RECORD OF DECISION

Hopewell Precision Superfund Site
Hopewell Junction, Dutchess County, New York

United States Environmental Protection Agency
Region 2
New York, New York
September 28, 2009

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Hopewell Precision Superfund Site
Hopewell Junction, Dutchess County, New York

Superfund Site Identification Number: NYD066813064

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the U.S. Environmental Protection Agency's selection of a remedial alternative for the groundwater at the Hopewell Precision Superfund site (Site), designated Operable Unit (OU) 1, chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. Section 9601, et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300. This decision document explains the factual and legal basis for selecting the OU 1 remedy for the Site. The attached index (see Appendix III) identifies the items that comprise the Administrative Record upon which the selection of the remedy is based.

The New York State Department of Environmental Conservation (NYSDEC) was consulted on the planned remedy in accordance with CERCLA Section 121(f), 42 U.S.C. Section 9621(f), and it concurs with the selected remedy (see Appendix IV).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the groundwater includes the following components:

- A pre-design investigation and pilot study of aerobic cometabolic bioremediation (ACB) to determine the rate and the parameters for full-scale enhancement of aerobic cometabolic degradation in the aquifer.

- Remedial design and implementation of full-scale enhancement of the ACB remedy to achieve restoration of the groundwater to drinking water standards within a reasonable time period.

- Long-term groundwater monitoring to track the movement of and changes in the contaminated groundwater plume.

- Vapor monitoring of homes located above the groundwater plume for vapor intrusion and implementation of vapor mitigation systems in homes that exceed protective levels.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy for OU 1 meets the requirements for remedial actions set forth in CERCLA Section 121, 42 U.S.C. Section 9621, because it: 1) is protective of human health and the environment by providing accelerated restoration of the groundwater; 2) meets a level or standard of control of the hazardous substances, pollutants, and contaminants which at least attains the legally applicable or relevant and appropriate requirements under federal and state laws; 3) is cost-effective; and 4) utilizes permanent solutions to the maximum extent practicable.

Because this OU 1 groundwater remedy will result in hazardous substances, pollutants, or contaminants remaining on the Site for some period of time above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted after completion of the construction of the remedial action components to ensure that the groundwater remedy is protective of human health.

ROD DATA CERTIFICATION CHECKLIST

The OU 1 ROD contains the remedy selection information noted below. More details may be found in the Administrative Record file for this Site.

- Site-related contaminants of concern and their respective concentrations (see ROD, pages 7-18);

- Baseline risk represented by the contaminants of concern (see ROD, pages 19-26);

- Cleanup Levels for contaminants of concern and the basis for these levels (see ROD, page 28;

- Manner of addressing source materials constituting principal threats (See ROD, page 45);

- Current and reasonably-anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (see ROD, page 18);

- Potential land and groundwater use that will be available at the Site as a result of the selected remedy (see ROD, pages 49 and 50);

- Estimated capital and present-worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (see ROD, page 49); and

- Key factors used in selecting the remedy (*i.e.*, how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (see ROD, page 45).

AUTHORIZING SIGNATURE

Sept. 28, 2009

Walter E. Mugdan, Director
Emergency and Remedial Response Division
EPA – Region 2

Date

RECORD OF DECISION FACT SHEET
EPA REGION 2

Site

Site name:	Hopewell Precision Superfund Site
Site location:	Hopewell Junction, Dutchess County, New York
HRS score:	100.00
Listed on the NPL:	April 27, 2005

Record of Decision

Date signed: September 28, 2009

Selected remedy:

(i) A pre-design investigation and pilot study of aerobic cometabolic bioremediation (ACB) to determine the rate and the parameters for full-scale enhancement of aerobic cometabolic degradation in the aquifer.

(ii) Remedial design and implementation of full-scale enhancement of the ACB remedy to achieve restoration of the groundwater to drinking water standards within a reasonable time period.

(iii) Long-term groundwater monitoring to track the movement of and changes in the contaminated groundwater plume.

(iv) Long-term vapor monitoring of homes located above the groundwater plume for vapor intrusion and implementation of vapor mitigation systems in homes that exceed protective levels.

Capital cost: $6,790,000

Present-worth cost: $12,000,000

Lead	EPA
Primary Contact:	Lorenzo Thantu, Remedial Project Manager, Eastern New York Remediation Section, (212) 637-4240
Secondary Contact:	Sal Badalamenti, Chief, Eastern New York Remediation Section, (212) 637-3314
Main PRPs	Hopewell Precision, Inc.
Waste	
Waste type:	Chlorinated Volatile Organic Compounds in Groundwater
Waste origin:	Spills/discharges at the former and current Hopewell Precision facilities (15 and 19 Ryan Drive, Hopewell Junction, New York).
Contaminated media:	Groundwater, Air

DECISION SUMMARY

Hopewell Precision Superfund Site
Hopewell Junction, Dutchess County, New York

United States Environmental Protection Agency
Region 2
New York, New York
September 28, 2009

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SITE NAME, LOCATION, AND DESCRIPTION

The Hopewell Precision site (Site) is located in Hopewell Junction, Dutchess County, New York (Figure 1). The Site consists of the former and current Hopewell Precision, Inc. facilities (referred to herein as one single "facility,"unless otherwise indicated) and the hydraulically downgradient area affected by the contaminated groundwater plume and its vapors (Figure 2). The Hopewell Precision facility was located at 15 Ryan Drive from 1977 to 1980. The facility moved to the adjacent property at 19 Ryan Drive in 1980 and still operates at that location. The combined size of the two properties is 5.7 acres. The remainder of the Site consists mostly of residential neighborhoods, all of which are served by private wells and septic systems. Almost 27,000 people live within 4 miles of the Hopewell Precision facility. Commercial development (*e.g.*, strip malls, businesses, and gas stations) in the area is primarily along New York State Route 82, which traverses the area in a northeast-southwest direction. An area of farmland borders the eastern side of a section of Route 82. Whortlekill Creek flows in a southerly direction across the residential area and along the western border of the Site. Several ponds are present within the area, including two large former quarries (Redwing Lake and the gravel pit) that are partially fed by groundwater.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site History

Hopewell Precision, Inc. is a manufacturer of sheet metal parts that are assembled into furniture. The property at 19 Ryan Drive was vacant land prior to 1980. From 1980 to the present, Hopewell Precision has been the sole occupant of the building on that property. Since 1981, the former facility at 15 Ryan Drive has been used by Nicholas Brothers Moving Company for equipment storage and office space.

Presently and at the former facility, processes at Hopewell Precision include shearing, punching, bending, welding, and painting. The painting process includes degreasing prior to the wet spray paint application. Hopewell Precision currently uses a water-based degreaser. The company used trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA) in a vapor degreasing machine until 1998. On July 23, 1980, Hopewell Precision filed a Notification of Hazardous Waste Activity as a generator of hazardous waste and obtained EPA ID. No. NYD 990881492. Hopewell Precision purchased 12 drums (7,020 pounds) of 1,1,1-TCA in 1980 and 15 drums (9,000 pounds) in 1994. The company generated 1,675 gallons (32 drums) of 1,1,1-TCA waste for off-Site disposal from 1986 through 1998. The company purchased 48 drums (31,680 pounds) of TCE in 1996 and 1997, but it does not have any hazardous waste manifests for off-Site disposal of TCE. Hopewell Precision reportedly no longer uses TCE or 1,1,1-TCA for degreasing.

In October 1979, EPA received a letter from a former Hopewell Precision employee alleging improper disposal practices. EPA performed an inspection of what is now the former facility located at 15 Ryan Drive in November 1979. EPA observed solvent odors coming from an open disposal area. At the time of the inspection, Hopewell Precision was alleged to have been dumping one to five gallons per day of waste solvents, paint pigments, and sodium nitrate directly on the ground. The results of EPA's November 1979 inspection were sent to the New York State Department of Environmental Conservation (NYSDEC), the responsible lead agency, along with a memorandum recommending that the facility be required to drum its solvent wastes and dispose of them in a proper manner rather than by open dumping.

The facility was inspected by NYSDEC in 1987 and 2002. At the Hazardous Waste Compliance Inspection of Hopewell Precision in May 1987, the inspector observed eleven 55-gallon drums of waste paint and thinners; six 55-gallon drums of waste 1,1,1-TCA; and one 55-gallon drum of unknown material at the facility. NYSDEC determined that Hopewell Precision was in violation of the hazardous waste regulations because it was operating as a hazardous waste storage facility without a permit or interim status authorization. Hopewell Precision subsequently identified the drum of unknown material as paint thinner and performed corrective measures, including waste disposal, which NYSDEC found to be satisfactory.

