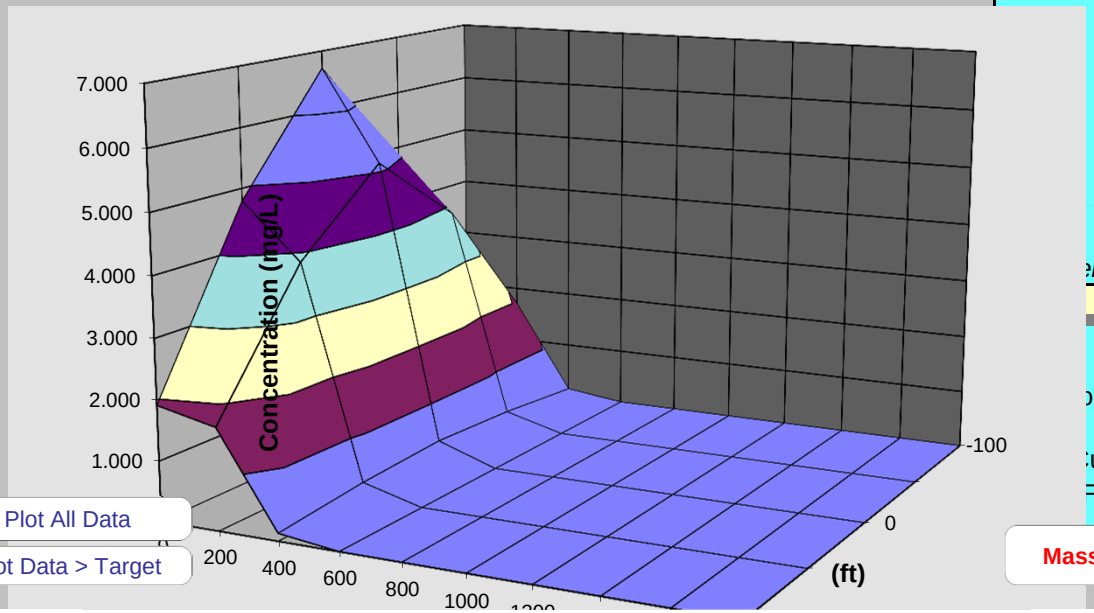
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	200	400	600	800	1000	1200	1400	1600	1800	2000
100	1.916	1.696	0.129	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	4.789	3.869	0.274	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	6.705	5.143	0.352	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-50	4.789	3.869	0.274	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-100	1.916	1.696	0.129	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	3.5E+4	2.7E+4	2.0E+3	1.0E+0	2.0E-6	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0

Model to Display:

- *No Degradation*
- *1st Order Decay*
- *Instantaneous*

Time: **10 Years** Target Level: **0.005** mg/L Displayed Model: **No Degradation**



Plot All Data

Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	126.4	*(Kg)*
- Actual Plume Mass	126.4	*(Kg)*
= Plume Mass Removed by Biodeg	**0.0**	*(Kg)*
	0 %	

Change in Electron Acceptor/Byproduct Masses:

Nitrate	*Iron II*	*Sulfate*	*Methane*	
na	na	na	na	*(Kg)*

Contam. Mass in Source (t=0 Years)	3000.0	*(Kg)*
Contam. Mass in Source Now (t=10Years)	2873.6	*(Kg)*
Current Volume of Groundwater in Plume	55.1	*(ac-ft)*
Flowrate of Water Through Source Zone	2.494	*(ac-ft/yr)*

Mass HELP

Recalculat

APPENDIX A
20 Years

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

MBA-Manorhaven
May 2010
Run Name

Data Input Instructions:

115 or 0.02
1. Enter value directly....or
2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	27.2	(ft/yr)
or		or	
Hydraulic Conductivity	K	5.0E-03	(cm/sec)
Hydraulic Gradient	i	0.0021	(ft/ft)
Porosity	n	0.4	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	12.5	(ft)
Transverse Dispersivity*	alpha y	1.3	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	250	(ft)

3. ADSORPTION

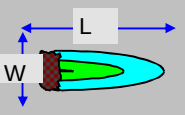
Retardation Factor*	R	1.0	(-)
or		or	
Soil Bulk Density	rho	1.7	(kg/l)
Partition Coefficient	Koc	100	(L/kg)
FractionOrganicCarbon	foc	1.0E-5	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	2.8E+0	(per yr)
or		or	
Solute Half-Life	t-half	0.25	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO	1.65	(mg/L)
Delta Nitrate*	NO3	0.7	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	22.4	(mg/L)
Observed Methane*	CH4	6.6	(mg/L)

5. GENERAL

Modeled Area Length*	2000	(ft)
Modeled Area Width*	200	(ft)
Simulation Time*	20	(yr)



6. SOURCE DATA

Source Thickness in Sat.Zone* 40 (ft)

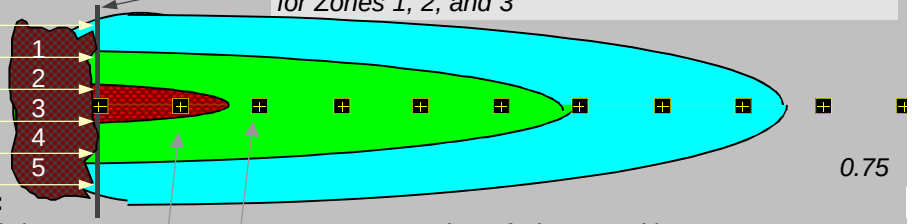
Source Zones:

Width* (ft)	Conc. (mg/L)*
50	2
50	5
50	7
50	5
50	2

Source Halflife (see Help):

40	200	(yr)
Inst. React.	1st Order	
Soluble Mass	3000	(Kg)
In Source NAPL, Soil		

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	Concentration (mg/L)
0	
200	
400	
600	
800	
1000	
1200	
1400	
1600	
1800	
2000	

