RECORD OF DECISION

Pride Solvents and Chemical Co.
State Superfund Project
Babylon, Suffolk County
Site No. 152025
March 2013

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT - RECORD OF DECISION

Pride Solvents and Chemical Co.
State Superfund Project
Babylon, Suffolk County
Site No. 152025
March 2013

Statement of Purpose and Basis

This document presents the remedy for the Pride Solvents and Chemical Co. site, a Class 2 inactive hazardous waste disposal site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375, and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the Pride Solvents and Chemical Co. site and the public's input to the proposed remedy presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Description of Selected Remedy

For OU: 01

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gas and other emissions;
- Increasing energy efficiency minimizing use of non-renewable energy, and generating some renewable energy on site if possible;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which will otherwise be considered a waste;

- Maximizing habitat value and creating habitat when possible
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Remedy Description: OU1 - Air Sparge/Soil Vapor Extraction (AS/SVE)

Air sparging is an in-situ technology used to treat groundwater contaminated with volatile organic compounds (VOCs). The process physically removes contaminants from the groundwater by injecting air into a well that has been installed into the groundwater. As the injected air rises through the groundwater it volatilizes the VOCs from the groundwater into the injected air. The VOCs are carried with the injected air into the vadose zone (the area below the ground surface but above the water table) where a soil vapor extraction (SVE) system is used to remove the injected air. The SVE system pulls a vacuum on wells that have been installed into the vadose zone to remove the VOCs along with the air introduced by the sparging process. The air extracted from the SVE wells is then run through activated carbon (or other air treatment as applicable) which removes VOCs from the air before it is discharged to the atmosphere.

The SVE system will also remediate unsaturated soil contaminated with VOCs. The vacuum draws air through the soil matrix which carries the VOCs from the soil to the SVE well. The VOC-contaminated soils are in the same locations as the contaminated groundwater.

At this site, approximately 40 air injection wells will be installed in the portion of the site to be treated to a depth of approximately 30 feet, which is 10-20 feet below the water table. To capture the volatilized contaminants, approximately 12 SVE wells will be installed in the vadose zone at a depth of approximately 7 feet below ground surface. The air containing VOCs extracted from the SVE wells will be treated with activated carbon (or other air treatment as applicable).

3. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property that;

- requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allows the use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH;
- prohibits agriculture or vegetable gardens on the controlled property; and
- requires compliance with the Department approved Site Management Plan.

4. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and

engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in the Institution Controls section above.

Engineering Controls: The OU1 AS/SVE system discussed in the Remedy Description section above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use, and/or groundwater use;
- a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedies. The plan includes, but may not be limited to:
- monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedies;
- a schedule of monitoring and frequency of submittals to the Department;
- monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required by the Institutional and Engineering Control Plan discussed above.
- monitoring for vapor intrusion in off-site buildings to assess the performance and effectiveness of the remedies, including a provision for implementing actions to address exposures related to soil vapor intrusion.

c. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, optimization, and reporting of any mechanical or physical components of the remedy. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. The plan includes, but is not limited to:
- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- performance monitoring to ensure that the remedies are meeting their design performance;
- collection of data necessary to optimize the operation of the remedy;
- maintaining site access controls and Department notification; and providing the Department access to the site and O&M records.

For OU: 02

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gas and other emissions;
- Increasing energy efficiency minimizing use of non-renewable energy, and generating some renewable energy on site if possible;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which will otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Remedy Description: OU2 - Permeable Reactive Barrier Using Enhanced Anaerobic Bioremediation

A permeable reactive barrier (PRB) is an in situ method for remediating contaminated ground water that combines a passive chemical or biological treatment zone with subsurface fluid flow management. Treatment media may include zero-valent iron, chelators, sorbents, and microbes to address a wide variety of groundwater contaminants, including chlorinated solvents. The contaminants are either degraded or concentrated and retained in the barrier material, which may need to be replaced periodically. PRBs can be installed as permanent or semi-permanent units.

Bioremediation uses microorganisms that already exist in the substrate to degrade organic contaminants in groundwater or on soil, either extracted/excavated or in situ. The microorganisms break down contaminants by using them as a food source or cometabolizing them with a food source. Aerobic processes require an oxygen source, and the end products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end products can include methane, hydrogen gas, sulfide, elemental sulfur, and nitrogen gas. In situ techniques stimulate and create a favorable environment for microorganisms to grow and use contaminants as a food and energy source. Sometimes, microorganisms that have been adapted for degradation of specific contaminants are applied to enhance the process.

Enhanced Anaerobic Bioremediation will be implemented via the injection of electron donors,

carbon, and nutrients (otherwise referred to as "amendments"), into the subsurface. Specifically, the amendments will be injected such that a very thick layer of amendment (essentially a horizontal Permeable Reactive Barrier), will cover the most highly impacted section of the clay layer, which is about 400 ft long by 100 ft wide by 10 ft thick, reducing the leaching of contamination exceeding the remedial action objectives from the clay into the groundwater. The chemical gradients induced between the Permeable Reactive Barrier and the impacted clay will serve to draw contamination out of the clay layer.

3. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property that;

- requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allows the use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH;
- prohibits agriculture or vegetable gardens on the controlled property; and
- requires compliance with the Department approved Site Management Plan.

4. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in the Institution Controls section above.

Engineering Controls: The OU2 Permeable Reactive Barrier Using Enhanced Anaerobic Bioremediation system discussed in the Remedy Description section above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use, and/or groundwater use;
- a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and

• the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedies. The plan includes, but may not be limited to:
• monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedies;
• a schedule of monitoring and frequency of submittals to the Department;
• monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required by the Institutional and Engineering Control Plan discussed above.
• monitoring for vapor intrusion in off-site buildings to assess the performance and effectiveness of the remedies, including a provision for implementing actions to address exposures related to soil vapor intrusion.

c. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, optimization, and reporting of any mechanical or physical components of the remedy. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. The plan includes, but is not limited to:
• compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
• performance monitoring to ensure that the remedies are meeting their design performance;
• collection of data necessary to optimize the operation of the remedy;
• maintaining site access controls and Department notification; and providing the Department access to the site and O&M records.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

March 27,2013

Date

Robert W. Schick, P.E., Director
Division of Environmental Remediation

RECORD OF DECISION

Pride Solvents and Chemical Co.
Babylon, Suffolk County
Site No. 152025
March 2013

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of hazardous wastes at this site, as more fully described in this document, has contaminated various environmental media. The remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This Record of Decision (ROD) identifies the selected remedy, summarizes the other alternatives considered, and discusses the reasons for selecting the remedy.

The New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repository:

West Babylon Public Library
Attn: Nicole Haas - Reference Librarian
211 Route 109
West Babylon, NY 11704
Phone: (631) 669-5445

A public meeting was also conducted. At the meeting, the findings of the remedial investigation

(RI) and the feasibility study (FS) were presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period was held, during which verbal or written comments were accepted on the proposed remedy.

Comments on the remedy received during the comment period are summarized and addressed in the responsiveness summary section of the ROD.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Pride Solvents site is located at both 78 and 88 Lamar Street, in the "West Babylon" or "Pinelawn Industrial Area" of Suffolk County, NY. It is about 500 feet east, crossgradient, of the Babylon Landfill, Site No. 152039, a class 2 site.

Site Features: The site is 1.3 acres with two occupied buildings. The remainder of the site is paved except for two small, grassy areas directly in front of the buildings.

Current Zoning/Use(s): Current zoning and uses are commercial in nature. Surrounding parcels are used for commercial and light industrial purposes.

Historic Use(s): This site was occupied by Pride Solvents from 1960 to the late 1990's/early 2000's and was operated as a chemical and solvent distribution and reclamation facility. Presently, the property is owned by Pride and leased to a roll-off container distributing company and an autobody shop. The facility was formerly permited to operate as a TSDF facility under the Resource Conservation and Recovery Act (RCRA) program. The site has been included in the USEPA's tracking system under GPRA (Government Performance and Results Act) for corrective action. The RCRA Corrective Action Program requires investigation and cleanup of releases of hazardous wastes and hazardous constituents that pose an unacceptable risk at RCRA hazardous waste treatment, storage and disposal facilities. This site has not yet met indicators to show compliance with RCRA Corrective Action.

Pride Solvents and Chemicals received and stored waste solvents, both inside and outside, and then reclaimed the material via a filtration and distillation process. The operation at 78 Lamar Street included storage and reclamation of chlorinated and fluorinated solvents by distillation. Operations at the 88 Lamar Street facility were limited, reportedly, to bulk storage, drum packaging, and distribution.

Contamination associated with the Pride site was first identified in 1982 to 1983 by the Suffolk County Department of Health. A Phase I Preliminary Site Assessment was conducted in 1984 followed by a hydrogeologic investigation in 1991. Various investigations were conducted by Pride in 1992, 1993, and 1996, under the RCRA program until the Division of Environmental Remediation took over the project at the end of 1999.

Prior to January 1991, the northernmost yard of 88 Lamar Street contained 16 underground storage tanks. 12 were removed and 4 were filled with concrete and left in place. Despite the reported good condition of the tanks, about 50 cubic yards of soil were removed and disposed off-site during the tank removal. No tank tightness testing data are available.

Operable Units: The Operable Units (OU) were redefined in 2011 to identify the two remedial areas to be addressed; OU1 Shallow Groundwater and Soil Down to 20' below ground surface (bgs), and OU2 Deep Groundwater Greater than 20' bgs.

Site Geology and Hydrology: Groundwater is present between 10' and 20' bgs and flows to the south-southeast. The site is immediately underlain by the moderately to highly permeable sand, gravel and cobble outwash deposits of the upper glacial aquifer. For most of the site a clay layer is found at approximately 83-92' bgs, underlying the upper glacial aquifer and serves as a confining unit between the upper glacial aquifer and the underlying Magothy aquifers. This clay layer was not found however, in the northern area of the site, rather a clear contact between the Magothy's gray-white fine sand and the Upper Glacial's medium to coarse sand, gravel, and cobbles was encountered.

Operable Unit (OU) Numbers 01 and 02 are the subject of this document.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to commercial use (which allows for industrial use) as described in Part 375-1.8(g) were/was evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the RI to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include:

Pride Solvents Chemical Company of New York, Inc.

78-88 Lamar Street Realty Corporation

The PRPs for the site declined to implement a remedial program when requested by the Department. After the remedy is selected, the PRPs will again be contacted to assume responsibility for the remedial program. If an agreement cannot be reached with the PRPs, the Department will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the state for recovery of all response costs the state has incurred.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A Remedial Investigation (RI) has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the RI Report.

The following general activities are conducted during an RI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

The analytical data collected on this site includes data for:

- groundwater
- soil
- soil vapor
- indoor air

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified at this site is/are:

For OU: 01

TRICHLOROETHENE (TCE) TETRACHLOROETHYLENE (PCE)

For OU: 02

TRICHLOROETHENE (TCE) 1,1,1-TRICHLOROETHANE
TETRACHLOROETHYLENE (PCE)

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil
- soil vapor intrusion
- indoor air

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

The following IRM(s) has/have been completed at this site based on conditions observed during the RI.