During an inspection in October 2002, NYSDEC observed four full or partially full 55-gallon drums of waste paint and solvent at the facility. The NYSDEC inspector reported that a spray booth/paint finishing operation generated waste paint and paint thinner. As a result of the inspection, NYSDEC cited the facility for 10 violations of the hazardous waste regulations. Hopewell Precision subsequently corrected the violations. The 2002 inspection report found that the company was at that time a small quantity generator of hazardous waste. In August 2003, a former employee stated that the common practice for disposal of waste solvents at the former facility was to pour the material on the ground outside the building. Waste paints and thinners were dumped on a daily basis and waste solvents from the degreaser were dumped on a biweekly basis while he worked at Hopewell Precision in 1979 and 1980.

The former facility at 15 Ryan Drive was served by a 25-foot deep well that was sampled in March 1980 (sample collection point was a rest room faucet). The analytical results indicated the presence of 1,1,1-TCA at 3.6 micrograms per liter (μg/L) and TCE at 0.6 μg/L. NYSDEC installed 3 monitoring wells, each 39 to 40 feet deep, at the former facility in May 1985 and sampled the wells in March 1986. The analytical results for monitoring well B-3, located between the current and former buildings, indicated the presence of 1,1,1-TCA at 23 μg/L and TCE at an estimated 4 μg/L. Samples collected from the on-Site monitoring wells by Hopewell Precision in April 1993 showed the continuing presence of 1,1,1-TCA and TCE. In 1985, the Dutchess County Department of Health sampled four private drinking water wells near the Site, and no volatile organic compounds (VOCs) were detected in any of the samples.

In February 2003, EPA sampled 75 private wells near the Hopewell Precision facility. Analysis of these samples revealed that 5 private wells were contaminated with TCE ranging from 1.2 μg/L to 250 μg/L. At that time, NYSDEC, on behalf of New York State Department of Health (NYSDOH), requested that EPA conduct a removal action at the Site, including installation of carbon filter systems on the affected private wells.

From February to November 2003, EPA collected groundwater samples from hundreds of private drinking water wells in the vicinity of Hopewell Precision. Both TCE and 1,1,1-TCA were detected in numerous private well samples, at individual concentrations up to 250 μg/L for TCE and 11.7 μg/L for 1,1,1-TCA. In addition, 1,1-dichloroethene (1,1-DCE), a breakdown product of TCE and/or 1,1,1-TCA, was detected in two samples. Several instances of TCE detection exceeded the compound's Maximum Contaminant Level (MCL) of 5 μg/L. EPA installed point-of-entry treatment (POET) systems to remove VOCs at 41 homes where TCE exceeded or approached the MCL. NYSDEC installed POET systems at 14 homes in the southern part of the groundwater plume to remove 1,1,1-TCA that exceeded its New York State Drinking Water Standard but that fell below the federal MCL.

In April 2003, EPA collected water and sediment samples from small unnamed ponds located about 300 feet south-southwest (downgradient) of the Hopewell Precision facility. TCE was detected at concentrations of 4 μg/L and 3.4 μg/L in the water samples and 88 micrograms per kilogram (μg/kg) in one of the two sediment samples. EPA collected additional samples from two unnamed ponds located approximately 900 and 4,500 feet southwest of Hopewell Precision in May 2003. TCE was detected at an estimated concentration of 3.6 μg/kg in a sediment sample from the proximal pond, but was not detected in a water sample from the same proximal location or in sediment and water samples collected from the distal pond on Creamery Road.

In July 2003, EPA collected samples at the Hopewell Precision facility property and beyond its boundaries. TCE was detected in two soil samples at the facility property, and 1,1,1-TCA was detected in one sample, but neither contaminant was detected in any samples beyond the former facility property. EPA completed test borings and collected additional soil samples in December 2003, concentrating the investigation between the current and former Hopewell Precision facilities. Background samples were collected from test borings near the northern property boundaries. TCE was detected in 5 soil samples, at depths ranging from 0 to 12 feet. The maximum detected concentration was 3.7 μg/kg; TCE was not detected in background samples (i.e., areas unaffected by contamination) from the same depth range.

On September 26, 2003, EPA authorized a removal action at the Site to provide bottled water to residents whose water supplies had been contaminated with TCE. In October and December 2003, EPA also installed and sampled temporary shallow monitoring wells on both facility properties at 15 and 19 Ryan Drive. The analytical results indicated TCE concentrations up to 144 μg/L in groundwater at depths ranging from 10 to 30 feet below the ground surface (bgs).

EPA's Removal Action Branch conducted vapor intrusion indoor air testing at the Site. Since February 2004, EPA has collected sub-slab and/or indoor air samples from over 200 homes in the area, which are situated above the groundwater plume, to determine if there is an impact from contaminants related to the Site. EPA has installed sub-slab ventilation systems (SVSs) at 53 homes where vapors exceeded screening criteria in order to reduce the residents' exposure to indoor air contaminants associated with the Site. In addition, EPA conducts periodic vapor sampling during the winter heating season to monitor the migration of vapors to structures throughout the area of the groundwater plume.

The Site was listed on CERCLA's National Priorities List, pursuant to Section 105 of CERCLA, 42 U.S.C. Section 9605, in April 2005.

From January 2006 to August 2007, EPA conducted the field activities portion of a Remedial Investigation (RI) study and completed the RI report in June 2008. A Focused Feasibility Study (FFS) for Operable Unit (OU) 2 was completed in June 2008. A Feasibility Study (FS) for OU 1, supporting this ROD, was completed in July 2009.

Enforcement Activities

To date, EPA has sent request for information letters to potentially responsible parties to ascertain whether certain businesses that formerly operated at Ryan Drive in Hopewell Junction, New York may have disposed of or caused releases of volatile organic contaminants there. In addition, EPA has been evaluating certain potentially responsible parties' ability-to-pay related to the costs of the remedy. A Notice of Potential Liability pursuant to Section 107(a) of CERCLA, 42 U.S.C. Section 9607(a), was sent to Hopewell Precision, the operator of the facility, in March 2004.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

EPA conducted the RI/FS at the Site from 2005-2009. The findings are presented in a remedial investigation report[1] and feasibility study report[2]. EPA's preferred remedy and the basis for the preferred remedy was identified in a Proposed Plan dated July 2009. These documents were made available to the public in information repositories maintained at the following locations: (1) EPA Docket Room in the Region 2 offices at 290 Broadway in Manhattan and (2) Town of East Fishkill Community Library at 348 Route 376, Hopewell Junction, New York. A notice of the commencement of the public comment period, a public meeting date, a summary of the preferred remedy, EPA contact information, and the availability of the above-referenced documents was published in the *Poughkeepsie Journal* on July 31, 2009. The public comment period was from July 31, 2009 to August 30, 2009. EPA held a public meeting on August 11, 2009, at 7:00 P.M. at the Gayhead Elementary

1 *Final Remedial Investigation Report, Hopewell Precision Site, Hopewell Junction, New York*, Volumes I and II, CDM Federal Programs Corporation, June 30, 2008.

2 *Revised Final Feasibility Study Report, Hopewell Precision Site, Hopewell Junction, New York*, CDM Federal Programs Corporation, July 24, 2009.

School to present the Proposed Plan and to answer questions from the public about the Site and the remedial alternatives under consideration. Approximately 60 people, including residents, local business people, and local, state, and federal government officials attended the public meeting. On the basis of comments received during the public comment period, the public supports the preferred alternative. Responses to written comments that were received during the public comment period and to comments received at the public meeting are included in the Responsiveness Summary (see Appendix V).

Public meetings and availability sessions were also held for the Site during the removal action and the RI and FFS for OU 2, including an informal meeting on March 25, 2004; a public information meeting on May 5, 2004; a meeting sponsored by the NYSDOH on January 22, 2007; a Congressional field hearing held by the House Transportation and Infrastructure Subcommittee on Water Resources and the Environment on April 11, 2008, a public meeting on July 17, 2008, and a meeting on September 8, 2008 with Congressman John Hall's District Director, the Town Supervisor for East Fishkill, members of the Little Switzerland Water District, and residents from the Hopewell hook-up area.

SCOPE AND ROLE OF THE OPERABLE UNIT

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Section 300 *et seq.*, defines an OU as a discrete action that comprises an incremental step toward comprehensively addressing Site problems. *See* 40 CFR Section 300.5. A discrete portion of a remedial response eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site. This response action for OU 1 includes the remedy for groundwater contaminated with chlorinated solvents. The prior response action for OU 2 included the provision of an alternate water supply to the area with private drinking water wells that have been or have the potential to be affected by the groundwater plume from the Hopewell Precision facility. The OU 2 ROD was completed in September 2008.

SUMMARY OF SITE CHARACTERISTICS

Dutchess County is located in the southeast region of New York State and is bordered by the State of Connecticut to the east and the Hudson River to the west. The topography of Dutchess County is comprised of rolling hills and plains, with valleys having narrow stream bottom lands and wetlands. The irregular topography has been shaped by glaciation and orogeny (mountain building). The Hudson River is the major topographic feature in the county. Several major creeks are prevalent in the county and flow southward; the majority of the creeks flow toward the Hudson River.