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN — **View Output**

RUN ARRAY — **View Output**

Help | Recalculate

Paste Example Dataset

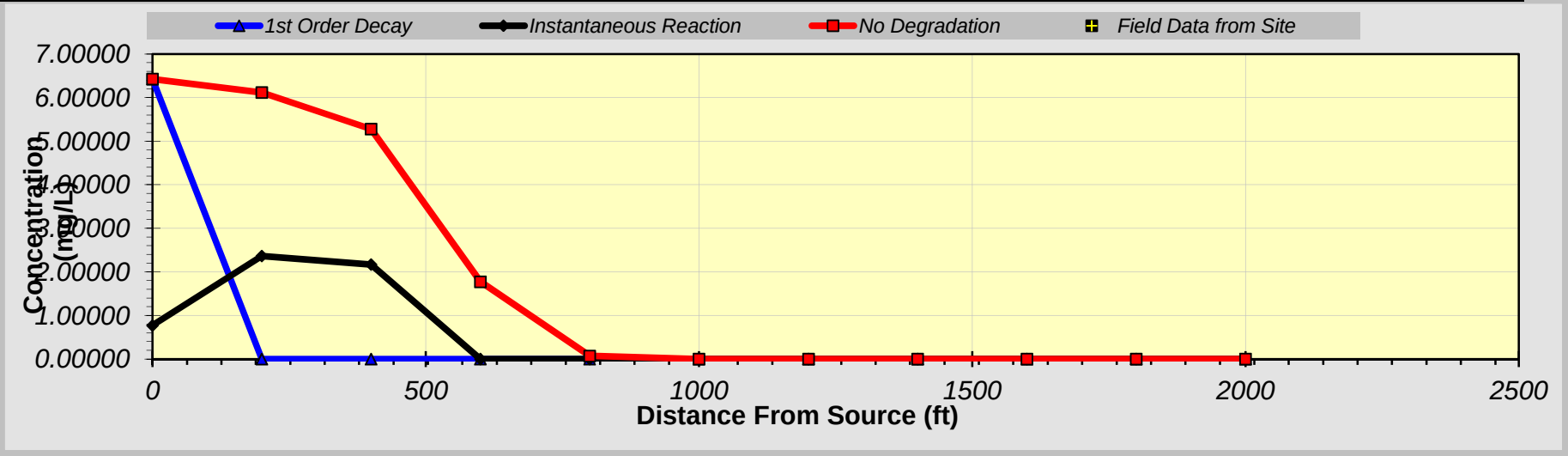
Restore Formulas for Vs,

APPENDIX A
20 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	200	400	600	800	1000	1200	1400	1600	1800	2000
No Degradation	6.423	6.117	5.279	1.774	0.072	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	6.423	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.772	2.363	2.170	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Time:

20 Years

Calculate

Return to

Recalculate This

APPENDIX A
20 Years

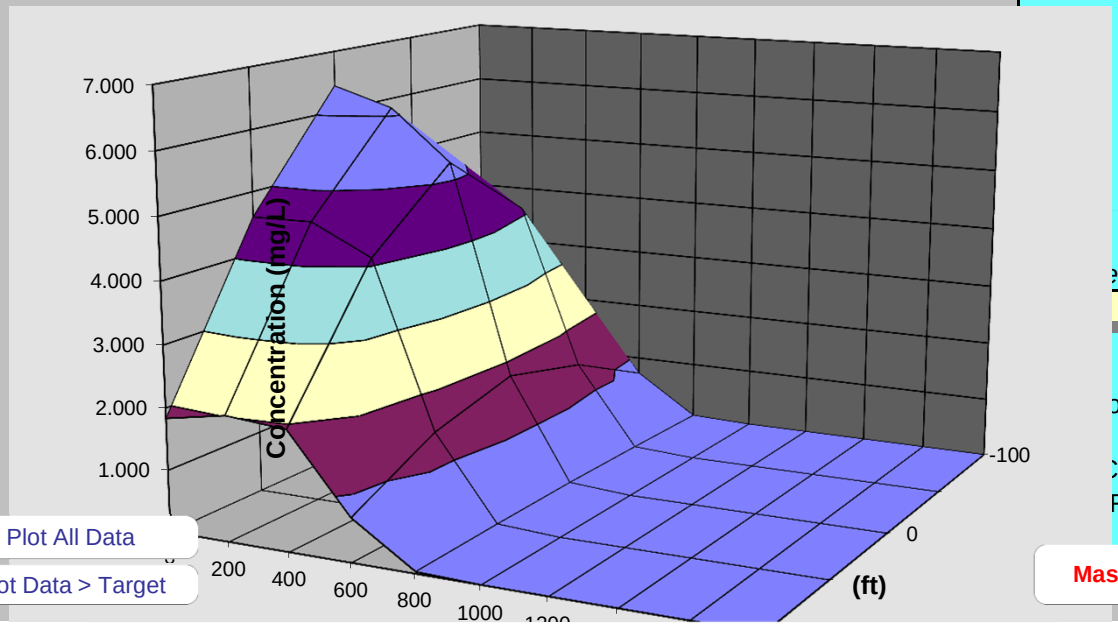
DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	200	400	600	800	1000	1200	1400	1600	1800	2000
100	1.835	2.017	1.936	0.707	0.031	0.000	0.000	0.000	0.000	0.000	0.000
50	4.588	4.601	4.119	1.417	0.059	0.000	0.000	0.000	0.000	0.000	0.000
0	6.423	6.117	5.279	1.774	0.072	0.000	0.000	0.000	0.000	0.000	0.000
-50	4.588	4.601	4.119	1.417	0.059	0.000	0.000	0.000	0.000	0.000	0.000
-100	1.835	2.017	1.936	0.707	0.031	0.000	0.000	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	3.5E+4	3.3E+4	2.9E+4	1.0E+4	4.2E+2	1.3E+0	2.4E-4	2.5E-9	0.0E+0	0.0E+0	0.0E+0

Model to Display:

- *No Degradation*
- *1st Order Decay*
- *Instantaneous*

Time: **20 Years** Target Level: **0.005** mg/L Displayed Model: **No Degradation**



Plot All Data

Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	247.5	*(Kg)*
- Actual Plume Mass	247.5	*(Kg)*
= Plume Mass Removed by Biodeg	**0.0**	*(Kg)*
	0 %	

Change in Electron Acceptor/Byproduct Masses:

Nitrate	*Iron II*	*Sulfate*	*Methane*	
na	na	na	na	*(Kg)*

Contam. Mass in Source (t=0 Years)	3000.0	*(Kg)*
ontam. Mass in Source Now (t=20Years)	2752.5	*(Kg)*
Current Volume of Groundwater in Plume	91.8	*(ac-ft)*
Flowrate of Water Through Source Zone	2.494	*(ac-ft/yr)*

Mass HELP

Recalculat

APPENDIX A
30 Years

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

MBA-Manorhaven
May 2010
Run Name

Data Input Instructions:

115 or 0.02
1. Enter value directly....or
2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	27.2	(ft/yr)
or		or	
Hydraulic Conductivity	K	5.0E-03	(cm/sec)
Hydraulic Gradient	i	0.0021	(ft/ft)
Porosity	n	0.4	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	12.5	(ft)
Transverse Dispersivity*	alpha y	1.3	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	250	(ft)

3. ADSORPTION

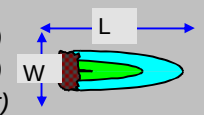
Retardation Factor*	R	1.0	(-)
or		or	
Soil Bulk Density	rho	1.7	(kg/l)
Partition Coefficient	Koc	100	(L/kg)
FractionOrganicCarbon	foc	1.0E-5	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	2.8E+0	(per yr)
or		or	
Solute Half-Life	t-half	0.25	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO	1.65	(mg/L)
Delta Nitrate*	NO3	0.7	(mg/L)
Observed Ferrous Iron*	Fe2+	16.6	(mg/L)
Delta Sulfate*	SO4	22.4	(mg/L)
Observed Methane*	CH4	6.6	(mg/L)

5. GENERAL

Modeled Area Length*	2000	(ft)
Modeled Area Width*	200	(ft)
Simulation Time*	30	(yr)



6. SOURCE DATA

Source Thickness in Sat.Zone* 40 (ft)

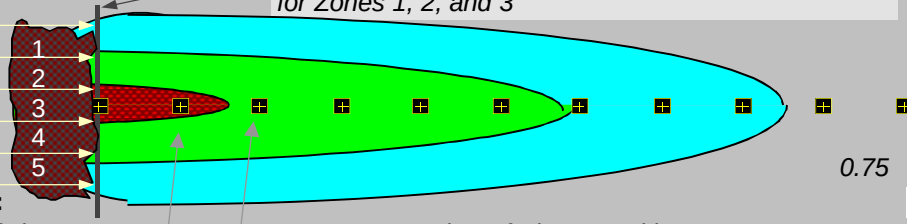
Source Zones:

Width* (ft)	Conc. (mg/L)*
50	2
50	5
50	7
50	5
50	2

Source Halflife (see Help):

40	200	(yr)
Inst. React.	1st Order	
Soluble Mass	3000	(Kg)
In Source NAPL, Soil		

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	Concentration (mg/L)
0	
200	
400	
600	
800	
1000	
1200	
1400	
1600	
1800	
2000	

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN — **View Output**

RUN ARRAY — **View Output**

Help — Recalculate

Paste Example Dataset

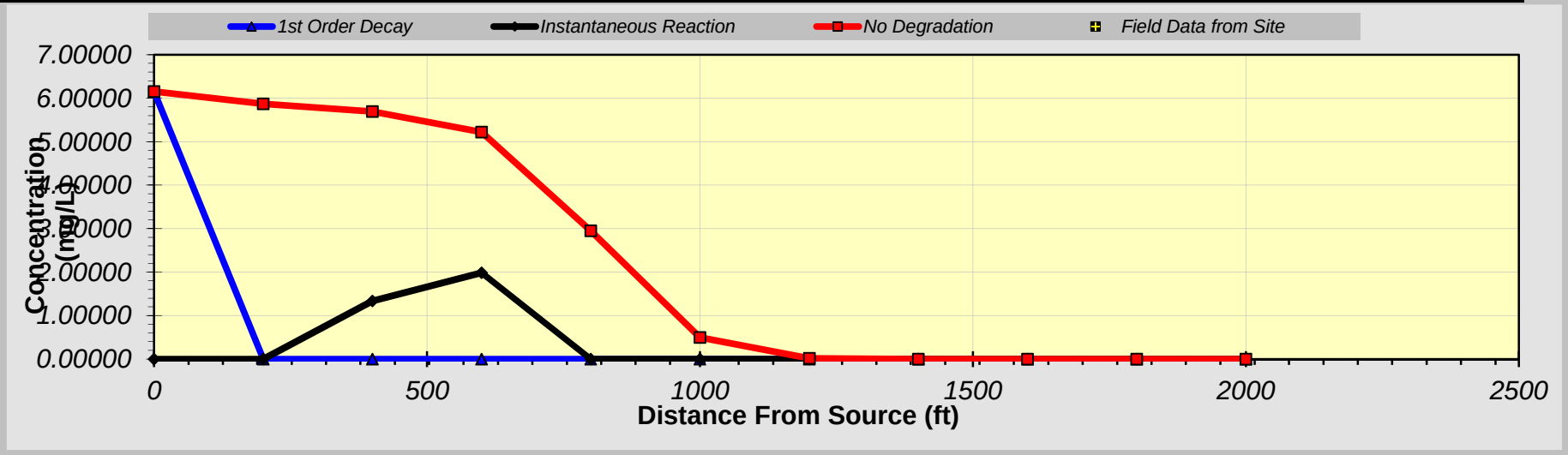
Restore Formulas for Vs,

APPENDIX A
30 Years

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	200	400	600	800	1000	1200	1400	1600	1800	2000
No Degradation	6.152	5.870	5.690	5.220	2.948	0.496	0.016	0.000	0.000	0.000	0.000
1st Order Decay	6.152	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.000	0.000	1.335	1.985	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site											



Time:

30 Years

Calculate

Return to

Recalculate This

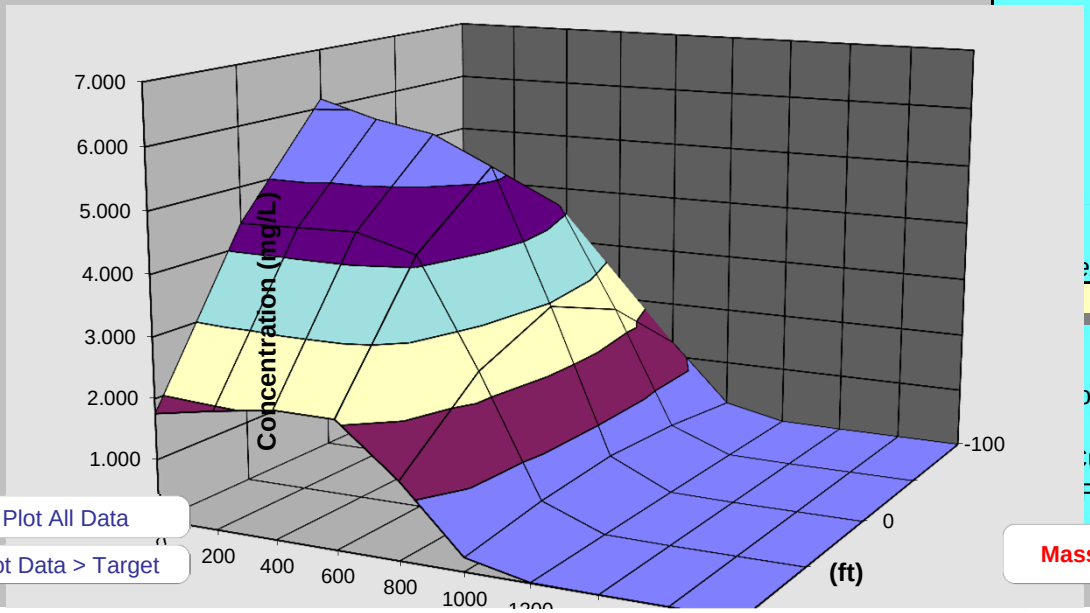
APPENDIX A
30 Years

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	200	400	600	800	1000	1200	1400	1600	1800	2000
100	1.758	1.935	2.087	2.080	1.261	0.226	0.008	0.000	0.000	0.000	0.000
50	4.394	4.415	4.440	4.169	2.397	0.409	0.014	0.000	0.000	0.000	0.000
0	6.152	5.870	5.690	5.220	2.948	0.496	0.016	0.000	0.000	0.000	0.000
-50	4.394	4.415	4.440	4.169	2.397	0.409	0.014	0.000	0.000	0.000	0.000
-100	1.758	1.935	2.087	2.080	1.261	0.226	0.008	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	3.5E+4	3.1E+4	3.2E+4	3.0E+4	1.7E+4	3.0E+3	1.0E+2	5.6E-1	4.8E-4	6.1E-8	1.6E-12

Model to Display: No Degradation | 1st Order Decay | Instantaneous

Time: 30 Years Target Level: 0.005 mg/L Displayed Model: No Degradation



Plot All Data

Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	363.4	(Kg)
- Actual Plume Mass	363.4	(Kg)
= Plume Mass Removed by Biodeg	0.0	(Kg)
	0 %	

Change in Electron Acceptor/Byproduct Masses:

...en	Nitrate	Iron II	Sulfate	Methane	
	na	na	na	na	(Kg)