IRM - Underground Storage Tank - Soil Removal

In 1990, under the RCRA program, twelve underground storage tanks were removed and four others were abandoned in place and filled with concrete. Fifty cubic yards of soil was removed from around the tanks.

IRM - Cleanout of Underground Injection Control Features

In 1998, under the RCRA program, the Responsible Party performed a clean-out of the two sanitary systems and one drywell at the site. These had been shown to contain elevated levels of volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs).

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern at this site, a Fish and Wildlife Resources Impact Analysis (FWRIA) was deemed not necessary for OUs 01 and 02.

Nature and Extent of Contamination: No current or potential site-related surface water impacts have been identified. No site-related groundwater contamination has been identified in the Magothy Aquifer. Therefore, no remediation of groundwater is required for this aquifer. Site related contamination is impacting groundwater in the Upper Glacial Aquifer. Two distinct, contaminated groundwater plumes were identified, a shallow plume (above 20 ft bgs), and a deep plume (below 20 ft bgs). This groundwater is not used as a source of potable water. Protection of this groundwater resource will be addressed in the remedy selection process.

Based upon investigations conducted to date, the contaminants of concern for OU1 and OU2 include tetrachloroethylene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (TCA), and their break down products.

These contaminants plus toluene and methylene chloride were also found in on-site dry wells and/or storm drains at 88 Lamar, as well as in the on-site soils around and under the former UST and ASTs. PCE disposal has resulted in the contamination of deep, saturated soil which results in groundwater contamination exceeding SCGs.

Concentrations of TCE in indoor air of on- and off-site buildings range from non-detect to 3,200 micrograms per cubic meter (ug/m3); PCE concentrations in the indoor air range from non-detect to 3,500 µg/m3; and concentrations of TCA in indoor air range from non-detect to 160 ug/m3.

Concentrations of TCE in sub-slab soil vapor of on- and off-site buildings range from 7 ug/m3 to 54,000 ug/m3; PCE concentrations in the sub-slab range from 210 ug/m3 to 540,000 ug/m3; and TCA concentrations in the sub-slab soil vapor range from non-detect to 930 ug/m3.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Since the site is covered by asphalt and buildings, people will not come into contact with contaminated groundwater or residual soil contamination unless they dig below these materials. Volatile organic compounds in the groundwater or soil may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Soil vapor intrusion sampling identified impacts to indoor air quality in on- and off- site buildings and this represents a health concern.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

For OU 01:

Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.

Soil

RAOs for Public Health Protection

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

Soil Vapor

RAOs for Public Health Protection

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

For OU 02:

Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

SECTION 7: SUMMARY OF THE SELECTED REMEDY

To be selected the remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Section 6.5. Potential remedial alternatives for the Site were identified, screened and evaluated in the feasibility study (FS) report.

A summary of the remedial alternatives that were considered for this site is presented in Exhibit B. Cost information is presented in the form of present worth, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit C.

The basis for the Department's remedy is set forth at Exhibit D.

For OU 01: Shallow Groundwater and Soil Down to 20 ft bgs, the selected remedy is referred to as the Air Sparge/Soil Vapor Extraction remedy.

The estimated present worth cost to implement the remedy is $1,520,000. The cost to construct the remedy is estimated to be $603,000 and the estimated average annual cost is $195,000.

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gas and other emissions;
- Increasing energy efficiency minimizing use of non-renewable energy, and generating some renewable energy on site if possible;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which will otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Remedy Description: OU1 - Air Sparge/Soil Vapor Extraction (AS/SVE)

Air sparging is an in-situ technology used to treat groundwater contaminated with volatile organic compounds (VOCs). The process physically removes contaminants from the groundwater by injecting air into a well that has been installed into the groundwater. As the injected air rises through the groundwater it volatilizes the VOCs from the groundwater into the injected air. The VOCs are carried with the injected air into the vadose zone (the area below the ground surface but above the water table) where a soil vapor extraction (SVE) system is used to remove the injected air. The SVE system pulls a vacuum on wells that have been installed into the vadose zone to remove the VOCs along with the air introduced by the sparging process. The air extracted from the SVE wells is then run through activated carbon (or other air treatment as applicable) which removes VOCs from the air before it is discharged to the atmosphere.

The SVE system will also remediate unsaturated soil contaminated with VOCs. The vacuum draws air through the soil matrix which carries the VOCs from the soil to the SVE well. The VOC-contaminated soils are in the same locations as the contaminated groundwater.

At this site, approximately 40 air injection wells will be installed in the portion of the site to be treated to a depth of approximately 30 feet, which is 10-20 feet below the water table. To capture the volatilized contaminants, approximately 12 SVE wells will be installed in the vadose zone at a depth of approximately 7 feet below ground surface. The air containing VOCs extracted from the SVE wells will be treated with activated carbon (or other air treatment as applicable).

3. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property that;

- requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allows the use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;

- restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH;
- prohibits agriculture or vegetable gardens on the controlled property; and
- requires compliance with the Department approved Site Management Plan.

4. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in the Institution Controls section above.

Engineering Controls: The OU1 AS/SVE system discussed in the Remedy Description section above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use, and/or groundwater use;
- a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedies. The plan includes, but may not be limited to:
- monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedies;
- a schedule of monitoring and frequency of submittals to the Department;
- monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required by the Institutional and Engineering Control Plan discussed above.
- monitoring for vapor intrusion in off-site buildings to assess the performance and effectiveness of the remedies, including a provision for implementing actions to address exposures related to soil vapor intrusion.

c. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, optimization, and reporting of any mechanical or physical components of the remedy. The operation of the components of the remedy will continue until the remedial

objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. The plan includes, but is not limited to:

- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- performance monitoring to ensure that the remedies are meeting their design performance;
- collection of data necessary to optimize the operation of the remedy;
- maintaining site access controls and Department notification; and providing the Department access to the site and O&M records.

For OU 02: Deep Groundwater Greater than 20 ft bgs, the selected remedy is referred to as the Permeable Reactive Barrier Using Enhanced Anaerobic Bioremediation remedy.

The estimated present worth cost to implement the remedy is $3,590,000. The cost to construct the remedy is estimated to be $2,300,000 and the estimated average annual cost is $50,000.

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gas and other emissions;
- Increasing energy efficiency minimizing use of non-renewable energy, and generating some renewable energy on site if possible;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which will otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Remedy Description: OU2 - Permeable Reactive Barrier Using Enhanced Anaerobic Bioremediation

A permeable reactive barrier (PRB) is an in situ method for remediating contaminated ground water that combines a passive chemical or biological treatment zone with subsurface fluid flow management. Treatment media may include zero-valent iron, chelators, sorbents, and microbes to address a wide variety of groundwater contaminants, including chlorinated solvents. The

contaminants are either degraded or concentrated and retained in the barrier material, which may need to be replaced periodically. PRBs can be installed as permanent or semi-permanent units.

Bioremediation uses microorganisms that already exist in the substrate to degrade organic contaminants in groundwater or on soil, either extracted/excavated or in situ. The microorganisms break down contaminants by using them as a food source or cometabolizing them with a food source. Aerobic processes require an oxygen source, and the end products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end products can include methane, hydrogen gas, sulfide, elemental sulfur, and nitrogen gas. In situ techniques stimulate and create a favorable environment for microorganisms to grow and use contaminants as a food and energy source. Sometimes, microorganisms that have been adapted for degradation of specific contaminants are applied to enhance the process.

Enhanced Anaerobic Bioremediation will be implemented via the injection of electron donors, carbon, and nutrients (otherwise referred to as "amendments"), into the subsurface. Specifically, the amendments will be injected such that a very thick layer of amendment (essentially a horizontal Permeable Reactive Barrier), will cover the most highly impacted section of the clay layer, which is about 400 ft long by 100 ft wide by 10 ft thick, reducing the leaching of contamination exceeding the remedial action objectives from the clay into the groundwater. The chemical gradients induced between the Permeable Reactive Barrier and the impacted clay will serve to draw contamination out of the clay layer.

3. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property that;

- requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allows the use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH;
- prohibits agriculture or vegetable gardens on the controlled property; and
- requires compliance with the Department approved Site Management Plan.

4. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in the Institution Controls section above.

Engineering Controls: The OU2 Permeable Reactive Barrier Using Enhanced Anaerobic Bioremediation system discussed in the Remedy Description section above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use, and/or groundwater use;
- a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedies. The plan includes, but may not be limited to:

- monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedies;
- a schedule of monitoring and frequency of submittals to the Department;
- monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required by the Institutional and Engineering Control Plan discussed above.
- monitoring for vapor intrusion in off-site buildings to assess the performance and effectiveness of the remedies, including a provision for implementing actions to address exposures related to soil vapor intrusion.

c. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, optimization, and reporting of any mechanical or physical components of the remedy. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. The plan includes, but is not limited to:

- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- performance monitoring to ensure that the remedies are meeting their design performance;
- collection of data necessary to optimize the operation of the remedy;
- maintaining site access controls and Department notification; and providing the Department access to the site and O&M records.

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation (RI) for all environmental media that were evaluated. As described in Section 6.1, samples were collected from various environmental media to characterize the nature and extent of contamination.

As described in the RI report, groundwater and soil samples were collected to characterize the extent of site-related contamination at concentrations that exceed the Unrestricted Use SCGs in the upper glacial aquifer. Soil samples were collected to determine the magnitude and extent of site-related contamination in the clay layer and at the clay that underlies the upper glacial aquifer. Additionally, soil vapor data collected during a previous investigation were evaluated during the RI. As seen in **Figures 3** through **5** and summarized in **Tables 1** and **2** below, the contaminants that exceed their SCGs are volatile organic compounds (VOCs). For comparison purposes, where applicable, SCGs are provided for each medium. Constituent concentrations are reported in parts per billion (ppb) for water, parts per million (ppm) for soil, and micrograms per cubic meter ($\mu g/m^3$) for soil vapor. The SCGs that the results were compared to in the RI are as follows:

- Groundwater SCGs are based on the Department's Ambient Water Quality Standards and Guidance Values and Part 5 of the New York State Sanitary Code.

- Soil SCGs are based on the Unrestricted and Commercial Use Soil Cleanup Objectives as listed in 6NYCRR Part 375-6.

Waste/Source Areas

As described in the RI report, waste/source materials were identified at the site and are impacting groundwater, soil, and soil vapor.

Wastes are defined in 6 NYCRR Part 375-1.2 (aw) and include solid, industrial and/or hazardous wastes. Source Areas are defined in 6 NYCRR Part 375-1.2 (au). Source areas are areas of concern at a site were substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium. Both Waste and Source areas were identified at the site and include the on-site soils around and under the UST and ASTs, the on-site dry wells and/or storm drains at 88 Lamar St., and groundwater impacted in the Upper Glacial Aquifer (see **Figures 3** through **5**).

Certain of the waste/source areas identified at the site were addressed by the IRM(s) described in Section 6.2. The remaining waste/source area(s) identified during the RI will be addressed in the remedy selection process.