The Site is located in the south-central region of Dutchess County, in a flat, northeast-southwest trending valley between higher bedrock ridges to the east and west. These ridges slope upward to approximately 400 feet above mean sea level (msl). The Site lies at a general elevation of 290 feet above msl, with the southern portion gradually sloping downward to approximately 240 feet above msl. A small hill is present in the central portion of the Site; it rises to approximately 320 feet above msl. The hamlet of Hopewell Junction occupies the southern region of the valley.

The Site is situated in a glaciated valley underlain by the Hudson River Formation in the northern portion of the Site and the Stockbridge Limestone in the southern portion of the Site. The bedrock is overlain by unconsolidated sediments deposited by glaciers and glacial meltwater. The glacial outwash deposits are a complex mixture of boulders, gravel, sand, silt, and clay which form discontinuous beds or lenses. Because of multiple glaciation events, subsurface units are heterogeneous and highly localized. Glacial till deposits are also present in some areas of the Site, including a tear drop shaped mound between Creamery Road and Clove Branch Road. Glacial tills generally have low permeability and limited ability to transmit groundwater.

The unconsolidated deposits at the Site have been grouped into three hydrostratigraphic units: 1) sand and gravel unit (including silty sand, silty gravel, and mixtures of sand, silt, and gravel), 2) silt and clay (including silty clay), and 3) the till mound between Creamery Road and Clove Branch Road. The sand and gravel units transmit groundwater more readily than the silt and clay units and act as preferential flow paths for groundwater contamination. All of these units are localized and discontinuous, and they are likely to create multiple complex flow pathways throughout the unconsolidated deposits.

The higher conductivity sand and gravel units in the overburden at the Site are a major source of groundwater for residential and commercial wells in the area. In addition, some residential and commercial wells are completed in the bedrock underlying the glacial outwash deposits. The glacial outwash and bedrock are interconnected and generally are considered a single aquifer unit.

In general, groundwater flow is towards the valley from the upland areas on the east and west sides of the valley. In the valley, groundwater flow is generally towards the southwest along the valley axis. The glacial till mound located between Creamery Road and Clove Branch Road impedes groundwater flow within the valley. Groundwater flows preferentially in silty sand and gravel units. The vertical gradient in most monitoring wells is upwards, indicating groundwater discharges into the valley and Whortlekill Creek which runs along the axis of the valley and also flows toward the southwest. The contaminant flow velocity at the Site was estimated to average from 0.8 to 1.1 feet/day in the permeable preferential flow pathways. The depth to water across the Site varies but is generally about 15 feet below the ground surface. The groundwater at the Site is classified by NYSDEC as Class GA, indicating it is considered a source of drinking water. The groundwater contamination is limited to the glacial (unconsolidated) portion of the aquifer.

SUMMARY OF REMEDIAL INVESTIGATION SAMPLE RESULTS

In December 2005, EPA initiated an RI/FS as part of the long-term Site cleanup phase. The RI/FS evaluated the nature and extent of groundwater, soil, sediment, surface water, and vapor contamination at the Site and was designed to help EPA determine the appropriate cleanup alternatives for the identified contamination. EPA completed all RI field activities during the summer of 2007 and publicly released the RI Report in June 2008 and the OU 1 FS Report in July 2009.

The field activities performed as part of the RI for OU 1 included two rounds of monitoring well sampling, soil sampling at the properties occupied by Hopewell Precision, surface water and sediment sampling in Whortlekill Creek and two ponds, and vapor sampling. Residential well sampling results were also summarized in the Record of Decision for OU 2. The results of all RI sampling are summarized below.

Monitoring Well Results

During the RI, two rounds of groundwater samples were collected from 35 monitoring wells installed during the RI and from 3 monitoring wells installed by NYSDEC at the Hopewell Precision facility. Two wells, EPA-07S and EPA-07D, are background wells. All of the wells were installed in the unconsolidated sediments, with shallow wells generally screened just below the groundwater table and deep wells screened just above the top of weathered bedrock. The analytical results were compared to the federal MCLs and the New York State Drinking Water Standards. The following summary focuses on the seven contaminants that were determined to be related to activities at the Hopewell Precision facility. The Site-related contaminants include TCE, 1,1,1-TCA, 1,1-DCE, cis-1,2-dichloroethene (cis-1,2-DCE),, chloromethane, methyl ethyl ketone (MEK) and tetrachloroethene (PCE). Figure 3 indicates the locations of monitoring wells and the VOCs detected in each well. Figure 4 shows the mapped TCE and 1,1,1-TCE groundwater plumes. The monitoring well results will be discussed from north to south, based on proximity to the Hopewell Precision facility.

Upgradient of the Hopewell Precision Facility: Monitoring wells EPA-07S and EPA-07D were installed upgradient of the Hopewell Precision facility to determine background groundwater conditions. No Site-related contaminants were detected in either well during Round 1. During Round 2, 1,1,1-TCA was detected at trace levels in both upgradient wells (0.052 J µg/L at EPA-07S and 0.065 J µg/L at EPA-07D), below the screening criterion of 5 µg/L. The "J" qualifier indicates the results were estimated. No other Site-related contaminants were detected in the Round 2 samples at EPA-07S or EPA-07D.

Hopewell Precision Facility: Five wells at the Hopewell Precision facility were sampled (EPA-05, MW-B1, MW-B3, EPA-08S, and EPA-08I). In Round 1, TCE and 1,1,1-TCA were detected in MW-B3 at 0.58 J µg/L and 0.11 J µg/L, respectively, both below the screening criteria of 5 µg/L. In Round 2, 1,1,1-TCA was detected in four of the five wells at concentrations ranging from 0.094 J µg/L at EPA-08S and MW-B3 to 0.05 J µg/L at MW-

B1. PCE was only detected in one of the five wells, EPA-08I, in the Round 2 sample at 0.076 J µg/L, below the screening criterion of 5 µg/L. PCE was not detected in any of the Round 1 samples. TCE was detected in two of the five wells, MW-B3 and EPA-08S, at 0.56 µg/L and 3.1 µg/L, respectively. None of the detections of Site-related contaminants in these wells exceeded screening criteria.

Oak Ridge Road to Hamilton Road: Ten wells are located between Oak Ridge Road and Hamilton Road (EPA-10S, EPA-10D, EPA-12S, EPA-12D, EPA-14S, EPA-15D, EPA-16S, EPA-16D, EPA-19S, and EPA-19D). At 6 of the 10 wells (EPA-10S, EPA-12S, EPA-15D, EPA-16S, EPA-16D, and EPA-19S), TCE was detected above the screening criterion of 5 µg/L during both sampling rounds. Levels ranged from 94 µg/L at EPA-10S to 13 µg/L at EPA-19S. 1,1,1-TCA was detected in these six wells at concentrations below the screening criterion of 5 µg/L, ranging from 2.7 µg/L in EPA-16D to 0.67 µg/L in EPA-15D. No PCE or chloromethane was detected in these six wells.

Four of the 10 wells (EPA-10D, EPA-12D, EPA-14S, and EPA-19D) had no Site-related contaminants above the screening criteria of 5 µg/L. EPA-10D, EPA-12D, and EPA-19D are likely screened under and below the plume core and EPA-14S is located on the western edge of the plume. TCE was detected in all four wells at low levels, ranging from 1.9 µg/L at EPA-10D to 0.1 J µg/L at EPA-14S. 1,1,1-TCA was detected in two of the four wells, EPA-12D and EPA-19D, at 2.4 µg/L and 0.54 µg/L, respectively. PCE was detected in EPA-10D, EPA-14S, and EPA-19D at concentrations ranging from 0.61 µg/L at EPA-10D to 0.099 J µg/L at EPA-14S.

Hamilton Road to the Gravel Pit: Eleven wells were located downgradient of the plume core, between Hamilton Road and the gravel pit (EPA-18S, EPA-18D, EPA-21S, EPA-21D, EPA-23S, EPA-23D, EPA-24S, EPA-25S, EPA-25D, EPA-26S, and EPA-26D). Concentrations of Site-related contaminants in these wells were below the screening criteria of 5 µg/L. 1,1,1-TCA was detected in 8 of the 11 wells ranging from 3.7 µg/L in EPA-23S to 0.08 J µg/L in EPA-26D. TCE was detected in two of 11 wells, EPA-21S and EPA-21D, at 0.29 J µg/L and 0.52 µg/L, respectively. PCE was not detected in any of these wells during Round 1, but was detected in four of the 11 wells (EPA-18D, EPA-21S, EPA-21D, and EPA-23D) during Round 2, at concentrations ranging from 0.23 J µg/L at EPA-23D to 0.11 J µg/L at EPA-18D. TCE was not detected in samples collected from EPA-25S and EPA-25D during Rounds 1 and 2.