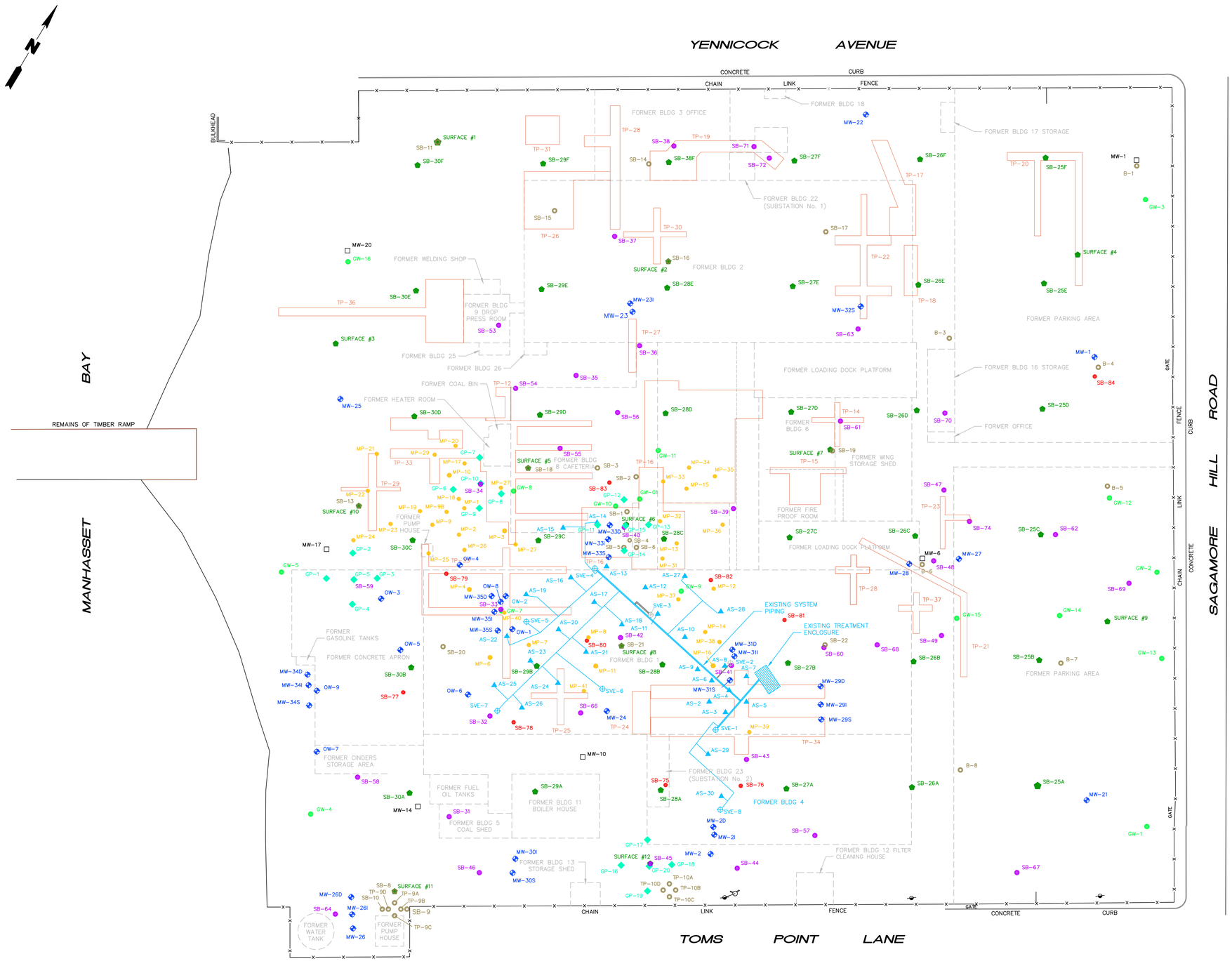
Contam. Mass in Source (t=0 Years)	3000.0	(Kg)
...ontam. Mass in Source Now (t=30Years)	2636.6	(Kg)
...urrent Volume of Groundwater in Plume	128.6	(ac-ft)
...Flowrate of Water Through Source Zone	2.494	(ac-ft/yr)

Mass HELP

Recalculat

PLATES

1. Sample Locations
2. Shallow Zone Groundwater Results
3. ISCO Injection Locations and Groundwater Results



LEGEND

- FORMER BUILDING (BLDG) FOOTPRINT
- MW-1 — LOCATION AND DESIGNATION OF EXISTING MONITORING WELL
- OW-6 — LOCATION AND DESIGNATION OF EXISTING OBSERVATION WELL
- MW-17 — LOCATION AND DESIGNATION OF FORMER MONITORING WELL
- SB-77 — LOCATION AND DESIGNATION OF HYDROPUNCH GROUNDWATER SAMPLING POINT – JULY 2005
- SB-40 — LOCATION AND DESIGNATION OF HYDROPUNCH GROUNDWATER SAMPLING POINT – MARCH 2001
- GW-10 — LOCATION AND DESIGNATION OF HYDROPUNCH GROUNDWATER SAMPLING POINT – JUNE 1999
- AS-12 — LOCATION AND DESIGNATION OF AIR SPARGE WELL
- SVE-1 — LOCATION AND DESIGNATION OF SOIL VAPOR EXTRACTION WELL
- SB-13 — LOCATION AND DESIGNATION OF SOIL BORING
- GP-16 — LOCATION AND DESIGNATION OF SOIL GAS SURVEY SAMPLING POINT
- SURFACE #1 / SB-25B — LOCATION AND DESIGNATION OF RISK ASSESSMENT SOIL SAMPLE
- MP-1 — LOCATION AND DESIGNATION OF MEMBRANE INTERFACE PROBE SOIL BORING
- HYDRANT
- UTILITY POLE
- D — DEEP
- I — INTERMEDIATE
- S — SHALLOW
- TP-37 — LOCATION AND DESIGNATION OF TEST PIT / TRENCH

SOURCE

BUILDING FOOTPRINT OBTAINED FROM LOCKWOOD GREENE ENGINEERS, INC. PLANCOR 999 PLOT PLAN AND THYPIN STEEL CO., INC. ADVERTISING BROCHURE.

40' 0 40'

Title:

SAMPLING LOCATIONS

FORMER THYPIN STEEL FACILITY
MANORHAVEN, NEW YORK

Prepared For:
MBA–MANORHAVEN, LLC
PRprinceton, NEW JERSEY

ROUX ASSOCIATES, INC.
Environmental Consulting and Management

Compiled by: J.W.	Date: 31JAN13	PLATE
Prepared by: J.A.D.	Scale: AS SHOWN	1
Project Mgr: C.P.	Project: 0771.0001Y000	
File: 0771.0001Y327.05		