Groundwater

Groundwater samples were collected from groundwater screening points and groundwater monitoring wells installed in the upper glacial aquifer and the underlying Magothy Aquifer. Groundwater samples were collected to assess groundwater conditions both on- and off-site just above the clay layer, in the clay, and in the underlying Magothy Aquifer just underneath the clay layer. Groundwater sample results from the October 2008 and February 2009 groundwater sampling events are summarized in **Table 1** below and are also provided in **Figures 3** and **4**.

Monitoring wells were installed in the Magothy Aquifer after the October 2008 groundwater sampling event, so the results for the shallow Magothy are depicted in **Figure 4** only (note that the Magothy wells have "SM" in their names). When reviewed in combination, the groundwater screening and sampling results indicate that site-related contamination in the upper glacial aquifer exceeds the Unrestricted SCGs for volatile organic compounds at the site and to approximately 900 feet southeast/downgradient of the site. Contaminant levels in the underlying Magothy aquifer did not exceed the SCGs.

Table 1 - Groundwater

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
1,1-Dichloroethane	ND to 9	5	3 out of 141 total samples*
1,1-Dichloroethene	ND to 25	5	2 out of 141
1,1,1-Trichloroethane	ND to 950	5	9 out of 141
cis-1,2-Dichloroethene	ND to 7.7	5	2 out of 141
Acetone	ND to 120	50	1 out of 141
Tetrachloroethylene	ND to 1,900	5	28 out of 141
Toluene	ND to 110D	5	1 out of 141
Trichloroethene	ND to 610	5	8 out of 141

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b- SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).
D – The reported value is from a secondary analysis with a dilution factor. The original analysis exceeded the calibration range.
ND – not detected
* total sample number includes environmental sample duplicates.

The primary groundwater contaminants are chlorinated volatile organic compounds. These contaminants are associated with possible former disposal practices and releases from underground storage tanks and affiliated piping at the site. The location of the septic systems and ancillary structures on-site are depicted in **Figure 2**. The bulk of contamination occurs in the deeper parts of the upper glacial aquifer, though at select locations across the site, shallow contamination exists at concentrations exceeding the SCGs, as well. A comparison of historical and current data indicate that the total VOCs plume may not be growing, and that the high groundwater flow velocity at the site is controlling plume size by dilution and dispersion.

Based on the findings of the RI, analysis of the spatial distribution of contamination and detection frequencies/levels, and review of historical data for the site, the disposal of hazardous waste has resulted in the contamination of groundwater. The site contaminants that are considered the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: tetrachloroethylene, trichloroethene, and 1,1,1-trichloroethane.

Soil

Subsurface soil samples were collected from the saturated zone at the site during groundwater screening activities during the RI. Samples were collected from the bottom of groundwater screening points and where clay or evidence of contamination, via visual, olfactory, or PID readings above background concentrations, was encountered. Soil sample results are summarized in **Table 2** below and are depicted in **Figure 5**. Site-related contamination at the interface between the upper glacial aquifer and the underlying clay layer was identified at concentrations exceeding the Unrestricted SCGs and thus requiring remedial action at the site and downgradient of the site.

Table 2 - Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Commercial Use SCG[c] (ppm)	Frequency Exceeding Restricted SCG
VOCs					
Tetrachloroethylene	ND to 7.8	1.3	2 out of 16 total samples	150	0 out of 16
Trichloroethene	ND to 0.1	0.47	0 out of 16	200	0 out of 16

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Use Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives.
ND – not detected

The primary soil contaminant associated with former disposal practices and releases from underground storage tanks and affiliated piping is tetrachloroethylene. It is assumed that tetrachloroethylene in the non-aqueous phase migrated under the influence of gravity down through the sands and gravels of the upper glacial aquifer, accumulated on top of the underlying clay layer, and diffused into the clay and migrated along the top of the clay layer to points of lower elevation. As noted in **Figure 5**, tetrachloroethylene contamination above SCGs was confirmed in the clay at the site and approximately 900 feet southeast of the site.

Based on the findings of the RI, the disposal of hazardous waste has resulted in the contamination of deep, saturated soil. The site contaminant identified in soil which is considered to be the primary contaminant of concern to be addressed by the remedy selection process is tetrachloroethylene.

Soil Vapor

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated during the RI. Specifically, the RI evaluated the results of a sub-slab soil vapor and indoor air investigation that was conducted previously.

Sub-slab soil vapor samples were collected from beneath the two on-site structures and at five off-site properties. Indoor air samples were also collected concurrently with the sub-slab soil vapor samples. The results indicate that elevated concentrations of volatile organic compounds were detected in sub-slab soil vapor and the indoor air of several structures.

The primary sub-slab and indoor air contaminants include PCE, TCE and TCA which are all associated with former disposal practices and releases at the site.

Based on the concentrations detected in the indoor air and sub-slab soil vapor samples, and in comparison to the NYSDOH Soil Vapor Intrusion Guidance, actions are recommended to reduce exposure at five of the structures/properties sampled and additional monitoring at the two remaining structures/properties will be required.

Based on the findings of the Remedial Investigation, the disposal of hazardous waste has resulted in the contamination of soil vapor and indoor air. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of soil vapor to be addressed by the remedy selection process are tetrachloroethylene, trichloroethene, and 1,1,-trichloroethane.

Exhibit B

Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (see Section 6.5) to address the contaminated media identified at the site as described in Exhibit A. The following remedial alternatives are separated into those for OU1 Shallow Groundwater and Soils, and those for OU2 Deep Groundwater.

OU1 Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of the site completed by the IRM(s) described in Section 6.2. This alternative leaves the site in its present condition and does not provide any additional protection of the environment. Groundwater will continue to migrate and the contamination will continue to attenuate through dilution, dispersion, limited biodegradation, etc. This alternative does not include institutional controls or long-term groundwater monitoring.

OU1 Alternative 2: Institutional Controls

Institutional controls such as environmental easements, site management plans, groundwater use restrictions, and long-term monitoring were retained as screened alternatives. These alternatives together will be instituted to impose restrictions in the subsurface zones.

An initial comparison of historical and current data indicate that the total VOCs plume may not be growing, and that the high groundwater flow velocity at the site is controlling plume size by dilution and dispersion. If these mechanisms are in fact controlling plume size, Institutional Controls could potentially meet the remedial action objectives at the site. The length of time to achieve remedial objectives will depend on the groundwater flow velocity, as well as the amount of contaminant mass in the vadose zone and the rate of mass transfer from the vadose zone into the shallow groundwater. It is important to acknowledge that the data collected thus far do not allow for a statistically significant determination of plume shrinkage (a minimum of eight sampling rounds will be recommended for plume stability analysis).

For cost comparison purposes, it is assumed that long-term monitoring will be performed for the 20-year evaluation period, quarterly for the first five years and annually after that. A review of site conditions will be conducted every five years using data obtained from a long-term monitoring program. The Periodic Review Report will include an evaluation of the extent of contamination and an assessment of contaminant migration and attenuation over time. The five-year review will contain recommendations to determine if monitoring should be continued or discontinued. The monitoring program will be modified as needed based on the monitoring results.

Present Worth:.....*$480,000*
Capital Cost:.....*$43,000*
Annual Costs:.....*$16,000*

OU1 Alternative 3: Air Sparge/Soil Vapor Extraction (AS/SVE)

This alternative achieves all of the SCGs discussed in Section 6.1.1 and Exhibit A. Air sparging is an in-situ technology used to treat groundwater contaminated with volatile organic compounds (VOCs). The process physically removes contaminants from the groundwater by injecting air into a well that has been installed into the groundwater. As the injected air rises through the groundwater it volatilizes the VOCs from the groundwater into

the injected air. The VOCs are carried with the injected air into the vadose zone (the area below the ground surface but above the water table) where a soil vapor extraction (SVE) system is used to remove the injected air. The SVE system pulls a vacuum on wells that have been installed into the vadose zone to remove the VOCs along with the air introduced by the sparging process. The air extracted from the SVE wells is then run through activated carbon (or other air treatment as applicable) which removes VOCs from the air before it is discharged to the atmosphere.

The SVE system will also remediate unsaturated soil contaminated with VOCs. The vacuum draws air through the soil matrix which carries the VOCs from the soil to the SVE well. The VOC-contaminated soils are in the same locations as the contaminated groundwater.

At this site, approximately 40 air injection wells will be installed in the portion of the site to be treated to a depth of approximately 30 feet, which is 10-20 feet below the water table. To capture the volatilized contaminants, approximately 12 SVE wells will be installed in the vadose zone at a depth of approximately 7 feet below ground surface. The air containing VOCs extracted from the SVE wells will be treated with activated carbon (or other air treatment as applicable).

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site. The environmental easement will include a provision limiting the use and development of the controlled property for commercial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws.

Present Worth:.....*$1,520,000*
Capital Cost:.....*$603,000*
Annual Costs:.....*$195,000*

OU2 Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of the site completed by the IRM(s) described in Section 6.2. This alternative leaves the site in its present condition and does not provide any additional protection of the environment. Groundwater will continue to migrate and the contamination will continue to attenuate through dilution, dispersion, limited biodegradation (although on-site data do not indicate biodegradation, this may not be true off-site), etc. This alternative does not include institutional controls or long-term groundwater monitoring.

OU2 Alternative 2: Institutional Controls

This alternative achieves all of the SCGs discussed in Section 6.1.1 and Exhibit A. Institutional controls such as environmental easements, site management plans, groundwater use restrictions, and long-term monitoring were retained as screened alternatives. These alternatives together will be instituted to impose restrictions in the subsurface zones.

An initial comparison of historical and current data indicate that the total VOCs plume may not be growing, and that the high groundwater flow velocity at the site is controlling plume size by dilution and dispersion. If these mechanisms are in fact controlling plume size, Institutional Controls could potentially meet the remedial action objectives at the site. The length of time to achieve remedial objectives will depend on the groundwater flow velocity, as well as the amount of contaminant mass adsorbed into the clay layer and its rate of desorption. The presence of DNAPL in trapped fissures or pockets could also provide a continuing source of dissolved phase contamination. NAPL, i.e., non-aqueous phase liquid, means a contaminant that is a liquid which may be denser or lighter than water and does not mix easily or dissolve in water, but remains as a separate phase. A DNAPL is

denser than water. It is important to acknowledge that the data collected thus far do not allow for a statistically significant determination of plume shrinkage (a minimum of eight sampling rounds will be recommended for plume stability analysis).

For cost comparison purposes, it is assumed that long-term monitoring will be performed for the 20-year evaluation period, quarterly for the first five years and annually after that. A review of site conditions will be conducted every five years using data obtained from a long-term monitoring program. The Periodic Review Report will include an evaluation of the extent of contamination and an assessment of contaminant migration and attenuation over time. The five-year review will contain recommendations to determine if monitoring should be continued or discontinued. The monitoring program will be modified as needed based on the monitoring results.