Other Site Monitoring Wells: No Site-related contaminants were detected during either round of sampling at EPA-09S, EPA-11S, EPA-11D, EPA-17S, EPA-20S, or EPA-22S. EPA-09S is likely to the west of the plume and EPA-11S, EPA-11D, EPA-17S, EPA-20S, and EPA-22S are likely to the east of the plume. The results for Round 1 indicated that EPA-13S, EPA-13D, EPA-17D, and EPA-22D were also outside of the plume boundary. However, PCE was detected at concentrations an order of magnitude below the screening criterion of 5 µg/L in each of these wells during Round 2.

Chloromethane was detected in three monitoring wells, EPA-19S, EPA-23D and EPA-25S, at concentrations ranging from 0.46 J µg/L at EPA-25S to 0.19 J µg/L at both EPA-23D and EPA-19S. Levels were below the screening criterion of 5 µg/L. No 1,1-DCE, cis-1,2-DCE, or MEK was detected in either round of monitoring well samples.

Summary of Groundwater Contamination: As shown in Figure 4, the shape of the TCE plume is indicative of the heterogeneous nature of the aquifer and the presence of preferential flow paths. The area of highest concentration, or the plume core, is denoted by the 50 µg/L contour. This area extends from just south of Oak Ridge Road to just north of Creamery Road. The shape of the plume mirrors the potentiometric surface and shows the groundwater turning to the west in this area as it flows preferentially between a low conductivity till to the north and the till mound to the south. The till mound is further defined by an area where TCE is not detected. The plume appears to flow around the till to both the east and west. There are low-level detections of TCE both to the west and south of the 5 µg/L contour and low levels of TCE discharge to the stream, Redwing Lake, and the gravel pit.

Figure 4 also shows the outline of the 1,1,1-TCA plume to the 1 µg/L level. The 1 µg/L level was chosen because the majority of the detections were approximately 1 µg/L; detections above the screening criterion (5 µg/L) are rare. The concentrations and extent of the 1,1,1-TCA plume are significantly different than the TCE plume. 1,1,1-TCA is not detected in the groundwater in the eastern TCE lobe. The lower overall concentrations of 1,1,1-TCA may reflect the history of disposal practices at the Hopewell Precision facility. It may also be caused by 1,1,1-TCA's low vapor pressure and greater tendency to partition to the atmosphere or soil vapor. In addition, 1,1,1-TCA degrades approximately three times faster than TCE in groundwater.

An assessment of the groundwater plume indicates that contaminant levels are generally decreasing and would be expected to continue to decrease through natural processes within the aquifer including dilution, dispersion, biodegradation, and discharge to surface water bodies. In limited areas of the Site, contaminant levels may potentially show a slight increase in contaminant levels, but these increases are expected to be low.

Soil Results

Several Site-related VOCs were detected in soil samples as described below. The soil screening criteria were the most conservative of available federal and New York state standards. VOCs detected in soil samples are shown in Figure 5.

15 Ryan Drive Sample Results: A total of 33 soil samples were collected from the former facility location varying in depth from 2-4 feet bgs to 13-15 feet bgs. Four Site-related contaminants were detected. TCE was detected in 10 samples from five borings, ranging in concentration from 0.29 J µg/kg to 5.9 µg/kg; only one sample exceeded the screening criterion of 3 µg/kg. TCE was predominantly detected in the deeper samples, at 10-12 feet and/or 13-15 feet. PCE was detected at B-21 at 13-15 feet at 2.6 J µg/kg, and at B-24 at

13-15 feet at 1.7 J µg/kg, below the screening criterion of 3 µg/kg. Cis-1,2-DCE was detected in borings B-21 and B-24 in the deepest samples, with concentrations of 0.47 J µg/kg and 0.58 J µg/kg, below the screening criterion of 20 µg/kg. MEK (2-butanone) was detected once, in B-16 at 10-12 feet at 11 µg/kg, below the screening criterion of 120 µg/kg.

19 Ryan Drive Sample Results: A total of 39 soil samples were collected from the current location of the Hopewell Precision facility, varying in depth from 2-4 feet to 13-15 feet. One Site-related contaminant was detected. TCE was detected in four samples from two borings (B-10 and B-11) south of the building, ranging in concentration from 0.44 J µg/kg to 1.4 J µg/kg. All concentrations were below the screening criterion of 3 µg/kg.

Background Sample Results: Three background samples were collected from one boring (B-25) in a background/upgradient location (north) of 15 and 19 Ryan Drive. Two contaminants identified as related to Site activities were detected in these samples. However, as they are upgradient from the Site, they are from sources other than the Site. PCE was detected in all three samples at concentrations ranging from 2.2 J µg/kg to 3.3 J µg/kg. The PCE detection at B-25 at 8-10 feet (3.3 J µg/kg) exceeded the Site-specific screening criterion of 3 µg/kg. Cis-1,2-DCE was detected below the 20 µg/kg screening criterion in all three samples, ranging from 0.52 J µg/kg to 1.2 J µg/kg.

Summary of Soil Contamination: The low concentrations and limited distribution of Site-related contaminants indicate that no significant soil source remains at the facility. PCE and cis-1,2-DCE were not detected in the groundwater samples at the facility, so the presence of concentrations in soil do not appear to impact the local groundwater.

Surface Water Results

Surface water samples were collected at 37 locations downgradient of the Hopewell Precision facility and two background samples upgradient. Analytical results for surface water samples were compared to New York State surface water standards. Sampling areas included: Ryan Drive wetland area, Unnamed Pond 1, Unnamed Pond 2, a pond on Clove Branch Road, Redwing Lake, the gravel pit, and Whortlekill Creek. Figure 6 shows all VOCs detected in surface water samples.

Ryan Drive Wetland Area: One sample, SW-001, was collected from the Ryan Drive Wetland area. No Site-related contaminants were detected.

Unnamed Ponds 1 and 2 and Pond on Clove Branch Road: Two samples, SW-002 and SW-003, were collected from Unnamed Pond 1. No Site-related contaminants were detected in either sample.

Three samples, SW-004 through SW-006, were collected from Unnamed Pond 2. No Site-related contaminants were detected.

One sample, SW-027, was collected from a pond on Clove Branch Road. TCE was detected at 0.28 J µg/L, but did not exceed the 5 µg/L screening criterion.

Redwing Lake: Ten samples, SW-007 through SW-016, were collected from Redwing Lake. No Site-related contaminants were detected.

Gravel Pit: Ten samples, SW-017 through SW-026, were collected from the gravel pit. Site-related contaminants 1,1,1-TCA and chloromethane were both detected at SW-017, below the 5 µg/L screening criteria for these compounds. 1,1,1-TCA was detected at SW-018 and chloromethane was detected at SW-021, SW-025 and SW-026. No Site-related contaminants exceeded screening criteria.

Whortlekill Creek: Ten samples, SW-028 through SW-037, were collected from Whortlekill Creek. Site-related contaminants 1,1,1-TCA and TCE were both detected at SW-030 and SW-031. 1,1,1-TCA was detected at SW-028 and SW-029 and TCE was detected at SW-033. Concentrations did not exceed the 5 µg/L screening criteria.

Background: Two background samples, SW-038 and SW-039, were collected from Whortlekill Creek upstream of the Hopewell Precision facility in areas that should not be impacted by activities at the facility. No Site-related contaminants were detected.

Summary of Surface Water Contamination: Potentiometric data show that the southern portion of Whortlekill Creek is characterized as a gaining stream. This is supported by detections of Site-related contaminants at locations immediately north and south of Clove Branch Road, indicating very low levels of contaminated groundwater discharge into the water bodies. In addition, the southern portion of the creek does not flow in a distinct channel; the water is very slow moving, and prone to marshy areas. However, no Site-related contaminants identified in surface water samples exceeded their screening criteria.

Sediment Sample Results

Sediment samples were collected at the same locations as surface water samples. Analytical results were compared to New York State sediment criteria. The sediment sampling areas include: Ryan Drive wetland area, Unnamed Pond 1, Unnamed Pond 2, a pond on Clove Branch Road, Redwing Lake, the gravel pit, and Whortlekill Creek. Figure 7 shows all VOCs detected in sediment samples.

Ryan Drive Wetland Area: One sample, SD-001, was collected from the Ryan Drive Wetland area. No Site-related contaminants were detected.

Unnamed Ponds 1 and 2 and Pond on Clove Branch Road: Two samples, SD-002 and SD-003, were collected from Unnamed Pond 1. No Site-related contaminants were detected.

Three samples, SD-004 through SD-006, were collected from Unnamed Pond 2. No Site-related contaminants were detected.

One sample, SD-027, was collected from a pond on Clove Branch Road. No Site-related contaminants were detected.

Redwing Lake: Ten samples, SD-007 through SD-016, were collected from the Redwing Lake. MEK (2-butanone) was detected at 7 µg/kg at SD-014; no screening criterion is available for MEK. No other Site-related contaminants were detected.