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YENNICOCK AVENUE

CONCRETE — CHAIN — LINK — FENCE — CURB

BULKHEAD

FORMER BLDG 3 OFFICE

FORMER BLDG 18

FORMER BLDG 17 STORAGE

MW-22

MW-33S	6/26/2001	5/9/2003	10/21/2003	1/13/2004	3/9/2004	8/4/2004	6/7/2005	11/16/2005	5/8/2006	7/28/2006	10/16/2006	8/7/2007	2/26/2008	11/24/2008	2/2/2009	3/12/2009	3/16/2010
Analyte																	
1,1 DCA	ND	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 DCE	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2 DCE	2 J	120	<2	ND	ND	ND	1 J	ND	0.71 J	ND	2.9 J	1.9	0.53 J	ND	ND	1 J	1 J
1,1,1 TCA	ND	82	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCE	1 J	90	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCE	30	93	ND	ND	6	4 J	8.1	2.6 J	6.5	6.3	8.7	6.2	3.3 J	5.9	8.7	8.7	8.9
VC	30	ND	180	70	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MW-24	6/15/2001	5/9/2003	10/21/2003	1/13/2004	3/9/2004	8/4/2004	6/7/2005	11/16/2005	5/8/2006	7/28/2006	10/16/2006	8/7/2007	2/26/2008	11/24/2008	2/2/2009	3/12/2009	3/16/2010
Analyte																	
1,1 DCA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2 DCE	ND	ND	<2	ND	ND	ND	ND	ND	ND	ND	ND	0.78	ND	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5 J	ND	ND
TCE	7	16	29	8	5	10	4.6 J	2.4 J	13	11	6	43	3.1 J	2.4 J	6.2	4 J	1.8 J
VC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MW-35S	6/28/2001	8/4/2004	6/7/2005	11/16/2005	5/8/2006	10/16/2006	8/7/2007	2/26/2008	11/24/2008	2/2/2009	3/11/2009	3/16/2010
Analyte												
1,1 DCA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 DCE	ND	4 J	1.3 J	ND	1.8 J	ND	ND	ND	ND	ND	ND	ND
1,2 DCE	ND	23	6.4	0.88 J	19	10 J	6	ND	4.4 J	1.9 J	6.7	4.1 J
1,1,1 TCA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCE	ND	1 J	0.85 J	ND	0.92 J	ND	ND	ND	ND	ND	ND	ND
TCE	ND	1,500	380	29	800	370	120	1.5 J	41	24	85	48
VC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

FORMER WELDING SHOP

FORMER BLDG 9 DROP PRESS ROOM

FORMER BLDG 25

FORMER BLDG 26

FORMER COAL BIN

FORMER HEATER ROOM

FORMER PUMP HOUSE

FORMER BLDG 8 CAFETERIA

AREA 1

AREA 2

MW-23I

MW-23

MW-32S

MW-31S	6/26/2001	5/9/2003	10/21/2003	1/13/2004	3/9/2004	8/4/2004	6/7/2005	11/16/2005	7/28/2006	10/16/2006	8/7/2007	2/26/2008	12/1/2008	2/2/2009	3/12/2009	3/16/2010
Analyte																
1,1 DCA	10	ND	ND	NS	ND	ND	7.6	ND	ND	1.3 J	ND	ND	7	7.3	7.8	1.5 J
1,1 DCE	3 J	ND	ND	NS	ND	ND	2.2 J	ND	ND	ND	ND	ND	1.1 J	1.4 J	1.8 J	ND
1,2 DCE	76	3	2	NS	4	2 J	17	0.67 J	13	3 J	ND	ND	31	31	34	11
1,1,1 TCA	52	ND	2	NS	3	ND	58	1.5 J	29	3.6 J	ND	ND	24	31	25	3,4 J
PCE	100	3	2	NS	6	1 J	66	ND	32	3.8 J	0.96	ND	52	55	48	14
TCE	100	160	2	NS	5	2 J	61	1.8 J	49	7.1	1.2	0.92 J	78	84	81	22
VC	ND	1	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

FORMER BLDG 16 STORAGE

FORMER BLDG 6

FORMER WING STORAGE SHED

FORMER OFFICE

FORMER FIRE PROOF ROOM

FORMER LOADING DOCK PLATFORM

MW-28

MW-27

AIR SPARGE WELLS TOP BE USED FOR INJECTION (21–22 FT BLS)

EXISTING SYSTEM PIPING

EXISTING TREATMENT ENCLOSURE

FORMER BLDG 1

FORMER PARKING AREA

MW-34S	7/1/2001	6/7/2005	2/26/2008	11/24/2008	2/2/2009	3/11/2009	3/16/2010
Analyte							
1,1 DCA	ND	ND	ND	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND	ND	ND	ND
1,2 DCE	ND	ND	ND	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND	ND	ND	ND
PCE	ND	ND	ND	ND	ND	ND	ND
TCE	ND	ND	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND	ND

FORMER GASOLINE TANKS

FORMER CONCRETE APRON

FORMER CINDERS STORAGE AREA

MW-34D

MW-34I

MW-34S

MW-35D

MW-35I

MW-35S

MW-4

OW-1

OW-2

OW-5

OW-6

OW-7

SVE-1

SVE-2

SVE-3

SVE-4

SVE-5

SVE-6

SVE-7

SVE-8

AS-1 AS-2 AS-3 AS-4 AS-5 AS-6 AS-7 AS-8 AS-9 AS-10 AS-11 AS-12 AS-13 AS-14 AS-15 AS-16 AS-17 AS-18 AS-19 AS-20 AS-21 AS-22 AS-23 AS-24 AS-25 AS-26 AS-27 AS-28 AS-29 AS-30

MW-24

MW-33D

MW-33I

MW-33S

MW-31D

MW-31I

MW-31S

MW-29D

MW-29I

MW-29S

MW-21

MW-26	6/19/2001	6/7/2005	2/26/2008	12/23/2008	2/2/2009	3/11/2009	3/16/2010
Analyte							
1,1 DCA	ND	ND	ND	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND	ND	ND	ND
1,2 DCE	ND	ND	ND	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND	ND	ND	ND
PCE	2 J	0.72 J	1.1 J	ND	1.8 J	1.1 J	1.1 J
TCE	ND	ND	3.2 J	1.4 J	ND	0.86 J	ND
VC	ND	ND	ND	ND	ND	ND	ND

MW-29S	6/26/2001	5/9/2003	10/21/2003	1/13/2004	3/9/2004	8/4/2004	6/7/2005	10/16/2006	8/7/2007	2/26/2008	3/16/2010
Analyte											
1,1 DCA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2 DCE	ND	ND	<2	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCE	5	4	2	4	ND	3 J	1.5 J	1.2 J	1	ND	ND
TCE	2 J	2	ND	2	35	2 J	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

MW-30I

MW-30S

FORMER BLDG 13 STORAGE SHED

MW-26D

MW-26I

MW-26

FORMER WATER TANK

FORMER PUMP HOUSE

MW-30S	6/18/2001	6/7/2005	2/26/2008	12/23/2008	2/2/2009	3/12/2009	3/16/2010
Analyte							
1,1 DCA	ND	ND	ND	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND	ND	ND	ND
1,2 DCE	ND	ND	ND	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND	ND	ND	ND
PCE	ND	0.61 J	ND	ND	0.88 J	ND	ND
TCE	3 J	1.9 J	1.8 J	1.8 J	1.7 J	4.5 J	0.63 J
VC	ND	ND	ND	ND	ND	ND	ND

MW-2	6/15/2001	5/9/2003	10/21/2003	1/13/2004	3/9/2004	6/7/2005	11/16/2005	5/8/2006	7/28/2006	10/16/2006	8/7/2007	2/26/2008	3/16/2010
Analyte													
1,1 DCA	ND	5	6	2	4	ND	ND	ND	ND	ND	0.70	ND	ND
1,1 DCE	ND	1	2	ND	1	ND	ND	ND	ND	ND	ND	ND	ND
1,2 DCE	ND	32	52	15	25	1,4 J	ND	1,9 J	ND	ND	1.5	1 J	3.0 J
1,1,1 TCA	ND	18	23	7	13	ND	ND	4.9 J	ND	ND	2.0	ND	ND
PCE	3 J	50	68	27	45	5.8	0.76 J	8.7	ND	5.6	5.8	2.9 J	5.4
TCE	17	62	64	ND	34	5.1	1.7 J	9.6	ND	4.5 J	5.8	7	9.2
VC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TOMS POINT LANE