Present Worth:.....*$1,260,000*
Capital Cost:.....*$43,000*
Annual Costs:.....*$50,000*

OU2 Alternative 3: In-Situ Thermal Remediation with Groundwater Extraction and Treatment

This alternative achieves all of the SCGs discussed in Section 6.1.1 and Exhibit A. In-Situ Thermal Remediation (ISTR) applies heat to the impacted zone in order to partition the contaminants into a vapor phase. The targeted geological zone must be heated to greater than the boiling point of the contaminants of concern. Once this temperature is reached, the contaminant mass will become heated vapor that will rise vertically through pore space.

In the most common application of ISTR, the entire water column of the aquifer is heated above the contaminant boiling point, and the contaminant vapor is then captured in the vadose zone with a soil vapor extraction system. Given the depth to the contaminated zone at the site and the fact that clean water overlies the contamination, this common system setup is not feasible at the site. Instead, it will be necessary to first allow the contaminant mass to contact groundwater that is below the boiling point such that the mass is then transferred into the groundwater. This groundwater will then be extracted and treated.

The ISTR alternative is designed to treat the most highly impacted clay in-situ. The full nature and extent of clay contamination will be delineated during a pre-design investigation. A series of electrodes will be inserted into the impacted clay approximately 19 feet apart. Wattage from the local electricity grid will be applied to the electrodes. In the subsurface, the electrical current will travel through the clay (from one electrode to another), and the resistance in the clay between electrodes will create the heat needed. Given the low porosity of the clay, this Electrical Resistance Heating will be an effective thermal technique to heat the clay. As stated earlier, vaporized solvents will rise out of the clay through the pore spaces and into the overlying Upper Glacial Aquifer. Groundwater extraction wells will be drilled and screened right adjacent to the heated clay, and used to extract the contaminant mass (now dissolved in cooler groundwater) and bring the water to the surface for treatment with an air stripper and activated carbon. For cost estimating purposes, vertically-screened wells are proposed. However, extraction wells drilled and screened horizontally above the clay will likely reduce the total number of well heads at ground surface.

Modeling will be needed to design the system. Once the contaminants are vaporized in the heated clay, it will be necessary to understand how the contaminants will be expected to rise into the Upper Glacial Aquifer, and where specifically they will be expected to re-dissolve. Incorporating this information into a groundwater flow model will allow designers to appropriately place the groundwater extraction system to ensure that the contamination released from the clay is completely captured.

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site. The environmental easement will include a provision limiting the use and development of the controlled property for commercial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws.

Present Worth:.....*$6,790,000*
Capital Cost:.....*$5,450,000*
Annual Costs:.....*$50,000*

OU2 Alternative 4: Fracturing and In-situ Treatment of the Impacted Clay Layer

This alternative achieves all of the SCGs discussed in Section 6.1.1 and Exhibit A. In this application, boreholes are drilled into the clay layer, and then force is applied to the clay using either pneumatic or hydraulic pressure to overcome the confining stress and material strength of the clay and open a network of thin fractures in the clay matrix. These fractures will be targeted in the contaminated intervals of the clay. Amendments are then directly injected into the fractures to remediate the VOCs. Once in the fractures, the amendments will permeate into the microporous structure of the clay to contact and destroy the VOC contaminants.

The fractures can be allowed to close after injecting the amendment. Alternatively, the fractures can be "propped open" by injecting clean sand into the fractures, allowing the borehole to be completed as a permanent well and receive multiple injections over time. This approach has benefits if contaminant concentrations are high and multiple injections are expected. However, the risk is that fractures may propagate vertically through the clay opening pathways for flow of contaminated groundwater into the Magothy Aquifer underneath the clay. In either scenario, it is possible that a pathway - either temporary or "propped open" - may be created into the Magothy resulting in the addition of a limited volume of the injected amendment into the Magothy.

A treatability study will be needed to determine a suitable amendment for injection into the fractures (such as a chemical oxidant, bioremediation amendment, and/or zero-valent iron). A pre-design investigation will be necessary to delineate the impacted clay. A pilot study will also be necessary to determine the likely radius and pattern of fractures in the impacted clay at the site. Costs were developed assuming one round of fracturing and injection of activated persulfate every 20 feet. Fractures will be allowed to close in order to protect the Magothy Aquifer. It is assumed that fluid will be injected into two fracture networks in each borehole: one created near the top of the clay, and a second network created at a greater depth.

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site. The environmental easement will include a provision limiting the use and development of the controlled property for commercial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws.

Present Worth:.....*$2,690,000*
Capital Cost:.....*$1,800,000*
Annual Costs:.....*$50,000*

OU2 Alternative 5: Enhanced Anaerobic Bioremediation Permeable Reactive Barrier

This alternative achieves all of the SCGs discussed in Section 6.1.1 and Exhibit A. A permeable reactive barrier (PRB) is an in-situ method for remediating contaminated ground water that combines a passive chemical or biological treatment zone with subsurface fluid flow management. Treatment media may include zero-valent iron,

chelators, sorbents, and microbes to address a wide variety of ground-water contaminants, such as chlorinated solvents, other organics, metals, inorganics, and radionuclides. The contaminants are either degraded or concentrated and retained in the barrier material, which may need to be replaced periodically. PRBs can be installed as permanent or semi-permanent units.

Bioremediation uses microorganisms that already exist in the substrate to degrade organic contaminants in groundwater or on soil, sludge, and solids either excavated or in-situ. The microorganisms break down contaminants by using them as a food source or co-metabolizing them with a food source. Aerobic processes require an oxygen source, and the end products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end products can include methane, hydrogen gas, sulfide, elemental sulfur, and nitrogen gas. In-situ techniques stimulate and create a favorable environment for microorganisms to grow and use contaminants as a food and energy source. Sometimes, microorganisms that have been adapted for degradation of specific contaminants are applied to enhance the process.

Enhanced Anaerobic Bioremediation could be implemented via the injection of electron donors, carbon, and nutrients into the subsurface. Specifically, the amendments will be injected such that a very thick layer of amendment (essentially a horizontal Permeable Reactive Barrier), will cover the most highly impacted section of the clay layer, reducing the leaching of contamination from the clay into the groundwater. The chemical gradients induced between the Permeable Reactive Barrier and the impacted clay will serve to draw contamination out of the clay.

This alternative includes institutional controls, in the form of an environmental easement and a site management plan, necessary to protect public health and the environment from any contamination identified at the site. The environmental easement will include a provision limiting the use and development of the controlled property for commercial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws.

Present Worth:.....*$3,590,000*
Capital Cost:.....*$2,300,000*
Annual Costs:.....*$50,000*

Exhibit C

Remedial Alternative Costs

Remedial Alternative	Total Present Worth ($)	Capital Cost ($)	Annual Costs ($)
OU1 Alternative 1 - No Action	0	0	0
OU1 Alternative 2 - Institutional Controls	480,000	43,000	16,000
OU1 Alternative 3 - Air Sparge/Soil Vapor Extraction	1,520,000	603,000	195,000
OU2 Alternative 1 - No Action	0	0	0
OU2 Alternative 2 - Institutional Controls	1,260,000	43,000	50,000
OU2 Alternative 3 - In-Situ Thermal Remediation with Groundwater Extraction and Treatment	6,790,000	5,450,000	50,000
OU2 Alternative 4 – Fracturing and In-situ Treatment of the Impacted Clay Layer	2,690,000	1,800,000	50,000
OU2 Alternative 5 - Enhanced Anaerobic Bioremediation Permeable Reactive Barrier	3,590,000	2,300,000	50,000

Exhibit D

SUMMARY OF THE SELECTED REMEDY

The Department is selecting OU1 Alternative 3, Air Sparge and Soil Vapor Extraction, and OU2 Alternative 5, Enhanced Anaerobic Bioremediation Permeable Reactive Barrier, as the remedies for this site. OU1 Alternative 3 and OU2 Alternative 5 will achieve the remediation goals for the site by utilizing multiple source removal and plume treatment technologies, enhancing existing naturally occurring remedial conditions, and addressing soil vapor intrusion issues. The elements of these remedies are described in Section 7.

OU1 Basis for Selection

The selected remedy is based on the results of the RI and the evaluation of alternatives. The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

The selected OU1 Alternative 3 is an active treatment method that will satisfy this criterion by removing contamination from the subsurface, thereby meeting the remedial action objectives and providing protection to human health and the environment, including addressing soil vapor intrusion issues. OU1 Alternative 1 will not provide protection of human health and the environment, since contamination will remain in groundwater for a long time in the future and no mechanism will be implemented to prevent exposure to contaminated groundwater. As such, OU1 Alternative 1 will not be considered any further.

OU1 Alternative 2 will only be protective if a statistically sound evaluation (at least eight quarters of monitoring) showed the plume to be shrinking due to dilution and dispersion, and if cleanup levels could be achieved within 30 years. Given the primarily sandy geology at the site, retardation of contaminant movement will not be as great as in other more organic soils. Extraction of the contaminants should therefore not be prolonged. As such OU1 Alternative 2 will not be considered any further.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

The selected OU1 Alternative 3 will achieve chemical-specific SCGs by actively removing the contamination from the subsurface.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been

implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

The selected OU1 Alternative 3 will provide the highest effectiveness and permanence.

4. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

The selected OU1 Alternative 3 will not affect the mobility of contaminants in groundwater. However, contaminant volume will be reduced permanently. Toxicity will be reduced by the above ground treatment system.

5. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

The selected OU1 Alternative 3 will have some impacts to the community and the environment due to site work and the continued operation of the AS/SVE system. Given the primarily sandy geology at the site, retardation of contaminant movement will not be as great as in other more organic soils. Extraction of the contaminants should therefore not be prolonged.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

For the selected OU1 Alternative 3, existing site operations and infrastructure may or may not inhibit the optimal placement of the remediation system.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

The selected OU1 Alternative 3 has the highest capital costs, annual costs, and present worth, but is the only alternative that satisfies the necessary criteria to achieve the remedial action objectives.

8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The selected OU1 Alternative 3 will treat or remove the contamination permanently.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluated. A responsiveness summary has been prepared that describes public comments received and the manner in which the Department will address the concerns raised.

OU1 Alternative 3 has been selected because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.

OU2 Basis for Selection

The selected remedy is based on the results of the RI and the evaluation of alternatives. The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

OU2 Alternatives 3 through 5 are active treatment methods that either destroy mass in-situ or remove contamination from the subsurface, thereby meeting the remedial action objectives and providing protection to human health and the environment. OU2 Alternative 1 will not provide protection of human health and the environment, since contamination will remain in groundwater for a long time in the future, and no mechanism will be implemented to prevent exposure to contaminated groundwater. As such OU2 Alternative 1 will not be considered any further.

OU2 Alternative 2 will only be protective if a statistically sound evaluation (at least eight quarters of monitoring) showed the plume to be shrinking due to dilution and dispersion, and if cleanup levels could be achieved within 30 years. Given the primarily sandy geology at the site, retardation of contaminant movement will not be as great as in other more organic soils. Extraction of the contaminants should therefore not be prolonged. As such OU2 Alternative 2 will not be considered any further.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

OU2 Alternatives 3 through 5 are all designed for source removal; the main differentiator is the amount of time required for cleanup. The site groundwater is currently contaminated with chlorinated VOCs above the groundwater quality standards and drinking water standards.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

OU2 Alternative 3 will provide the greatest opportunity for long-term effectiveness and permanence. The clay will be heated thoroughly across a broad area and thickness, causing the contaminants in the heated zone to vaporize and be removed from the clay. As long as the vaporized contaminants are captured by the groundwater extraction system and treated, the remedy will be considered effective and permanent.