Gravel Pit: Ten samples, SD-017 through SD-026, were collected from the gravel pit. No Site-related contaminants were detected.

Whortlekill Creek: Ten samples, SD-028 through SD-037, were collected from Whortlekill Creek. No Site-related contaminants were detected.

Background: Two samples, SD-038 and SD-039, were collected from Whortlekill Creek in areas that should not be impacted by activities at the Hopewell Precision facility and were designated as background samples. No Site-related contaminants were detected.

Summary of Sediment Contamination: No Site-related contaminants were detected in any sediment samples with the exception of MEK (2-butanone) in one sample from Redwing Lake. The sediments in the area are generally free of Site-related contaminants.

Deep Water Sample Results

Ten deep water samples were collected from Redwing Lake and from the gravel pit. Results were compared to surface water criteria. Figure 8 shows all VOCs detected in deep water samples.

Redwing Lake: TCE was detected below the 5 µg/L screening criterion at DW-001 at 0.26 J µg/L. No other Site-related contaminants were detected.

Gravel Pit: Ten samples, DW-011 through DW-020, were collected from the gravel pit. 1,1,1-TCA was detected at DW-013, DW-015, DW-016, DW-017, DW-018, DW-019, and DW-020, ranging from 0.15 J µg/L to 0.37 J µg/L. TCE was detected at DW-018 at 0.14 J µg/L. Concentrations of both compounds did not exceed the 5 µg/L screening criteria.

Summary of Deep Water Contamination: Site-related contaminants 1,1,1-TCA, and TCE were detected in deep water samples; however, all concentrations were well below the screening criteria. Results of the deep water samples were similar to the surface water in that most Site-related contaminants were found in the gravel pit at very low levels. The presence of very low levels of Site-related contaminants indicates that groundwater discharges to the two ponds that were formerly gravel pits.

Sub-slab and Indoor Air Results

Sub-slab and indoor air investigations included two rounds of sampling for sub-slab air and one round for indoor air. The first round of sub-slab sampling included 64 properties in the winter of 2006, and the second round included 135 properties in the winter of 2007. The only round of indoor air sampling was conducted at 44 properties in the winter of 2007. Air analytical results were compared to screening criteria. The analytical results are discussed by rounds and are described as clusters by street names.

Round 1 Sub-Slab Air Sample Results

Sub-slab samples were collected in February and March 2006 from 64 properties southwest of the Hopewell Precision facility, primarily in the area where the groundwater plume is dominated by 1,1,1-TCA.

<u>Sub-Slab TCE</u>: TCE was only detected in two samples during Round 1. The sample from Cavelo Road exceeded the screening criterion with a concentration of 18 micrograms per cubic meter (µg/m^3). The sample from Hamilton Road contained 1.5 µg/m^3, below the screening criterion. There were no other detections of TCE during Round 1 sub-slab air sampling.

<u>Sub-Slab 1,1,1-TCA</u>: 1,1,1-TCA was detected at 31 sample locations; none exceeded the screening criteria. A cluster of detections is located south of Clove Branch Road and north of Cavelo Road. Concentrations within this cluster range from 3 µg/m^3 to 94 µg/ m^3; all below the screening criterion. A second cluster is located north of West Old Farm Road, with concentrations ranging from 8.8 µg/m^3 to 270 µg/m^3. There were no detections of 1,1,1-TCA east of Route 82. Blue Jay Boulevard and Mockingbird Court had two detections at 0.89 µg/m^3 and 5.5 µg/m^3. Two detections were observed north of Clove Branch Road, west of Route 82 and south of Creamery Road, at 1.8 µg/m^3 and 270 µg/m^3.

<u>Sub-Slab PCE</u>: PCE was detected in 23 samples; none exceeded the screening criterion. A small cluster of detections were located east of Route 82 and north of Clove Branch Road, with concentrations ranging from 1.2 µg/m^3 to 7.1 µg/m^3. One detection was found south of Clove Branch Road, west of Route 82 with a concentration of 3.8 µg/m^3. The majority of detections were found in an area bounded by Old Farm Road to the south, Clove Branch Road to the north, Route 82 to the east and Purse Lane and Mockingbird Court to the west. Concentrations of PCE ranged from 1.2 µg/m^3 to 14 µg/m^3. There were two detections of PCE north of Creamery Road and west of Route 82, at 1.1 µg/m^3 and 1.2 µg/m^3.

<u>Sub-Slab Other Site-Related Compounds</u>: MEK (2-butanone) was detected in 17 samples at concentrations ranging from 2.2 to 16 µg/m^3. All detections were below the screening criterion. The detections were sporadic, with the majority of detections on Clove Branch Road, southern Route 82 and west of Farm Road. The highest concentration was detected at Blue Jay Boulevard.

Chloromethane was detected in 11 samples with concentrations ranging from 0.33 to 1.4 µg/m^3. All detections were below the screening criterion. More than half of the detections of chloromethane were located along Clove Branch Road. Cis-1,2-DCE was detected in two samples and 1,1-DCE was detected in one sample at concentrations below the screening criteria.

Round 2 Sub-slab Sample Results

Sub-slab samples were collected in February and March 2007 from 135 properties lying over the TCE/1,1,1-TCA groundwater plume.

Sub-Slab TCE: TCE was detected in 30 samples during Round 2; 16 exceeded the screening criterion. Detections generally lie along a north-south line from Creamery Road to Clove Branch Road and ranged in concentration from 1 µg/m^3 to 280 µg/m^3. This cluster is surrounded to the east and west by non-detects.

Sub-Slab 1,1,1-TCA: Eighty-one samples had 1,1,1-TCA concentrations ranging from 0.76 µg/m^3 to 120 µg/m^3. Detections did not exceed the screening criterion. Detections were scattered, from immediately bordering the Hopewell Precision facility to areas southwest of the facility. Detections immediately surrounding the facility ranged from 1.1 µg/m^3 to 19 µg/m^3. Further south of the facility, 1,1,1-TCA was detected in a cluster north of Creamery Road, ranging from 1.9 µg/m^3 to 21 µg/m^3. West of Route 82, detections follow Route 82 to Clove Branch Road, ranging from 0.76 µg/m^3 to 32 µg/m^3. West of Route 82, the largest cluster of detections was found between Creamery Road and West Old Farm Road, with the majority of detections west of Hamilton Drive. Concentrations ranged from 0.78 µg/m^3 to 120 µg/m^3.

Sub-Slab PCE: PCE was detected in 54 samples during Round 2. Three samples exceeded the screening criterion; two were located east of Route 82 with detections of 170 µg/m^3 to 9,800 µg/m^3. The third location was west of Route 82 with a concentration of 250 µg/m^3. Detections greater than 10 µg/m^3 but below the screening criteria were observed throughout the area south of Creamery Road and north of West Old Farm Road. A cluster of PCE detections was found west of Route 82 and east of Cavelo Road, ranging from 1.1 µg/m^3 to 10 µg/m^3. Sporadic detections below 10 µg/m^3 were observed throughout the sample area.

Sub-Slab Other Site-Related Compounds: Cis-1,2-DCE was detected in four of the samples at concentrations ranging from 1.1 to 15 µg/m^3, one detection exceeded the screening criterion. 1,1-Dichloroethene was detected in 10 samples at concentrations ranging from 0.55J to 2 µg/m^3, with all concentrations below the screening criterion.

Round 2 Indoor Air Sample Results

Forty-four indoor air samples were collected during Round 2 in March 2007, at locations that exceeded the screening criteria during Round 2. Three samples were generally collected at each residence, including a sub-slab sample, an indoor sample, and an ambient (outdoor) air sample. The following samples were collected: 14 indoor samples, 17 sub-slab samples, and 12 ambient samples. If buildings were closely spaced, one ambient air sample was designated to be representative of multiple structures. The properties sampled during Round 2 are scattered throughout the sampling area. No VOCs were detected in the ambient air samples so they will not be discussed further.

Sub-Slab and Indoor TCE: TCE was detected in 13 sub-slab air samples, with 10 exceeding the criterion. Concentrations ranged from 0.24 $\mu g/m^3$ to 150 µg/m3. TCE was detected in seven indoor air samples. All exceeded the screening criterion. Concentrations ranged from 0.89 $\mu g/m^3$ to 20 $\mu g/m^3$.

Sub-Slab and Indoor 1,1,1-TCA: 1,1,1-TCA was detected in 13 sub-slab air samples collected during Round 2; none exceeded the screening criterion. Concentrations ranged from 4.9 $\mu g/m^3$ to 51 $\mu g/m^3$. 1,1,1-TCA was detected in four indoor air samples: none exceeded the screening criterion. Concentrations ranged from 0.86 $\mu g/m^3$ to 2.6 $\mu g/m^3$.