LEGEND

- MW-2 — LOCATION AND DESIGNATION OF EXISTING WELL SAMPLED
  - WELL DEPTH DESIGNATIONS:
    - D – DEEP
    - I – INTERMEDIATE
    - S – SHALLOW
- MW-23 — LOCATION AND DESIGNATION OF EXISTING MONITORING WELL
- AS-12 — LOCATION AND DESIGNATION OF AIR SPARGE WELL
- AS-21 — LOCATION AND DESIGNATION OF AIR SPARGE WELL USED FOR FIRST ROUND OF INJECTIONS
- SVE-1 — LOCATION AND DESIGNATION OF SOIL VAPOR EXTRACTION WELL
- OW-3 — LOCATION AND DESIGNATION OF EXISTING OBSERVATION WELL
- AREAS OF IMPACT BASED ON MIP RESULTS

SAMPLE DESIGNATION — HISTORIC SAMPLE DATE

MW-30S	2/26/2008	12/23/2008	2/2/2009	3/12/2009	3/16/2010
Analyte					
1,1 DCA	ND	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND	ND
1,2 DCE	ND	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND	ND
PCE	ND	ND	0.88 J	ND	ND
TCE	1.8 J	1.8 J	1.7 J	4.5 J	0.63 J
VC	ND	ND	ND	ND	ND

← DATA IN ug/L

SOURCE:

BUILDING FOOTPRINT OBTAINED FROM LOCKWOOD GREENE ENGINEERS, INC. PLANCOR 999 PLOT PLAN AND THYPIN STEEL CO., INC. ADVERTISING BROCHURE.

50' 0 50'

Title:

SHALLOW ZONE GROUNDWATER RESULTS

FORMER THYPIN STEEL FACILITY
MANORHAVEN, NEW YORK

Prepared For:

MBA–MANORHAVEN, LLC
PRINCETON, NEW JERSEY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: J.W.	Date: 31JAN13	PLATE
Prepared by: J.A.D.	Scale: AS SHOWN	2
Project Mgr: C.P.	Project: 0771.0001Y000	
File: 0771.0001Y327.03.DWG		

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OW-4	11/24/2008	2/2/2009	3/11/2009	6/9/2009	3/16/2010	10/13/2011	1/6/2012	3/2/2012	3/30/2012	9/21/2012
Analyte										
1,1 DCA	ND	ND	ND	ND	ND	ND	ND	ND	0.14 J	ND
1,1 DCE	21	4.1 J	25	39	5.4	4.8	7.8	5	6.6	6.3
1,2 DCE	320 J	97	280 J	200 J	97	81	190	120	140	140
1,1,1 TCA	ND	ND	ND	ND	ND	ND	ND	ND	0.21 J	ND
PCE	1.2 J	ND	1.1 J	ND	ND	0.57 J	ND	0.59 J	0.62 J	ND
TCE	6,700	1,600	7,900	8,900	2,500	960	2700	1600	1500	2100
VC	18	8.4	18	17	4.7 J	4.7	3.9 J	ND	0.54 J	2.2 J

MW-35S	11/24/2008	2/2/2009	3/11/2009	3/16/2010
Analyte				
1,1 DCA	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND
1,2 DCE	4.4 J	1.9 J	6.7	4.1 J
1,1,1 TCA	ND	ND	ND	ND
PCE	ND	ND	ND	ND
TCE	41	24	85	48
VC	ND	ND	ND	ND

OW-3	11/24/2008	2/11/2009	3/12/2009	6/9/2009	3/16/2010
Analyte					
1,1 DCA	ND	ND	ND	ND	ND
1,1 DCE	1.9 J	ND	ND	ND	ND
1,2 DCE	5.7	ND	ND	1.7 J	2.1 J
1,1,1 TCA	ND	ND	ND	ND	ND
PCE	ND	1.3 J	ND	ND	ND
TCE	110	8.4	28	57	49
VC	ND	ND	ND	ND	ND

OW-5	11/24/2008	2/11/2009	3/11/2009	6/9/2009	3/16/2010	10/13/2011	1/6/2012	3/2/2012	3/30/2012
Analyte									
1,1 DCA	ND	ND	1.4 J	ND	ND	0.29 J	NS	ND	0.23 J
1,1 DCE	1.8 J	ND	37	ND	4.6 J	1.4	NS	1.5	1.2
1,2 DCE	5.2	48	100	1.9 J	26	0.44 J	NS	8.6	7.8
1,1,1 TCA	ND	ND	ND	ND	ND	ND	NS	ND	ND
PCE	ND	1.1 J	1.9 J	ND	ND	0.49 J	NS	0.3 J	0.21 J
TCE	98	1,100	2,400	66	770	170	NS	180	160
VC	1 J	11	31	ND	1.4 J	ND	NS	0.83 J	0.58 J

MW-34I	11/24/2008	2/11/2009	3/11/2009	3/16/2010	10/13/2011	1/6/2012	3/2/2012	3/30/2012
Analyte								
1,1 DCA	ND	ND	5.2	2.6 J	ND	ND	5.4 J	4.3
1,1 DCE	4.5 J	ND	58	6.9	21	20	21	21
1,2 DCE	24	180	230 J	170 J	75	120	96	130
1,1,1 TCA	ND	ND	ND	ND	ND	ND	NS	ND
PCE	ND	ND	1.3 J	ND	ND	ND	1.8 J	1.4
TCE	590	5,700	7,200	4,600	1800	3200	2700	2900
VC	1.6 J	24 J	36	11	3.8 J	14	15	17

OW-9	4/28/2009	6/9/2009	3/16/2010
Analyte			
1,1 DCA	ND	ND	ND
1,1 DCE	ND	ND	ND
1,2 DCE	89	87	12
1,1,1 TCA	ND	ND	ND
PCE	ND	1.1 J	ND
TCE	20	23	1.8 J
VC	ND	ND	ND

MW-34S	11/24/2008	2/2/2009	3/11/2009	3/16/2010
Analyte				
1,1 DCA	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND
1,2 DCE	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND
PCE	ND	ND	ND	ND
TCE	ND	ND	ND	ND
VC	ND	ND	ND	ND

OW-7	11/24/2008	2/11/2009	3/11/2009	6/9/2009	3/16/2010
Analyte					
1,1 DCA	ND	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND	ND
1,2 DCE	12	120	33	16	26
1,1,1 TCA	ND	ND	ND	ND	ND
PCE	ND	0.88 J	ND	ND	ND
TCE	10	110	39	16	18
VC	ND	ND	ND	ND	ND

OW-6	11/24/2008	2/11/2009	3/11/2009	6/9/2009	3/16/2010	9/22/2010	11/3/2010	11/17/2010
Analyte								
1,1 DCA	ND	ND	ND	ND	ND	5 U	5 U	5 U
1,1 DCE	1.6 J	ND	5.8	ND	6.8	5 U	5 U	5 U
1,2 DCE	14	33	37	42	83	13	1.8 J	1.4 J
1,1,1 TCA	ND	ND	ND	ND	ND	5 U	5 U	5 U
PCE	ND	1 J	0.96 J	1.1 J	ND	5 U	5 U	5 U
TCE	290	1,000	1,000	800	970	140	22	18
VC	ND	2.2 J	2 J	3.5 J	1.1 J	5 U	5 U	5 U