The effectiveness and permanence of OU2 Alternative 4 will also provide an opportunity for long term effectiveness and permanence, but at more risk than either OU2 Alternative 3 or 5. This is because the critical need for OU2 Alternative 4 is that the injected amendment (such as a chemical oxidant) must come into contact with the contaminant in order for the contaminant destruction to occur. Given that the fracturing pattern and success of injecting the amendment is unknown until it is actually implemented, there is the potential that areas of contamination in the clay may not be treated.

OU2 Alternative 5 will achieve long term effectiveness and permanence by controlling the flux of contamination off of the clay into the overlying aquifer rather than treating the contamination in the clay itself. In order to control this flux, the bio-amendment will be in place until a great enough mass of contaminant in the clay had fluxed off and the remedial action objective of restoring the ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable is met.

4. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

As planned, the three active remedial alternatives will all reduce the volume of contamination through treatment. Both OU2 Alternatives 4&5 will reduce mobility of the contaminants. OU2 Alternative 3, however, will be specifically designed to increase mobility initially, by spurring mass transfer from the clay and into groundwater. But overall, mobility will be reduced as long as the contamination in the groundwater was effectively captured.

5. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

OU2 Alternatives 3 through 5 will have some impacts to the community and the environment due to site work and the continued operation of a groundwater extraction and treatment system.

OU2 Alternative 3 will take the shortest time to be effective. The clay could be heated to the appropriate temperature on the order of weeks once the electrodes are in place. The short-term effectiveness of OU2 Alternative 4 will depend greatly on the fracturing pattern and contact between the contamination and the injected amendment: the better the contact, the more short-term effectiveness. Once installed, OU2 Alternative 5 will quickly lead to lower contaminant concentrations in the overlying groundwater as the flux out of the clay is controlled. However, the reduction in volume of contamination in the clay will be much slower than the other two active alternatives since OU2 Alternative 5 will not involve active remediation of the clay itself. OU2 Alternative 5 is considered a more sustainable remedy because it requires less energy usage and produces less waste while achieving the same remedial action objectives.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction,

institutional controls, and so forth.

Implementation issues may arise for all three active remediation alternatives due to the need to conduct subsurface operations across the entire areal extent of impacted clay. Overall, OU2 Alternative 3, will be the most difficult to implement because it will require above-ground infrastructure (electrodes, extraction wells, treatment system, treated water disposal/discharge) as well as coordination with utilities. OU2 Alternative 5 will likely be the next most difficult remedy to implement, primarily because multiple rounds of injections are expected over the next decade. OU2 Alternative 4 will be the least difficult alternative to implement. Injection points will still be needed to cover the areal extent of the most impacted clay, but fewer injection rounds than the bioremediation alternative are expected. However, fracturing is a specialized technology relative to injection of bioremediation amendments, and procuring experienced fracturing contractors may be difficult. The risk is that fractures may propagate vertically through the clay, opening pathways for flow of contaminated groundwater into the Magothy Aquifer underneath the clay.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

The costs of the alternatives vary significantly. Because of the technology to be employed, the depth it is to be delivered, and the multiple treatments necessary, OU2 Alternative 3 will have the highest present and capital work cost. Costs for OU2 Alternatives 4 & 5 are similar with OU2 Alternative 4 having a lower present value cost, a slightly less capital cost, and equal annual costs. However, the risks for employing OU2 Alternative 4 far outweigh the cost savings.

8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

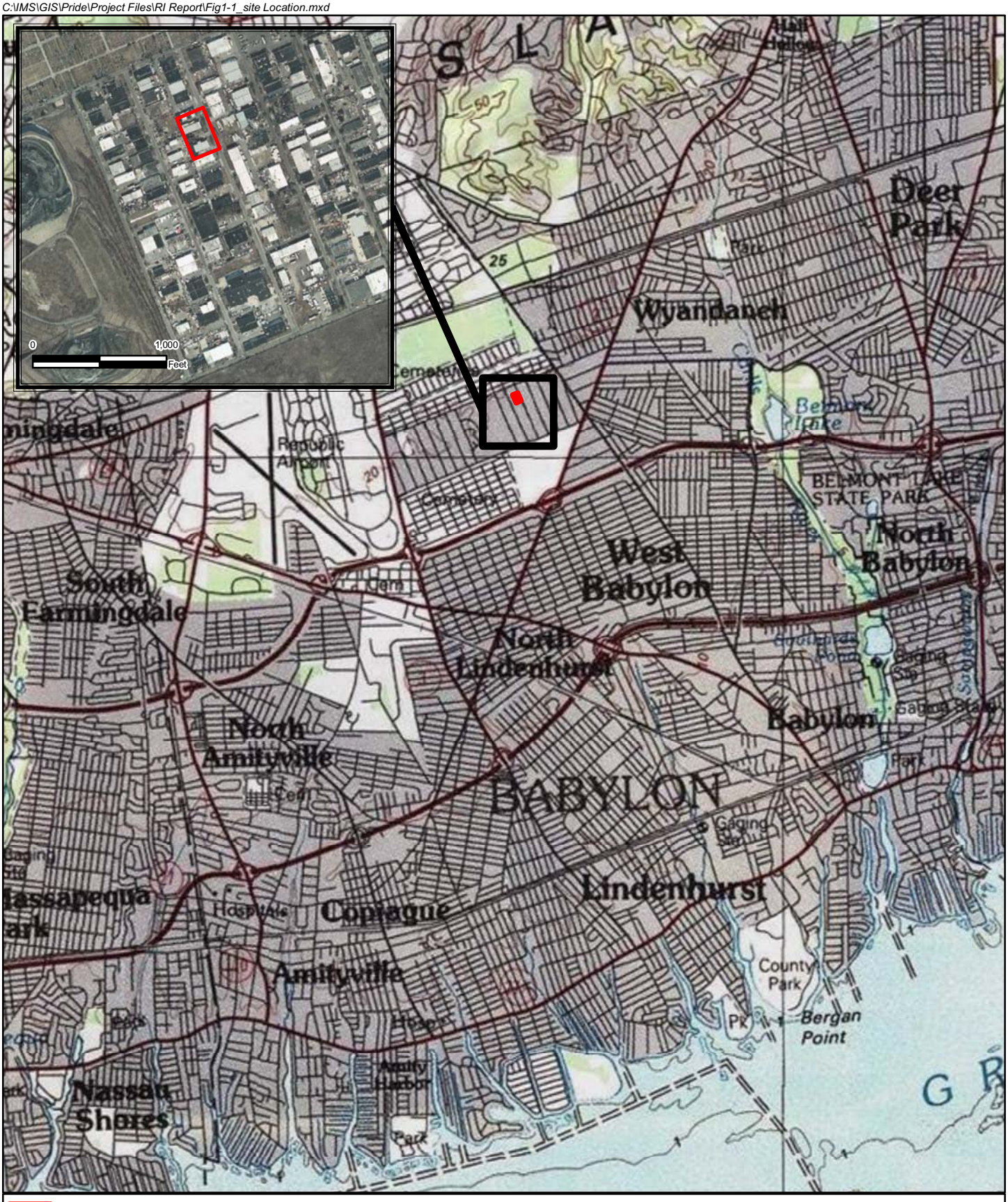
Since the property use is remaining commercial/industrial, and the contamination/remedies are at such a great depth below ground surface, land use is not a decision factor.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluated. A responsiveness summary has been prepared that describes public comments received and the manner in which the Department will address the concerns raised.

OU2 Alternative 5 has been selected because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.

C:\IMS\GIS\Pride\Project Files\RI Report\Fig1-1_site Location.mxd



Pride Solvents and Chemical Company Site

N

0 0.5 1 2

Miles

Figure 1
Site Location Map

Pride Solvents and Chemical Company
West Babylon, New York

CDM

Legend

- Pride Solvents and Chemical Company
- Buildings
- 5-ft Topographic Contour
- 1-ft Topographic Contour

Note: Topographic elevation data is in feet above mean sea level (datum is NAVD88)

Detailed Site Features:

- DW–01 Dry Well
- LP–01 Leaching Pool
- ST–0 Septic Tank
- Buried Underground Pipe
- Tree

Source: ERM 2004 RIR, modified from survey by Nelson & Pope and YEC, Inc. Monitoring Well and Boring Location Plan (drawing revised 8/13/2002).