Sub-Slab and Indoor PCE: PCE was detected in five sub-slab air samples; none exceeded the screening criterion. Concentrations ranged from 1.5 $\mu g/m^3$ to 16 $\mu g/m^3$. PCE was detected in six indoor air samples. One sample exceeded the screening criterion with a concentration of 560 $\mu g/m^3$. A second sample was just below the screening criterion at 98 $\mu g/m^3$. The remaining detections of PCE ranged from 1.1 $\mu g/m^3$ to 5.9 $\mu g/m^3$.

Summary of Vapor Sample Results

TCE is the primary contaminant detected above its screening criterion. 1,1,1-TCA was frequently detected, however, all of the detections were below the screening criterion. PCE was also frequently detected but only one sample, collected from an automotive garage, exceeded the screening criterion. MEK, 1,1-DCE, cis-1,2-DCE and chloromethane were all detected in at least one sample, but the detections were sporadic.

The distribution of vapors in the subsurface is controlled by processes and stratigraphy similar to those controlling the distribution of contamination in groundwater. The areas of vapor detections generally correlate with areas of groundwater detections. However, there does not appear to be a direct correlation between the magnitude of groundwater contamination and the magnitude of vapor contamination in a given area. The large area of till south of Creamery Road appears to impede the vapors and groundwater contamination in that area. No homes in this area had VOC detections in sub-slab samples.

The Round 2 sub-slab air sample results were compared to the Round 2 indoor air sample results. Seven of the locations sampled showed detections of the same compounds at similar magnitudes in both Round 2 sub-slab air samples and the indoor air samples. Four of the locations had detections in the sub-slab, but there were no detections in the indoor air samples. Three locations showed no correlation between the compounds detected or the magnitude of detection between the various samples. The migration of sub-slab vapors to indoor air is affected by a number of factors, including the construction and age of the building and the presence of cracks or other migration pathways in the substructure of the building.

Private Well Results

Several rounds of groundwater sampling of private wells in the area downgradient of the Hopewell Precision facility were conducted. The first round was a limited sampling event that included 48 private wells in the southern portion of the groundwater plume and near already identified, impacted wells with POET systems. The second round was a large-scale sampling event which included 195 private wells in the portions of the plume contaminated with TCE and 1,1,1-TCA. The private wells sampled during the RI were not outfitted with POET systems. Wells with POET systems (installed during earlier response activities) are sampled and maintained by EPA and NYSDEC. The analytical results of the sampling events were compared to the New York State Drinking Water Standards. Although the discussions below do not include the results from the private wells outfitted with POET systems, the results from these wells were included in all mapping of the groundwater contaminant plumes.

Round 1 Sample Results

Six of the seven Site-related contaminants have the same screening criterion: 5 μg/L. The screening criterion for MEK is 50 μg/L. None of the private well samples exceeded these criteria in Round 1.

1,1,1-TCA was detected in 12 of the 48 private wells. Levels in these wells ranged from 0.11 estimated (J) μg/L to 2.2 μg/L. The highest results were detected near the corner of Baris Lane and Clove Branch Road (2.2 μg/L), along Hamilton Road (1.1 μg/L), and along Route 82, just north of the intersection with Clove Branch Road (1.0 μg/L). Results below 1.0 μg/L are clustered north of the intersection of Route 82 and Creamery Road (two wells), and near the intersection of Clove Branch Road and Cavelo Road. PCE was detected in one private well located along Route 82, just north of the intersection with Clove Branch Road (0.17 J μg/L); the same private well had 1,1,1-TCA at 1.0 μg/L.

Eight of the 48 private wells contained TCE with levels ranging from 0.13 J μg/L to 4.7 μg/L. The distribution of TCE in private wells is similar to 1,1,1-TCA. The highest results were detected near the corner of Baris Lane and Clove Branch Road (4.7 μg/L), and near the intersection of Clove Branch Road and Cavelo Road (1.3 and 2.6 μg/L). Results below 1.0 μg/L were detected north of the intersection of Route 82 and Creamery Road (one well), north of the intersection of Route 82 and Clove Branch Road (two wells), and at the intersection of Clove Branch Road and Cavelo Road (one well).

Low levels of chloromethane were detected in three private wells along Route 82: near the intersection with Creamery Road (0.12 J μg/L), near the intersection with Mary Lane (0.16 J μg/L), and near the intersection with Clove Branch Road (0.35 J μg/L).

1,1-DCE was detected in one private well located on Hamilton Road (0.11 J μg/L). *Cis*-1,2-DCE and MEK were not detected in any of the private wells.

Round 2 Sample Results

1,1,1-TCA was detected in 23 of the 195 private wells, with levels ranging from 0.5 J μg/L to 3.3 μg/L. The highest results were detected on Baris Lane (2.2 μg/L), south of Cavelo Road (3.3 μg/L and 2.7 μg/L), and along Route 82, just north of the intersection with Clove Branch Road (1.0 μg/L). Results below 1.0 μg/L are clustered north of the intersection of Route 82 and Creamery Road (two wells) and near the intersection of Clove Branch Road and Cavelo Road.

TCE was detected in 16 of the 195 private wells, with levels ranging from 0.53 μg/L to 7.4 μg/L. The highest results were detected near the corner of Baris Lane and Clove Branch Road (7.4 μg/L which exceeded the 5 μg/L screening criterion), clustered near the intersection of Clove Branch Road and Cavelo Road (4.0, 3.7, 3.4, and 2.7 μg/L), and along Route 82, just south of the Creamery Road intersection (3.5 μg/L). Lower results were detected along Route 82 (0.53 μg/L to 0.98 μg/L), clustered along Cavelo Road (0.67 μg/L to 1.8 μg/L), and near the intersection of Creamery Road and Hamilton Road (1.2 μg/L and 1.9 μg/L).

MEK was detected in two wells, at concentrations ranging from 0.77 μg/L to 1.6 μg/L, which are below the screening criterion.

The Site-related contaminants PCE, 1,1-DCE, cis-1,2-DCE, and chloromethane were not detected in private well samples.

Summary of Private Well Results

The majority of private well samples did not contain detectable levels of VOCs. 1,1,1-TCA, which was the most prevalent Site-related contaminant during both sampling rounds conducted in August 2006 and August 2007, was detected in 25 percent of wells sampled in Round 1, and in approximately 13 percent of wells sampled in Round 2. TCE was detected in approximately 17 percent of wells in Round 1 and 8 percent in Round 2. The majority of 1,1,1-TCA and TCE results for both rounds are clustered in the area along Clove Branch Road, between Baris Lane and Route 82, and in areas just downgradient. In wells with detectable VOCs, concentrations were generally well below the Site-specific groundwater screening criteria, and in many cases, they were only detected at trace levels.

Wells outfitted with POET systems were also sampled by EPA or NYSDEC. These wells have higher levels of TCE and 1,1,1-TCA than wells sampled during the RI (summarized above). TCE in wells with POETs sampled by EPA from 2004 to 2009 ranged from 0.6 μg/L to 70 μg/L. 1,1,1-TCA in wells with POETs sampled by NYSDEC ranged from 0.7 μg/L to 5.7 μg/L in July 2007. Figure 4 shows the TCE and 1,1,1-TCA groundwater contaminant plumes.

Contamination Fate and Transport

The persistence of contaminants is determined by the rate of degradation, velocity of the groundwater, the geochemical conditions in the aquifer, and the retardation coefficient (Kd) of the individual compounds. The Kd values for the Site-related VOCs show that they have low adsorption to the materials in the aquifer. Soil sampling during the RI indicated that no residual sources in the unsaturated zone remain at the Hopewell Precision facility.

The Site-related VOCs are mobile and are expected to move with the groundwater, although at a slower rate. Natural attenuation via anaerobic biodegradation appears to be limited, and because of the high oxygen levels found in the aquifer, it is not likely to reduce contaminant levels significantly. However, the aerobic nature of the aquifer would be favorable for the occurrence of aerobic cometabolic bioremediation. Dissolved oxygen readings were collected during groundwater sampling to evaluate the aerobic nature of the aquifer. The dissolved oxygen readings ranged from 3.4 to 6.4 milligrams per liter (mg/L) in the background monitoring wells. As the groundwater flows across the facility toward the plume core, no apparent decrease in dissolved oxygen was observed (e.g., readings greater than 5 mg/L in plume core wells during both sampling rounds) and the aquifer conditions remained aerobic. Downgradient and beyond the plume core area, dissolved oxygen readings showed more variation, but generally remained well within the aerobic range.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The Site is predominantly residential, with nearly 400 homes in the affected area. Limited commercial development is present along parts of Route 82. EPA does not anticipate that the use of the Site in the future is likely to change.