MW-35I	11/24/2008	2/11/2009	3/11/2009	3/16/2010	9/22/2010	11/3/2010	11/17/2010	10/13/2011	1/6/2012	3/2/2012	3/30/2012	9/21/2012
Analyte												
1,1 DCA	1.7 J	ND	1.7 J	2.3 J	1.3 J	1.3 J	1.2 J	1.3 J	NS	1.3 J	1.2 J	0.35 J
1,1 DCE	2.4 J	ND	3.5 J	1.8	5.2	2.4 J	2.2 J	2.0 J	NS	ND	1.7 J	1.3
1,2 DCE	9.5	ND	12	11	5.8	8.1	8.9	ND	NS	11	8.8	21
1,1,1 TCA	ND	10 J	ND	ND	5 U	5 U	5 U	ND	NS	ND	0.41 J	1.3
PCE	1.5 J	ND	1.5 J	1.1 J	5 U	5 U	5 U	ND	NS	2.2 J	1.5 J	3.3
TCE	3,600	2,900	3,700	3,800	1500	2600	2000	2200	NS	2100	2600	410
VC	ND	ND	1.8 J	ND	5 U	5 U	5 U	ND	NS	ND	0.36 J	0.41 J

MW-35S	11/24/2008	2/2/2009	3/12/2009	3/16/2010
Analyte				
1,1 DCA	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND
1,2 DCE	ND	ND	1 J	1 J
1,1,1 TCA	ND	ND	ND	ND
PCE	ND	ND	ND	ND
TCE	8.9	8.7	8.7	8.9
VC	ND	ND	ND	ND

OW-8	4/28/2009	6/9/2009	3/16/2010
Analyte			
1,1 DCA	ND	ND	ND
1,1 DCE	ND	ND	1.1 J
1,2 DCE	10	8.3	17
1,1,1 TCA	ND	ND	ND
PCE	1.9 J	2.0 J	3.2 J
TCE	160	98	140
VC	ND	ND	ND

OW-2	9/22/2010	11/3/2010	11/17/2010
Analyte			
1,1 DCA	5 U	5 U	5 U
1,1 DCE	5 U	5 U	5 U
1,2 DCE	5 U	5 U	5 U
1,1,1 TCA	5 U	5 U	5 U
PCE	5 U	5 U	5 U
TCE	54	11	7.9
VC	5 U	5 U	5 U

MW-33I	11/24/2008	2/2/2009	3/12/2009
Analyte			
1,1 DCA	ND	ND	ND
1,1 DCE	ND	ND	ND
1,2 DCE	ND	ND	ND
1,1,1 TCA	ND	ND	ND
PCE	ND	ND	ND
TCE	ND	2.3 J	0.79 J
VC	ND	ND	ND

MW-33S	11/24/2008	2/2/2009	3/12/2009	3/16/2010
Analyte				
1,1 DCA	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND
1,2 DCE	ND	ND	1 J	1 J
1,1,1 TCA	ND	ND	ND	ND
PCE	ND	ND	ND	ND
TCE	8.9	8.7	8.7	8.9
VC	ND	ND	ND	ND

OW-1	9/22/2010	11/3/2010	11/17/2010
Analyte			
1,1 DCA	5 U	5 U	5 U
1,1 DCE	5 U	5 U	5 U
1,2 DCE	20	21	25
1,1,1 TCA	5 U	5 U	5 U
PCE	5 U	5 U	5 U
TCE	240	160	220
VC	5 U	5 U	5 U

MW-31I	11/24/2008	2/2/2009	3/12/2009
Analyte			
1,1 DCA	ND	ND	ND
1,1 DCE	ND	ND	ND
1,2 DCE	ND	2.4 J	ND
1,1,1 TCA	ND	4.1 J	ND
PCE	ND	2.4 J	ND
TCE	0.91 J	12	0.89 J
VC	ND	ND	ND

MW-31S	11/24/2008	2/2/2009	3/12/2009	3/16/2010
Analyte				
1,1 DCA	7	7.3	7.8	1.5 J
1,1 DCE	1.1 J	1.4 J	1.8 J	ND
1,2 DCE	31	31	34	11
1,1,1 TCA	24	31	25	3.4 J
PCE	52	55	48	14
TCE	78	84	81	22
VC	ND	ND	ND	ND

MW-29S	2/26/2008	3/16/2010
Analyte		
1,1 DCA	ND	ND
1,1 DCE	ND	ND
1,2 DCE	ND	ND
1,1,1 TCA	ND	ND
PCE	ND	ND
TCE	ND	ND
VC	ND	ND

MW-24	12/1/2008	2/2/2009	3/12/2009	3/16/2010
Analyte				
1,1 DCA	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND
1,2 DCE	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND
PCE	ND	2.5 J	ND	ND
TCE	2.4 J	6.2	4 J	1.8 J
VC	ND	ND	ND	ND

MW-26I	12/23/2008	2/11/2009	3/11/2009	3/16/2010
Analyte				
1,1 DCA	ND	ND	ND	ND
1,1 DCE	1.5 J	ND	1.4 J	ND
1,2 DCE	170	270	97	8.3
1,1,1 TCA	ND	ND	ND	ND
PCE	1.5 J	2.2 J	0.87 J	ND
TCE	620	1,100	440	27
VC	ND	ND	ND	ND

MW-26	12/23/2008	2/2/2009	3/11/2009	3/16/2010
Analyte				
1,1 DCA	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND
1,2 DCE	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND
PCE	ND	1.8 J	1.1 J	1.1 J
TCE	1.4 J	ND	0.86 J	ND
VC	ND	ND	ND	ND

MW-30S	12/23/2008	2/2/2009	3/12/2009	3/16/2010
Analyte				
1,1 DCA	ND	ND	ND	ND
1,1 DCE	ND	ND	ND	ND
1,2 DCE	ND	ND	ND	ND
1,1,1 TCA	ND	ND	ND	ND
PCE	ND	0.88 J	ND	ND
TCE	1.8 J	1.7 J	4.5 J	0.63 J
VC	ND	ND	ND	ND

MW-30I	12/23/2008	2/11/2009	3/12/2009
Analyte			
1,1 DCA	ND	ND	ND
1,1 DCE	ND	ND	ND
1,2 DCE	ND	5.4	ND
1,1,1 TCA	ND	ND	ND
PCE	ND	ND	ND
TCE	12	88	16
VC	ND	ND	ND

MW-2	2/26/2008	3/16/2010
Analyte		
1,1 DCA	ND	ND
1,1 DCE	ND	ND
1,2 DCE	1 J	3.0 J
1,1,1 TCA	ND	ND
PCE	2.9 J	5.4
TCE	7	9.2
VC	ND	ND

YENNICOCK AVENUE

MANHASSET BAY

TOMS POINT LANE

CONCRETE CHAIN LINK FENCE

CURB FENCE

BULKHEAD

REMAINS OF TIMBER RAMP

GATE

FORMER BLDG 3 OFFICE

FORMER BLDG 18

FORMER BLDG 17 STORAGE

FORMER BLDG 22 (SUBSTATION No. 1)