N

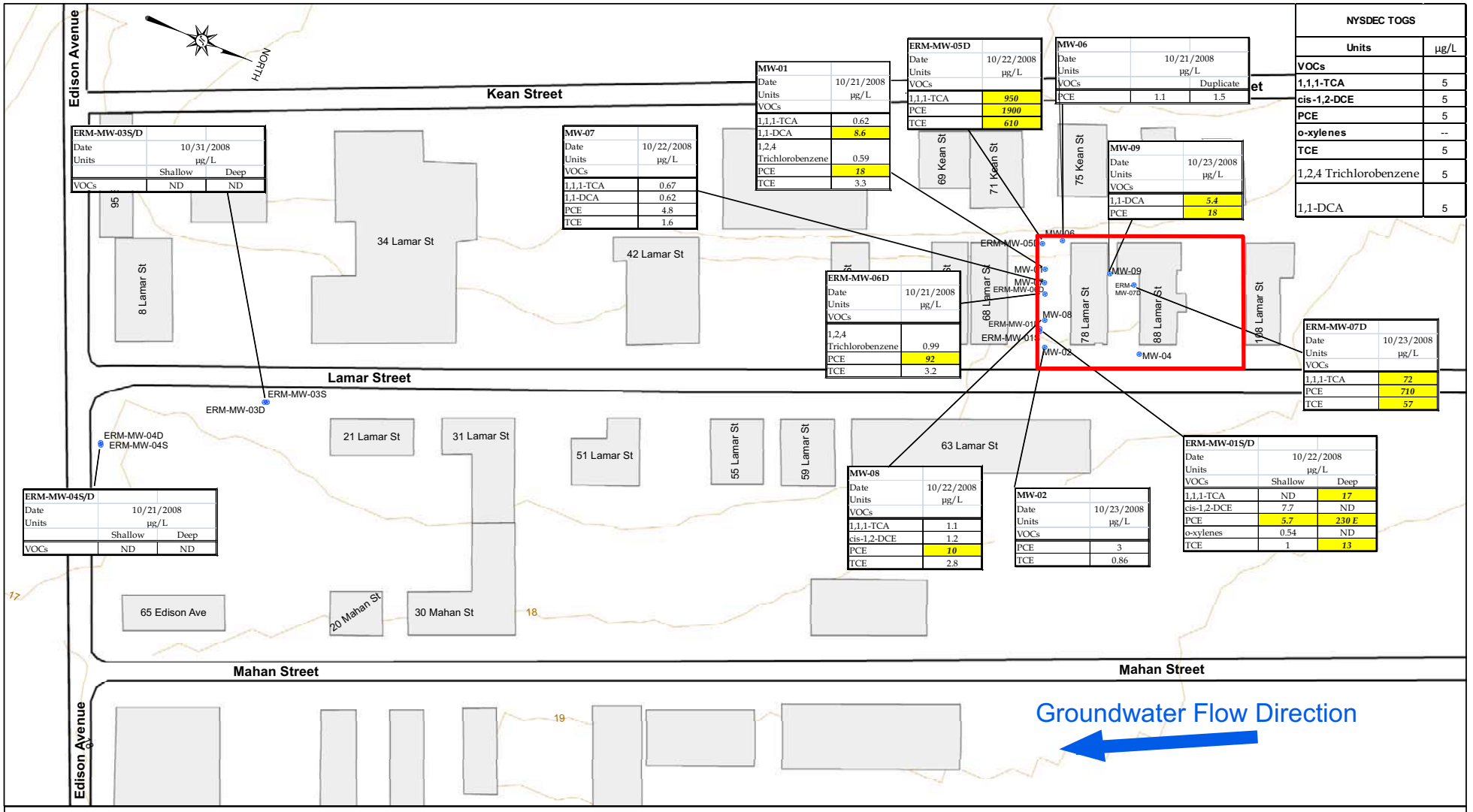
0 75 150 300 Feet

Figure 2
Site Map

Pride Solvents and Chemical Company
West Babylon, New York

CDM

C:\IMS\GIS\Pride\Project Files\Fig4_MW_Locs.mxd



Historic sample Locations

- Groundwater Profile and On-site Boring
- ERM Monitoring Well
- Mobile Laboratory Groundwater Screening
- MIP/Boring Location

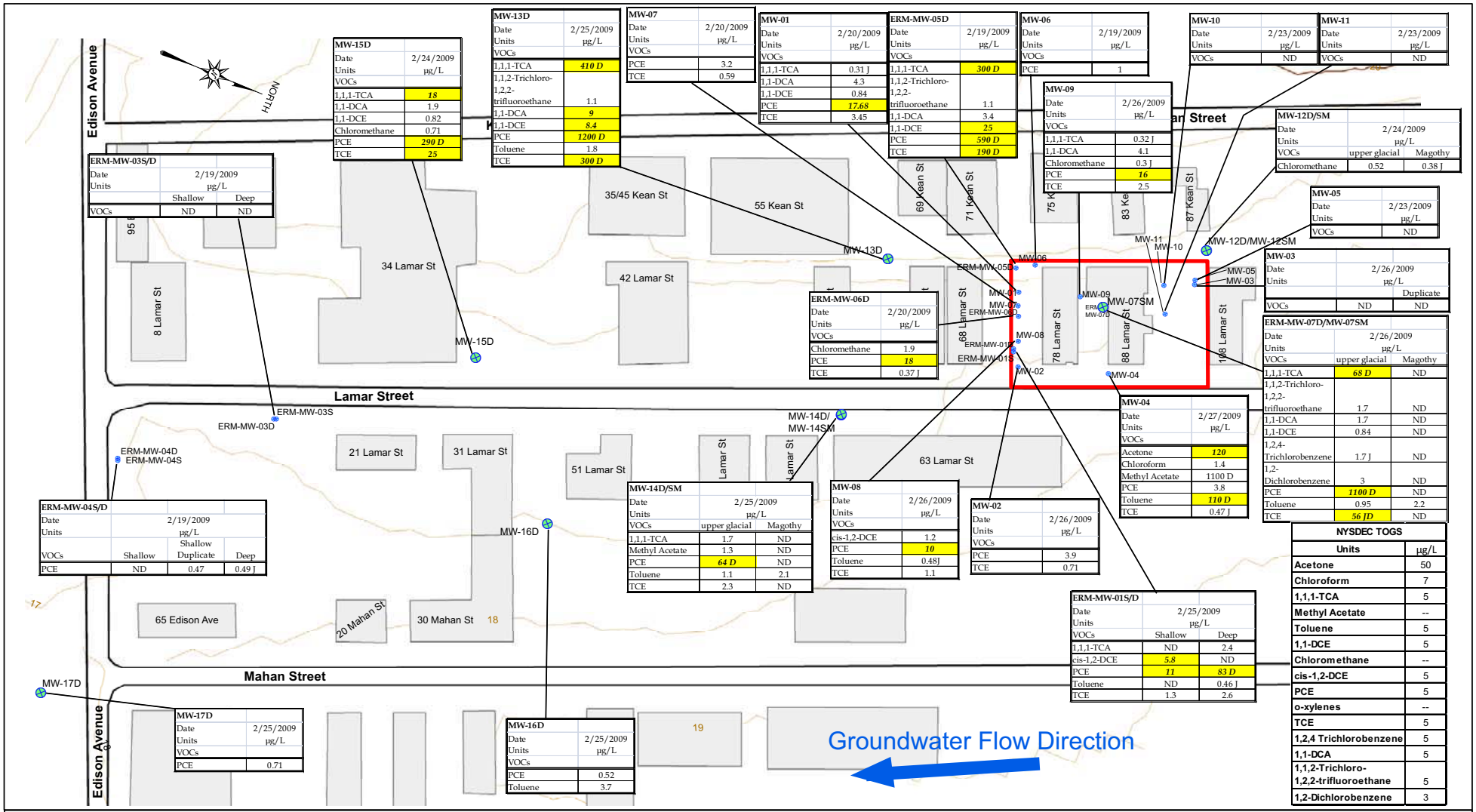
Concentrations highlighted in bold italics exceed standards.

0 75 150 300 Feet

Figure 3
October 2008 Groundwater Sampling Results

Pride Solvents and Chemical Company
West Babylon, New York
CDM

C:\MS\GIS\Pride\Project Files\Fig4_MW_Locs.mxd



MW-15D	
Date	2/24/2009
Units	µg/L
VOCs	
1,1,1-TCA	***18***
1,1-DCA	1.9
1,1-DCE	0.82
Chloromethane	0.71
PCE	***290 D***
TCE	***25***

MW-13D	
Date	2/25/2009
Units	µg/L
VOCs	
1,1,1-TCA	***410 D***
1,1,2-Trichloro-1,2,2-trifluoroethane	1.1
1,1-DCA	***9***
1,1-DCE	***8.4***
PCE	***1200 D***
Toluene	1.8
TCE	***300 D***

MW-07	
Date	2/20/2009
Units	µg/L
VOCs	
PCE	3.2
TCE	0.59

MW-01	
Date	2/20/2009
Units	µg/L
VOCs	
1,1,1-TCA	0.31 J
1,1-DCA	4.3
1,1-DCE	0.84
PCE	***17.68***
TCE	3.45

ERM-MW-05D	
Date	2/19/2009
Units	µg/L
VOCs	
1,1,1-TCA	***300 D***
1,1,2-Trichloro-1,2,2-trifluoroethane	1.1
1,1-DCA	3.4
1,1-DCE	***25***
PCE	***590 D***
TCE	***190 D***

MW-06	
Date	2/19/2009
Units	µg/L
VOCs	
PCE	1

MW-10		MW-11	
Date	2/23/2009	Date	2/23/2009
Units	µg/L	Units	µg/L
VOCs	ND	VOCs	ND

MW-09	
Date	2/26/2009
Units	µg/L
VOCs	
1,1,1-TCA	0.32 J
1,1-DCA	4.1
Chloromethane	0.3 J
PCE	***16***
TCE	2.5

MW-12D/SM		
Date	2/24/2009	
Units	µg/L	
VOCs	upper glacial	Magothy
Chloromethane	0.52	0.38 J

MW-05	
Date	2/23/2009
Units	µg/L
VOCs	ND

MW-03		
Date	2/26/2009	
Units	µg/L	
		Duplicate
VOCs	ND	ND

ERM-MW-03S/D		
Date	2/19/2009	
Units	µg/L	
	Shallow	Deep
VOCs	ND	ND

ERM-MW-04S/D			
Date	2/19/2009		
Units	µg/L		
		Shallow	
VOCs	Shallow	Duplicate	Deep
PCE	ND	0.47	0.49 J

ERM-MW-06D	
Date	2/20/2009
Units	µg/L
VOCs	
Chloromethane	1.9
PCE	***18***
TCE	0.37 J

MW-14D/SM		
Date	2/25/2009	
Units	µg/L	
VOCs	upper glacial	Magothy
1,1,1-TCA	1.7	ND
Methyl Acetate	1.3	ND
PCE	***64 D***	ND
Toluene	1.1	2.1
TCE	2.3	ND

MW-08	
Date	2/26/2009
Units	µg/L
VOCs	
cis-1,2-DCE	1.2
PCE	***10***
Toluene	0.48J
TCE	1.1

MW-02	
Date	2/26/2009
Units	µg/L
VOCs	
PCE	3.9
TCE	0.71

MW-04	
Date	2/27/2009
Units	µg/L
VOCs	
Acetone	***120***
Chloroform	1.4
Methyl Acetate	1100 D
PCE	3.8
Toluene	***110 D***
TCE	0.47 J

ERM-MW-07D/MW-07SM		
Date	2/26/2009	
Units	µg/L	
VOCs	upper glacial	Magothy
1,1,1-TCA	***68 D***	ND
1,1,2-Trichloro-1,2,2-trifluoroethane	1.7	ND
1,1-DCA	1.7	ND
1,1-DCE	0.84	ND
1,2,4-Trichlorobenzene	1.7 J	ND
1,2-Dichlorobenzene	3	ND
PCE	***1100 D***	ND
Toluene	0.95	2.2
TCE	***56 JD***	ND

ERM-MW-01S/D		
Date	2/25/2009	
Units	µg/L	
VOCs	Shallow	Deep
1,1,1-TCA	ND	2.4
cis-1,2-DCE	***5.8***	ND
PCE	***11***	***83 D***
Toluene	ND	0.46 J
TCE	1.3	2.6

MW-17D	
Date	2/25/2009
Units	µg/L
VOCs	
PCE	0.71

MW-16D	
Date	2/25/2009
Units	µg/L
VOCs	
PCE	0.52
Toluene	3.7

NYSDEC TOGS	
Units	µg/L
Acetone	50
Chloroform	7
1,1,1-TCA	5
Methyl Acetate	--
Toluene	5
1,1-DCE	5
Chloromethane	--
cis-1,2-DCE	5
PCE	5
o-xylenes	--
TCE	5
1,2,4 Trichlorobenzene	5
1,1-DCA	5
1,1,2-Trichloro-1,2,2-trifluoroethane	5
1,2-Dichlorobenzene	3