Currently, each home or business has a private well for its water supply and a septic system. Some of the private wells tap the contaminated groundwater in the shallow glacial aquifer. The 2008 remedy selected for OU 2 will eliminate the use of private drinking water wells within the area of the groundwater plume. The depth to water across the Site varies but is generally about 15 feet bgs. The groundwater at the Site is classified by NYSDEC as Class GA, indicating it is considered a source of drinking water. The groundwater contamination is limited to the glacial (unconsolidated) portion of the aquifer.

SUMMARY OF SITE RISKS

As part of the RI/FS, EPA conducted baseline risk assessments to estimate the current and future effects of contaminants on human health and the environment. Baseline risk assessments are an analysis of the potential adverse human health and ecological effects of releases of hazardous substances from a site in the absence of any actions or controls to mitigate such releases under current and future land uses. The baseline risk assessment includes a human health risk assessment and a screening level ecological risk assessment. They provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessments for the Site.

Human Health Risk Assessment

A four-step process is utilized for assessing Site-related human health risks for a reasonable maximum exposure scenario: *Hazard Identification* – uses the analytical data collected to identify the contaminants of potential concern at the Site for each medium, with consideration of a number of factors explained below; *Exposure Assessment* - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (*e.g.*, ingesting contaminated well-water) by which humans are potentially exposed; *Toxicity Assessment* - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and *Risk Characterization* - summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks. The risk characterization also identifies contamination with concentrations which exceed acceptable levels, defined by the NCP as an excess lifetime cancer risk greater than $1 \times 10^{-6} - 1 \times 10^{-4}$ or a Hazard Index greater than 1.0; contaminants at these concentrations are considered chemicals of concern (COCs) and are typically those that will require remediation at the Site. This section includes a discussion of the uncertainties associated with these risks.

Hazard Identification

In this step, the COCs in each medium were identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations, mobility, persistence, and bioaccumulation. Analytical information, which was used to determine the nature and extent of contamination, revealed that the following chemicals were COCs, by media. Groundwater COCs are TCE, PCE, atrazine, aluminum, arsenic, iron, manganese, and nickel. Soil COCs are benzo(a)pyrene, benzo(b)fluoranthene, aluminum, arsenic, iron, manganese, and vanadium. The surface water COC in Redwing Lake is bis(2-ethylhexyl)phthalate. The surface water COCs in the gravel pit are bis(2-ethylhexyl)phthalate, lead, and manganese. The surface water COCs in Whortlekill Creek include TCE, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, and beta-BHC. The surface water COCs in unnamed pond 1 include iron and manganese. The surface water COC in unnamed pond 2 is manganese. The surface water COC in the pond on Clove Branch Road is TCE. The surface water COCs in the wetland area south of Ryan Drive include aluminum, arsenic, iron, lead, manganese, and vanadium. The sediment COCs in Redwing Lake include aluminum, antimony, arsenic, iron, manganese, and vanadium. The sediment COCs in the gravel pit include aluminum, antimony, arsenic, iron, lead, manganese, and vanadium. The sediment COCs in Whortlekill Creek include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, aluminum, antimony, arsenic, iron, manganese, thallium, and vanadium. The sediment COCs for unnamed pond 1 are aluminum, arsenic, iron, manganese, and vanadium. The sediment COCs for unnamed pond 2 are aluminum, antimony, arsenic, iron, manganese, and vanadium. The sediment COCs for the pond on Clove Branch Road are aluminum, arsenic, iron, manganese, and vanadium. The sediment COCs for the wetland area south of Ryan Drive include aluminum, arsenic, iron, manganese, and vanadium. Only TCE and PCE are associated with operations at the Hopewell Precision facility.

A comprehensive list of all COCs can be found in the Baseline Human Health Risk Assessment (BHHRA), entitled "Human Health Risk Assessment Report – Hopewell Precision Site" (USEPA, 2008). This document is available in the Administrative Record file. The COCs that are related to activities at the Hopewell Precision facility are listed in Table 1.

Exposure Assessment

Consistent with Superfund policy and guidance, the BHHRA is a baseline human health risk assessment that is conducted based on the assumption that no remediation or institutional controls will be utilized to mitigate or remove hazardous substance releases. Cancer risks and noncancer hazard indices were calculated based on an estimate of the reasonable maximum exposure (RME) expected to occur under current and future conditions at the Site. The RME is defined as the highest exposure that is reasonably expected to occur at a site. For those contaminants for which the risk or hazard exceeded the acceptable levels, the central tendency estimate (CTE), or the average exposure, was also evaluated.

The area above the groundwater plume is currently zoned for commercial and residential use. It is anticipated that the future land use for this area will remain consistent with its current use. The BHHRA evaluated potential risks to populations associated with both current and potential future land uses.

Exposure pathways were identified for each potentially exposed population and each potential exposure scenario for exposure to groundwater, soil, surface water, and sediment. Exposure pathways assessed in the BHHRA for the groundwater include ingestion of tap water, dermal contact with tap water, inhalation from the showerhead by adult and child residents, and ingestion of tap water for facility workers. Exposure pathways for soil include dermal contact and ingestion by facility workers, construction workers, or trespassers. Exposure pathways for surface water and sediment include dermal contact and ingestion by adult, adolescent, and child recreational users. A summary of the exposure pathways can be found in Table 2. Typically, exposures are evaluated using a statistical estimate of the exposure point concentration, which is usually an upper-bound estimate of the average concentration for each contaminant, but in some cases they may be the maximum detected concentration. A summary of the exposure point concentrations for the COCs in groundwater, soil, surface water, and sediment can be found in Table 1, while a comprehensive list of the exposure point concentrations for all COCs can be found in the BHHRA.

Toxicity Assessment

Under current EPA guidelines, the likelihood of carcinogenic risks and noncancer hazards that are attributable to exposure to Site chemicals are considered separately. Consistent with current EPA policy, it was assumed that the toxic effects of the Site-related chemicals would be additive. Thus, cancer and noncancer risks associated with exposures to individual COCs were summed to indicate the potential risks and hazards associated with mixtures of potential carcinogens and noncarcinogens, respectively.

Toxicity data for the human health risk assessment were provided by the Integrated Risk Information System database, the Provisional Peer Reviewed Toxicity Database, or another source that is identified as an appropriate reference for toxicity values consistent with EPA's directive on toxicity values. This information is presented in Table 3 (noncancer toxicity data summary) and Table 4 (cancer toxicity data summary). Additional toxicity information for all COCs is presented in the BHHRA.

Risk Characterization

Noncarcinogenic risks were assessed using a hazard index (HI) approach, based on a comparison of expected contaminant intakes and benchmark comparison levels of intake (reference doses, reference concentrations). Reference doses (RfDs) and reference concentrations (RfCs) are estimates of daily exposure levels for humans (including sensitive individuals) which are thought to be safe over a lifetime of exposure. The estimated intake of chemicals identified in environmental media (*e.g.*, the amount of a chemical ingested from contaminated drinking water) is compared to the RfD or the RfC to derive the hazard quotient (HQ) for the contaminant in the particular medium. The HI is obtained by adding the hazard quotients for all compounds within a particular medium that impacts a particular receptor population.

The HQ for oral and dermal exposures is calculated as below. The HQ for inhalation exposures is calculated using a similar model that incorporates the RfC, rather than the RfD.

HQ = Intake/RfD

Where: HQ = hazard quotient
Intake = estimated intake for a chemical (mg/kg-day)
RfD = reference dose (mg/kg-day).

The intake and the RfD will represent the same exposure period (*i.e.*, chronic, subchronic, or acute).

As previously stated, the HI is calculated by summing the HQs for all chemicals for likely exposure scenarios for a specific population. An HI greater than 1.0 indicates that the potential exists for noncarcinogenic health effects to occur as a result of Site-related exposures, with the potential for health effects increasing as the HI increases. When the HI calculated for all chemicals for a specific population exceeds 1.0, separate HI values are then calculated for those chemicals which are known to act on the same target organ. These discrete HI values are then compared to the acceptable limit of 1.0 to evaluate the potential for noncancer health effects on a specific target organ. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. A summary of the noncarcinogenic risks associated with these chemicals for each exposure pathway is contained in Table 5.