FORMER BLDG 2

FORMER WELDING SHOP

FORMER BLDG 9 DROP PRESS ROOM

FORMER BLDG 25

FORMER BLDG 26

FORMER COAL BIN

FORMER HEATER ROOM

FORMER PUMP HOUSE

FORMER LOADING DOCK PLATFORM

FORMER BLDG 16 STORAGE

FORMER OFFICE

FORMER BLDG 6

FORMER BLDG 8 CAFETERIA

FORMER WING STORAGE SHED

FORMER FIRE PROOF ROOM

FORMER LOADING DOCK PLATFORM

FORMER GASOLINE TANKS

FORMER CONCRETE PROW

FORMER BLDG 1

EXISTING SYSTEM PIPING

EXISTING TREATMENT ENCLOSURE

FORMER PARKIN

FORMER CINDERS STORAGE AREA

FORMER FUEL OIL TANKS

FORMER BLDG 11 BOILER HOUSE

FORMER BLDG 5 COAL SHED

FORMER BLDG 23 (SUBSTATION No. 2)

FORMER BLDG 4

FORMER BLDG 13 STORAGE SHED

FORMER BLDG 12 FILTER CLEANING HOUSE

FORMER WATER TANK

FORMER PUMP HOUSE

AREA 1

AREA 2

MW-22 MW-23I MW-23 MW-32S MW-33I MW-33S AS-14 AS-15 AS-16 AS-17 AS-18 AS-19 AS-20 AS-21 AS-22 AS-23 AS-24 AS-25 AS-26 AS-27 AS-28 AS-12 AS-11 AS-10 AS-9 AS-8 AS-7 AS-6 AS-5 AS-4 AS-3 AS-2 AS-1 SVE-1 SVE-2 SVE-3 SVE-4 SVE-5 SVE-6 SVE-7 SVE-8 MW-34I MW-34S MW-35I MW-35S OW-1 OW-2 OW-3 OW-4 OW-5 OW-6 OW-7 OW-9 IW-1 MW-29D MW-29I MW-29S MW-28 MW-27 MW-24 MW-2D MW-2I MW-2 MW-30I MW-30S MW-26I MW-26 MW-26D MW-31I MW-31S

N

LEGEND

- MW-35I — LOCATION AND DESIGNATION OF EXISTING WELL SAMPLED
  - WELL DEPTH DESIGNATIONS:
    - D – DEEP
    - I – INTERMEDIATE
    - S – SHALLOW
- MW-23 — LOCATION AND DESIGNATION OF EXISTING MONITORING WELL
- AS-12 — LOCATION AND DESIGNATION OF AIR SPARGE WELL
- AS-21 — LOCATION AND DESIGNATION OF AIR SPARGE WELL USED FOR FIRST PHASE OF INJECTIONS
- SVE-1 — LOCATION AND DESIGNATION OF SOIL VAPOR EXTRACTION WELL
- IW-1 — LOCATION AND DESIGNATION OF EXISTING INJECTION WELL
- LOCATION OF INJECTION POINT SECOND PHASE OF INJECTIONS
- LOCATION OF INJECTION POINT ISCO PILOT STUDY
- LOCATION OF INJECTION POINT THIRD PHASE OF INJECTIONS
- LOCATION OF INJECTION POINT FOURTH PHASE OF INJECTIONS
- AREAS OF IMPACT BASED ON MIP RESULTS
- LOCATION OF INJECTION POINTS FIRST ROUND OF INJECTIONS

ug/L – MICROGRAMS PER LITER

SAMPLE DESIGNATION

BASELINE SAMPLING 1ST PHASE ISCO INJECTIONS

BASELINE SAMPLING 2ND PHASE ISCO INJECTIONS

MW-35I	11/24/2008	2/11/2009	3/11/2009	3/16/2010	9/22/2010	11/3/2010	11/17/2010	10/13/2011	1/6/2012	3/2/2012	3/30/2012	9/21/2012
Analyte												
1,1 DCA	1.7 J	ND	1.7 J	2.3 J	1.3 J	1.3 J	1.2 J	1.3 J	NS	1.3 J	1.2 J	0.35 J
1,1 DCE	2.4 J	ND	3.5 J	1.8	5.2	2.4 J	2.2 J	2.0 J	NS	ND	1.7 J	1.3
1,2 DCE	9.5	ND	12	11	5.8	8.1	8.9	ND	NS	11	8.8	21
1,1,1 TCA	ND	10 J	ND	ND	5 U	5 U	5 U	ND	NS	ND	0.41 J	1.3
PCE	1.5 J	ND	1.5 J	1.1 J	5 U	5 U	5 U	ND	NS	2.2 J	1.5 J	3.3
TCE	3,600	2,900	3,700	3,800	1500	2600	2000	2200	NS	2100	2600	410
VC	ND	ND	1.8 J	ND	5 U	5 U	5 U	ND	NS	ND	0.36 J	0.41 J

DATA IN ug/L

BASELINE SAMPLING ISCO PILOT STUDY

BASELINE SAMPLING 3RD PHASE ISCO INJECTIONS

NOTES

1. BUILDING FOOTPRINT OBTAINED FROM LOCKWOOD GREENE ENGINEERS, INC. PLANCOR 999 PLOT PLAN AND THYPIN STEEL CO., INC. ADVERTISING BROCHURE.
2. SOIL VAPOR EXTRACTION (SVE) SYSTEM WAS INSTALLED IN AUGUST 2003. SVE SYSTEM WAS EXPANDED TO INCLUDE AN AIR SPARGE (AS) SYSTEM AND PUT INTO OPERATION IN DECEMBER 2005. THE AS/SVE SYSTEM WAS SHUTDOWN IN OCTOBER 2008.
3. ERD PILOT STUDY WAS CONDUCTED IN JUNE 2004.
4. FIRST PHASE OF IN SITU CHEMICAL OXIDATION (ISCO) INJECTIONS CONDUCTED FROM DECEMBER 2008 THROUGH FEBRUARY 2009.
5. SECOND PHASE OF ISCO INJECTIONS CONDUCTED IN MAY 2009.
6. ISCO SIDEWINDER PILOT STUDY CONDUCTED IN OCTOBER 2010.
7. THIRD PHASE OF ISCO INJECTION CONDUCTED IN OCTOBER/NOVEMBER 2011.
8. FOURTH PHASE OF ISCO INJECTIONS CONDUCTED IN JUNE 2012.

SOURCE

BUILDING FOOTPRINT OBTAINED FROM LOCKWOOD GREENE ENGINEERS, INC. PLANCOR 999 PLOT PLAN AND THYPIN STEEL CO., INC. ADVERTISING BROCHURE.

50' 0 50'

Title:

ISCO INJECTION LOCATIONS AND GROUNDWATER RESULTS

FORMER THYPIN STEEL FACILITY
MANORHAVEN, NEW YORK

Prepared For:

MBA–MANORHAVEN, LLC
PRINCETON, NEW JERSEY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: J.W.	Date: 31JAN13	PLATE
Prepared by: J.A.D.	Scale: AS SHOWN	3
Project Mgr: C.P.	Project: 0771.0001Y000	
File: 0771.0001Y327.04.DWG		

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