New Monitoring Wells

Historic sample Locations

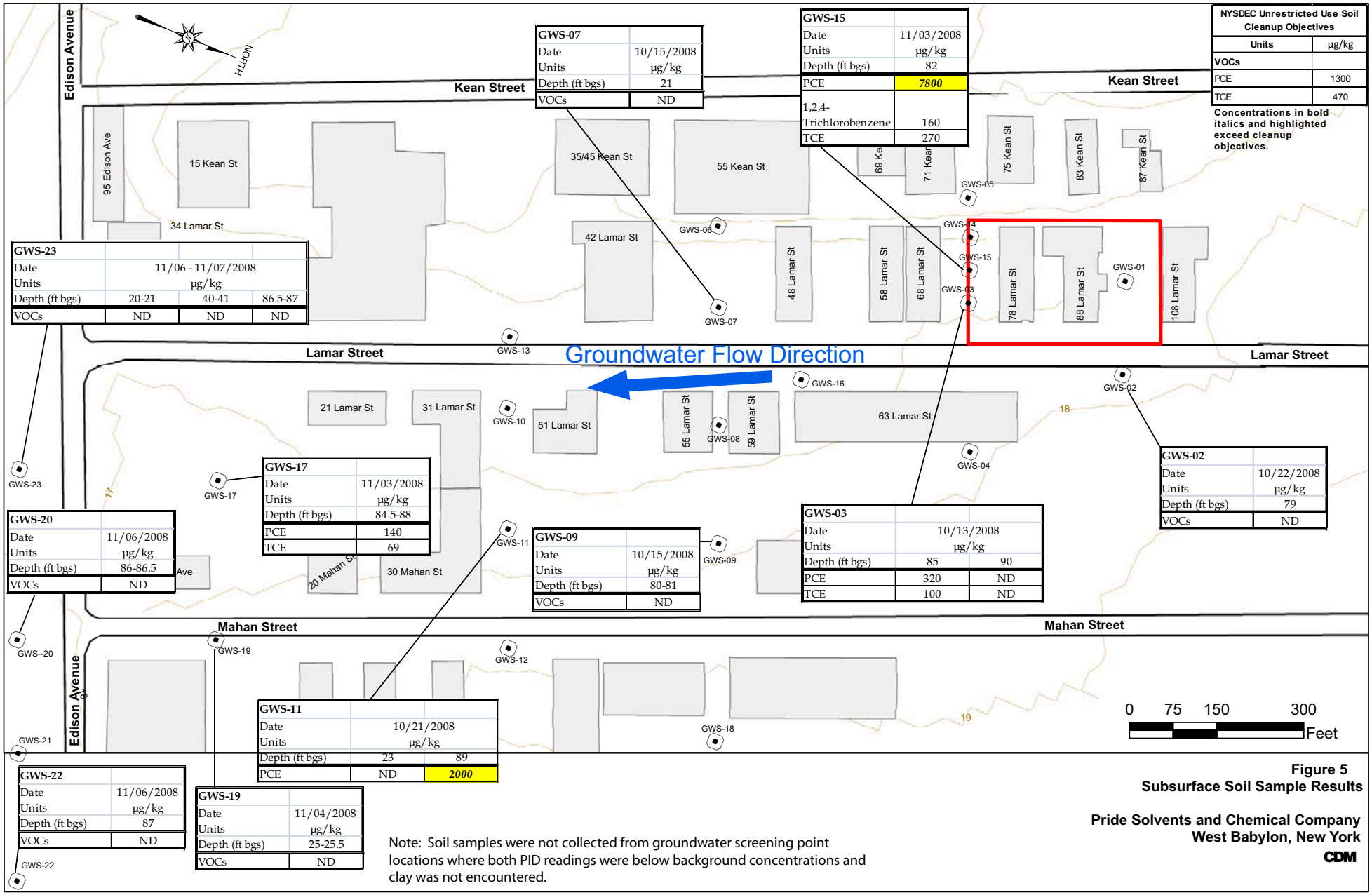
- Groundwater Profile and On-site Boring
- ERM Monitoring Well
- Mobile Laboratory Groundwater Screening
- MIP/Boring Location

Concentrations highlighted in bold italics exceed standards.

0 75 150 300 Feet

Figure 4
February 2009 Groundwater Sampling Results

Pride Solvents and Chemical Company
West Babylon, New York
CDM



GWS-07	
Date	10/15/2008
Units	µg/kg
Depth (ft bgs)	21
VOCs	ND

GWS-15	
Date	11/03/2008
Units	µg/kg
Depth (ft bgs)	82
PCE	***7800***
1,2,4-Trichlorobenzene	160
TCE	270

NYSDEC Unrestricted Use Soil Cleanup Objectives	
Units	µg/kg
VOCs	
PCE	1300
TCE	470

Concentrations in bold italics and highlighted exceed cleanup objectives.

GWS-23			
Date	11/06 - 11/07/2008		
Units	µg/kg		
Depth (ft bgs)	20-21	40-41	86.5-87
VOCs	ND	ND	ND

GWS-17	
Date	11/03/2008
Units	µg/kg
Depth (ft bgs)	84.5-88
PCE	140
TCE	69

GWS-20	
Date	11/06/2008
Units	µg/kg
Depth (ft bgs)	86-86.5
VOCs	ND

GWS-09	
Date	10/15/2008
Units	µg/kg
Depth (ft bgs)	80-81
VOCs	ND

GWS-03		
Date	10/13/2008	
Units	µg/kg	
Depth (ft bgs)	85	90
PCE	320	ND
TCE	100	ND

GWS-02	
Date	10/22/2008
Units	µg/kg
Depth (ft bgs)	79
VOCs	ND

GWS-11		
Date	10/21/2008	
Units	µg/kg	
Depth (ft bgs)	23	89
PCE	ND	***2000***

GWS-22	
Date	11/06/2008
Units	µg/kg
Depth (ft bgs)	87
VOCs	ND

GWS-19	
Date	11/04/2008
Units	µg/kg
Depth (ft bgs)	25-25.5
VOCs	ND

Note: Soil samples were not collected from groundwater screening point locations where both PID readings were below background concentrations and clay was not encountered.

Figure 5
Subsurface Soil Sample Results

Pride Solvents and Chemical Company
West Babylon, New York
CDM

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Pride Solvents and Chemical Co.
State Superfund Project
Babylon, Suffolk County, New York
Site No. 152025

The Proposed Remedial Action Plan (PRAP) for the Pride Solvents and Chemical Co. site was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on October 23, 2012. The PRAP outlined the remedial measure proposed for the contaminated soil, soil vapor, indoor air, and groundwater at the Pride Solvents and Chemical Co. site.

The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on January 22, 2013, which included a presentation of the feasibility study for the Pride Solvents and Chemical Co. as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the PRAP ended on January 30, 2013. The public comment period was to have ended on November 30, 2012, however it was extended to January 30, 2013, due to rescheduling the public meeting from November to January because of Hurricane Sandy.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

COMMENT 1: Are the chemicals associated with this plume carcinogenic?

RESPONSE 1: Trichloroethylene is characterized by the US Environmental Protection Agency (USEPA) as “carcinogenic to humans” by all routes of exposure (USEPA, 2011). This conclusion is based on convincing evidence of a causal association between trichloroethylene exposure in humans and kidney cancer. There is also evidence (though less strong) of an association between human trichloroethylene exposure and non-Hodgkin lymphoma and liver cancer. Trichloroethylene also causes cancer in the same target organs/tissues identified in the human studies when given orally or by inhalation in large amounts to laboratory animals for long periods.

In laboratory studies, inhalation of high levels of PCE almost daily for a lifetime has caused cancer in rats and mice. There is also suggestive evidence that workers in the laundry and dry cleaning industry exposed to high levels of PCE have an increased risk for some types of cancer. Based on these and animal studies, the USEPA considers PCE “likely to be carcinogenic in humans by all routes of exposure” (USEPA, 2012).

The USEPA concludes that the toxicological data for 1,1,1-TCA provides "inadequate information to assess carcinogenic potential" (USEPA, 2007).

EPA (United States Environmental Protection Agency). 2007. Integrated Risk Information System. 1,1,1-Trichloroethane (CASRN 71-55-6). Washington, DC: Office of Research and Development, National Center for Environmental Assessment. Available on line at http://www.epa.gov/iris/subst/0197.htm.

EPA (United States Environmental Protection Agency). 2011. Integrated Risk Information System. Trichloroethylene (CASRN 79-01-6). Washington, DC: Office of Research and Development, National Center for Environmental Assessment. Available on line at http://www.epa.gov/iris/subst/0199.htm.

EPA (United States Environmental Protection Agency). 2012. Integrated Risk Information System. Tetrachloroethylene (Perchloroethylene) (CASRN: 127-18-4). Washington, DC: Office of Research and Development, National Center for Environmental Assessment. Available on line at http://www.epa.gov/iris/subst/0106.htm

COMMENT 2: Is the environmental monitoring data available for review?

RESPONSE 2: Yes, the environmental monitoring data is summarized in this ROD as well as presented in detail in the Remedial Investigation Report, which are both available at the following document repositories.

West Babylon Public Library
Attn: Nicole Haas - Reference Librarian
211 Route 109
West Babylon, NY 11704
Phone: (631) 669-5445

NYSDEC, Region 1
by Appointment
Attn: Mr. William Fonda
SUNY - Bldg. 40
Stony Brook, NY 11790-2356
M-F 8:30 AM - 4:30 PM
Phone: (631) 444-0350

COMMENT 3: Are NYSDOH air sampling results available for review for the surrounding buildings tested? West Babylon Public Library did not have a copy of the air data for the soil vapor investigation. Why? What year was the air study and investigation completed?

RESPONSE 3: The ERM sampling data from 2006 is available in Appendix K of the Remedial Investigation Report which is available at the repositories identified in Response 2.

COMMENT 4: The Potentially Responsible Party requested a copy of the presentation at the public meeting.

RESPONSE 4: A copy of the presentation was provided to the Potentially Responsible Party at the meeting.

COMMENT 5: Is methylene chloride found throughout the site? Was it a laboratory contaminant?

RESPONSE 5: Based on the Data Usability Summary Report, methylene chloride is not believed to be a laboratory contaminant and was found in combination with the site contaminants of concern.

COMMENT 6: Was there any vinyl chloride found in soil or groundwater during the investigation?

RESPONSE 6: Vinyl chloride was not detected in any of the samples at concentrations equal to or above the laboratory reporting limits.

COMMENT 7: In the diagram in the presentation of OU1 shallow groundwater, OU2 is heavily chlorinated. What is the evidence that contaminants traveled from OU1 to OU2? How do you know? If you look at historical data, would you be able to see OU1 infiltrate into OU2?

RESPONSE 7: Historic documents show solvents used on-site included tetrachloroethylene, trichloroethylene, 1,1,1-trichloroethane, and methylene chloride. These solvents were found in on-site storm drains, septic systems, and soil around the underground storage tanks and drum storage areas. In addition, on-site groundwater samples showed evidence of disposal. Historic and current data shows that this contamination was not found upgradient or cross gradient of the site. In addition, the same contaminants found in the site's OU1 disposal areas are located in the OU2 clay interface. Based upon this information, the OU2 contamination can only come from the OU1 disposal areas above the OU2 contamination.

COMMENT 8: Could other sites from upgradient areas have contributed or caused OU2? Numerous facilities in the area have had their share of contamination. Could DNAPL have settled there from these sites?

RESPONSE 8: See Response 7.

COMMENT 9: Was any dense non-aqueous phase liquid found in the clay layer?

RESPONSE 9: The sample results showed the presence of dense non-aqueous phase liquid in the clay layer.

COMMENT 10: Does the dense non-aqueous phase liquid absorb into the clay layer? How will it be addressed?

RESPONSE 10: The data shows that the contaminants are within the clay layer and are contributing to groundwater contamination above this layer. The selected remedy will address this contamination by applying a permeable reactive barrier at the clay interface.

COMMENT 11: How long will the cleanup take using the barrier system?

RESPONSE 11: The length of remediation will depend on the quantity of contaminant mass within the clay. It was estimated during the Feasibility Study that cleanup would take about 20 years; however, this will be further defined in the pre-design investigation.

COMMENT 12: What type of oversight was given to the lab involved in this investigation?

RESPONSE 12: All samples were analyzed by a New York State Department of Health (NYSDOH) approved, Environmental Laboratory Accreditation Program (ELAP) certified laboratory. The analytical results were reviewed by a qualified data validator and the findings are provided in the Data Usability Summary Reports in Appendix J of the Remedial Investigation report.

COMMENT 13: You stated there is one residence on the site. Does DEC or NYSDOH keep people notified there or have they tested that particular property? Where is the property?

RESPONSE 13: The residence is located near the site, not on the site. The property was evaluated for soil vapor intrusion. The results of that evaluation have been provided to the property owner. Due to privacy rights, information regarding specific off-site structures that have been sampled is not made public.

COMMENT 14: Is the residual groundwater plume moving? How long will it take the groundwater plume to move 3 miles downgradient?

RESPONSE 14: The OU1 groundwater appears to be a stable plume. The data shows OU2 groundwater contamination is not detected by the time it gets to Edison Avenue, less than 1 block away.

Jonathan Murphy, Bleakly Platt & Schmidt, LLP Representing Pride Solvents submitted a letter dated January 29, 2013, which included the following comments:

COMMENT 15: The DEC has not followed their own “General Remedial Program Requirements”. Why?

RESPONSE 15: The requirements cited pertain to 6 NYCRR Subpart 375-1.10 Citizen Participation; and the availability and final status of certain project information. The Department’s citizen participation undertaken in the development and implementation of the remedial program for the Pride Solvents & Chemical Co. site has been in conformance with 6 NYCRR Section 375-1.10 and DER-23, Citizen Participation Handbook for Remedial Programs.

The data generated from the indoor air investigation was incorporated into the final Remedial Investigation Report for the Site, dated May 2012, as Appendix "K". The final Remedial Investigation Report was placed in the document repositories for the Site in the West Babylon

Public Library and the NYSDEC's Region 1 office in Stony Brook, New York in November 2012. The DEC provided notice of the availability of the Remedial Investigation Report at that time. The DEC developed the proposed remedial action plan for the Site after reviewing the detailed investigation of the Site and evaluating the remedial options in the Feasibility Study Report. The appropriate quality assurance and quality control procedures were followed to ensure the data, generated during the indoor air investigation conducted on behalf of the Department, was valid.

COMMENT 16: Why is there an alternate use designation for the Pride Solvents Site? The use designation should have been undertaken during the Feasibility Study, not the PRAP. The remedial action should only address one land use. Although the Site's land use was initially designated "commercial use", the remedial action appears to indicate that the remediation should be to "unrestricted use" levels. Why?

RESPONSE 16: The Proposed Remedial Action Plan is a summary of the Remedial Investigation/Feasibility Study. As per Section 4.4(b)(3) of the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, the Feasibility Study identifies and evaluates alternatives which are capable of achieving the goal, which is cleanup to pre-disposal or unrestricted condition. However, the Feasibility Study may also evaluate alternatives to achieve a cleanup necessary to meet an identified use of the site. This results in the Feasibility Study developing a range of alternatives, from no action or, where an IRM may already have addressed the disposal, no further action alternative to one or more alternatives capable of achieving unrestricted use, to one or more alternatives capable of achieving the most feasible and least restrictive use of the site, such as either a residential or restricted-residential alternative followed by a commercial use alternative if this is within the intended and allowable use of the site; and may end with an industrial use alternative, if that is the intended and allowable use of the site. The use of the site, however, must be consistent with local zoning in accordance with 6 NYCRR 375-1.8(g) (4) and (5) for the alternatives developed.

For the selected remedy, groundwater will be remediated to 6.NYCRR Part 703 standards. Soil vapor and indoor air is mitigated and/or monitored based on the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York.

COMMENT 17: Since the only human health and environmental concern with regard to the Site was Vapor Intrusion, why was the scenario the only one where data were not provided?

RESPONSE 17: The remedy addresses remedial action objectives for both human health and the environment as stated in section 6.5 of the ROD. These remedial action objectives are not limited to vapor intrusion, but also address exposures or impacts attributable to the groundwater and soil contamination associated with the site. The soil vapor intrusion data is in Appendix K of the Remedial Investigation report which is available at the repositories noted in Response 2.

COMMENT 18: Why weren't the soil and groundwater data separated in their respective OUs?

RESPONSE 18: Data is reviewed in its entirety to determine the full nature and extent of the contamination.

COMMENT 19: The PRAP indicates that the CVOC contamination at the Pride Site originated from the on-site underground storage tanks, dry wells and/or storm drains. However, since no data were provided to support these claims, please provide these data.

RESPONSE 19: The PRAP is a summary of investigations and does not necessarily contain all available data on past disposal at the site. The referenced details are outlined in Appendix A of the Remedial Investigation report.

COMMENT 20: Since there is no risk associated with the shallow soil, why is it necessary to remediate?

RESPONSE 20: The OU1 remedial action objectives (Section 6.5 of the ROD), which were developed based on contaminant-specific SCGs to address contamination identified at the site, indicate that remediation of soil is necessary to prevent ingestion/direct contact with contaminated soil and to prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

COMMENT 21: Since TCE and 1,1,1-TCA did not exceed either the soil or groundwater SCGs, while PCE only exceeded its soil unrestricted SCG once at depth (and was ~20 times lower than the commercial SCG) and less than half of the groundwater samples slightly exceeded its SCG, with evidence of some anaerobic dechlorination occurring on-site, why wasn't Monitored Natural Attenuation with Institutional Controls selected for OU1 of this commercial site?

RESPONSE 21: The selected remedy best meets the Remedy Selection criterion required by the alternative evaluation process, as set forth in Exhibit D of the PRAP and now the ROD. The Monitored Natural Attenuation (MNA) alternative alone would not address the NAPL in the clay layer which is a source of the contamination to the OU2 groundwater. MNA is not an acceptable remedy when a source of groundwater contamination still exists unaddressed at a site thus this alternative is unacceptable.

COMMENT 22: OU2, the deep groundwater scenario, lists COCs as PCE, TCE and 1,1,1-TCA. However all of the chemical data indicate that the deep water contamination is from off-site. Why has this upgradient, off-site source that is impacting the Pride Solvents Site not been remediated?

RESPONSE 22: See Response 7.

COMMENT 23: Why are there inconsistencies in the Feasibility Study Alternatives handout from the NYSDEC's public presentation on the PRAP?

RESPONSE 23: Terminology in the slide show referred to the different technologies as alternatives. To clarify, for this site, 5 alternatives and 14 technologies were evaluated. The evaluation of alternatives, for OU1 & OU2, was in accordance with DER policy.

COMMENT 24: Has the off-site, upgradient source area identified in previous investigations been confirmed and remediated? If not, what is the status of this off-site source?

RESPONSE 24: See Response 7.

COMMENT 25: Why was the DNAPL theory utilized for this Site when there is no evidence to show that such a condition exists?

RESPONSE 25: See Responses 9 & 10.

COMMENT 26: Why should the Pride Solvents Site be remediated when the contamination from the landfill would continue to release more contamination to it?

RESPONSE 26: As a Class 2 site, remediation of the contamination resulting from the past releases of hazardous waste is required to address the significant threat associated with the Pride Solvent site, even if comingling with another source may be occurring.

COMMENT 27: The Associated Press report on December 24, 2012 state that Superfund Sites in New York and New Jersey had not been retested following the super storm Sandy. There was concern that the storm could have resulted in substantial changes at these sites and current or proposed remedial actions may no longer be valid. Has the DEC confirmed their findings at the Pride Solvent Site following the super storm?

RESPONSE 27: A site assessment conducted shortly after the storm indicated there had been no impacts to this site attributable to the flooding associated with super storm Sandy. Additional sampling will be conducted during the pre-design remedial phase for purposes of refining the remedy.

APPENDIX B

Administrative Record

Administrative Record

Pride Solvents and Chemical Co.
State Superfund Project
Babylon, Suffolk County, New York
Site No. 152025

1. Proposed Remedial Action Plan for the Pride Solvents and Chemical Co. site, dated October 2012, prepared by the Department

2. "Final Feasibility Study Report", December 2011, prepared by Camp Dresser & McKee

3. "Final Remedial Investigation Report", May 2010, prepared by Camp Dresser & McKee

4. Work Completed under the "Remedial Investigation Report Addendum" prior to end of contract

5. "Remedial Investigation Report Addendum – Soil Vapor and Air Sampling", January 2005, prepared by Environmental Resources Management

6. "Remedial Investigation Report" Volume 1, February 2004, prepared by Environmental Resources Management

7. "Remedial Investigation Report" Volume 2, February 2004, prepared by Environmental Resources Management

8. "Hydrogeologic Investigation at Inactive Hazardous Waste Sites in the State of New York – Investigation of Pride Solvents – Phase II", July 1996, prepared by Tyree Brothers Environmental Services, Inc.

9. "Engineering Investigations as Inactive Hazardous Waste Sites in the State of New York Preliminary Site Assessment – Pinelawn Industrial Area", Volume I, October 1994, prepared by Engineering-Science, Inc.

10. "Engineering Investigations as Inactive Hazardous Waste Sites in the State of New York Preliminary Site Assessment – Pinelawn Industrial Area", Volume II - Appendices, October 1994, prepared by Engineering-Science, Inc.

11. "Hydrogeologic Investigation at Inactive Hazardous Waste Sites in the State of New York – Investigation of Pride Solvents", July 1993, prepared by Tyree Brothers Environmental Services, Inc.

12. "Volatile Organic Contaminant Plume Tracking Investigation in the Vicinity of the Babylon Landfill, Town of Babylon, New York", September 1992, prepared by Engineering-Science, Inc.

13. “Report on Hydrogeologic Investigation”, Volume 1, October 1991, prepared by H2M Group

14. “Engineering Investigations as Inactive Hazardous Waste Sites in the State of New York Phase I – Preliminary Investigation Final Report”, September 1984, prepared by Woodward-Clyde Consultants, Inc.

15. “Preliminary Investigation of an Industrial Organic Chemical Plume in Ground Water: West Babylon, New York”, December 1983, prepared by Sy Robbins, Suffolk County Department of Health Services

16. Letter dated January 29, 2013 from Jonathan Murphy, Bleakly Platt & Schmidt, LLP, representing Pride Solvents