The calculated HIs are summarized below and on Table 5. HIs greater than 1.0 indicate the potential for noncancer hazards. The calculated HIs for groundwater were:

- Adult: RME HI = 4; CTE HI = 3
- Child: RME HI = 12; CTE HI = 4
- Facility Worker: RME HI = 0.2; CTE HI = 0.1

The calculated HIs for surface water/sediment were:

<u>Redwing Lake</u>

- Adult: RME HI = 0.3
- Child: RME HI = 3; CTE HI = 0.7

<u>Gravel Pit</u>

- Adult: RME HI = 1
- Child: RME HI = 13; CTE HI = 3

<u>Whortlekill Creek</u>

- Adolescent: RME HI = 0.08

Unnamed Pond 1

- Adolescent: RME HI = 0.04

Unnamed Pond 2

- Adolescent: RME HI = 0.05

Pond on Clove Branch Road

- Adolescent: RME HI = 0.04

Wetland Area South of Ryan Drive

- Adolescent: RME HI = 0.09

The total incremental HI for exposure to subsurface soil was:

- Facility Worker: RME HI = 0.1

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen, using the cancer slope factor (SF) for oral and dermal exposures and the inhalation unit risk (IUR) for inhalation exposures. Excess lifetime cancer risk for oral and dermal exposures is calculated from the following equation, while the equation for inhalation exposures uses the IUR, rather than the SF:

Risk = LADD (lifetime average daily dose) x SF

Where: Risk = a unitless probability (e.g., 2×10^{-5}) of an individual developing cancer
LADD = lifetime average daily dose averaged over 70 years (mg/kg-day)
SF = cancer slope factor, expressed as [1/(mg/kg-day)]

These risks are probabilities that are usually expressed in scientific notation (such as 1×10^{-4}). An excess lifetime cancer risk of 1×10^{-4} indicates that one additional incidence of cancer may occur in a population of 10,000 people who are exposed under the conditions identified in the assessment. As stated in the NCP, the acceptable risk range for Site-related exposure is 10^{-6} to 10^{-4}.

Results of the BHHRA presented in Table 6 indicate the following potential for cancer risk. The total incremental lifetime cancer risk estimates for groundwater were:

- Adult: RME = 7×10^{-4}; CTE = 4×10^{-5}
- Child: RME = 1×10^{-3}; CTE = 2×10^{-4}
- Facility Worker: RME = 2×10^{-5}; CTE = 6×10^{-6}

The total incremental lifetime cancer risk estimates for surface water and sediment were:

Redwing Lake

- Adult: RME = 1×10^{-6}
- Child: RME = 2×10^{-6}; CTE = 7×10^{-7}

Gravel Pit

- Adult: RME = 3×10^{-5}; CTE = 3×10^{-6}
- Child: RME = 5×10^{-5}; CTE = 1×10^{-5}

Whortlekill Creek

- Adolescent: RME cancer risk: 5×10^{-6} and CTE cancer risk: 2×10^{-6}

Unnamed Pond 1

- Adolescent: RME = 4×10^{-7}

Unnamed Pond 2

- Adolescent: RME = 6×10^{-7}

Pond on Clove Branch Road

- Adolescent: RME = 5×10^{-7}

Wetland Area South of Ryan Drive

- Adolescent: RME = 1×10^{-6}

The total incremental lifetime cancer risk estimate for subsurface soil was:

- Facility Worker: RME = 3×10^{-7}

In summary, for groundwater, TCE, PCE, and arsenic contribute to unacceptable risks and hazards to receptor populations that may use the contaminated groundwater. However, arsenic is not related to any activities at the Hopewell Precision facility, and it was only detected in one monitoring well sample out of two rounds of sampling of 35 monitoring wells; the concentration of arsenic (16 μg/L) in this sample only slightly exceeded the drinking water standard (10 μg/L). Therefore, risks from arsenic are likely to be minimal. For surface water and sediment, calculations suggest that there is a potential for adverse effects on the whole body and blood because of elevated concentrations of antimony. Antimony is not a Site-related chemical and may be related to fishing or hunting activities.

For subsurface soil, calculations suggest no potential for risk. The non-cancer hazards and cancer risks from all COCs can be found in the BHHRA.

A remedial action is therefore necessary to protect the public health or welfare of the environment from actual or threatened releases of contaminants into the environment.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- Environmental chemistry sampling and analysis
- Environmental parameter measurement
- Fate and transport modeling
- Exposure parameter estimation
- Toxicological data

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper-bound estimates of the risks to populations near the Site, and thus it is highly unlikely to underestimate actual risks related to the Site.

More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the risk assessment report.

Ecological Risk Assessment

The Screening Level Ecological Risk Assessment (SLERA) evaluated the potential ecological impact of contaminants in surface water and sediment at the Site. Conservative assumptions were used to identify exposure pathways and, where possible, quantify potential ecological risks. Based on a comparison of maximum detected concentrations of contaminants in Site sediment and surface water to conservatively-derived ecological screening levels (ESLs), there is no potential for ecological risk from contaminants related to the Site. The SLERA indicated the potential for ecological risk from contaminants not related to the Site. Specifically, hazard quotients (HQs) greater than 1.0 may indicate potential risk from exposure to the following media-specific contaminants:

Sediment

VOCs: acetone and carbon disulfide

Semi-volatile organic compounds (SVOCs): acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i,)perylene, benzo(k) fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene

Pesticides: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-BHC, beta-BHC, alpha-chlordane, and gamma-chlordane

Inorganics: antimony, arsenic, cadmium, chromium, copper, cyanide, iron, lead, manganese, nickel, selenium, and silver

Surface Water

SVOCs: benzo(a)pyrene and fluoranthene

Pesticides: 4,4'-DDT, gamma-chlordane, and heptachlor

Inorganics: barium, copper, iron, manganese, and vanadium

COCs in the SLERA were comprised of different classes of contaminants; none are the identified Site-related contaminants. TCE and 1,1,1-TCA were detected in some surface water samples; however, levels detected were orders of magnitude below their respective screening criteria. In addition, MEK (2-butanone) was detected in one sediment sample below its screening criterion. These Site-related compounds were not retained as COCs because of their low concentrations. Chloromethane was identified as a Site-related contaminant and was retained as a COC because no ESL was located; however, only trace levels were detected in surface water. It is unlikely any risks exist to ecological receptors from exposure to this compound.

The SLERA indicates no risk to ecological receptors from Site-related contaminants. COCs such as polycyclic aromatic hydrocarbons and pesticides are typically associated with suburban/agricultural areas such as those within the Hopewell area, and they are unlikely to be related to activities at the Hopewell Precision facility. In addition, Whortlekill Creek receives surface and road runoff via overland flow and storm water drains; other surface water bodies are subject to overland flow, further contributing to the loading of non

Site-related COCs. Although groundwater has been observed to discharge to several surface water bodies in the Site vicinity (e.g., Whortlekill Creek, Redwing Lake, and the gravel pit), the contaminant levels discharging to water bodies are expected to remain at extremely low levels or decrease as the groundwater plume dissipates. Therefore, no further ecological investigations or risk assessments were warranted.

Basis for Action

Based upon the results of the monitoring well and private well sampling and human health risk assessment, EPA has determined that a response action is necessary to protect the public health or welfare of the residents from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are media-specific goals to protect human health and the environment. These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and risk-based levels established in the risk assessment.

The overall RAO is to ensure the protection of human health and the environment. The specific RAOs identified for OU 1 at the Site are listed below.

For groundwater:

- Prevent inhalation of contaminants volatilizing from groundwater.
- Restore the groundwater aquifer to drinking water standards within a reasonable time period.

For soil vapor:

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

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA Section 121(b)(1), 42 U.S.C. Section 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, are cost-effective, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants at a site. CERCLA Section 121(d), 42 U.S.C.

Section 9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section 121(d)(4), 42 U.S.C. Section 9621(d)(4).

Cleanup Levels

Cleanup Levels for OU 1 were selected based on federal and state promulgated ARARs known as groundwater federal MCLs and New York State Drinking Water Standards, respectively. These Cleanup Levels or MCLs were then used as a benchmark in the technology screening, alternative development and screening, and detailed evaluation of alternatives presented in the FS Report. The Cleanup Levels for groundwater are the most conservative of federal MCLs or New York State Drinking Water Standards and are shown in the table below.

Cleanup Levels

Site-Related Contaminants	Cleanup Levels for Groundwater (μg/L)
Trichloroethene (TCE)	5
1,1,1-Trichloroethane (1,1,1-TCA)	5
1,1-Dichloroethene (1,1-DCE)	5
Cis-1,2-Dichloroethene (cis-1,2-DCE)	5
Chloromethane	5
Methyl ethyl ketone (MEK)	50
Tetrachloroethene (PCE)	5

The objective of the FS for OU 1 was to identify and evaluate remedial action alternatives for contaminated groundwater at the Site and to monitor and/or mitigate vapor in indoor air in the future.

Detailed descriptions of the groundwater remedial alternatives for the Site are presented below. All alternatives were evaluated for a duration of 30 years because it is the standard default timeframe used for comparison purposes. The use of the 30-year timeframe does not imply that the remedy would become ineffective or be removed after 30 years.

Groundwater plumes such as at the Site are particularly difficult to address through active remediation because of the relatively low levels of contamination and the size of the plume. Traditional treatment technologies work best when applied to much higher levels of contamination. At the Site, the remedial alternatives include traditional technologies and approaches for groundwater contamination (e.g., pump and treat) but also an innovative, emerging technology - aerobic cometabolic bioremediation (ACB) – that has been shown to be effective in reducing TCE levels in aerobic aquifers such as at the Site.

The potential technologies to address groundwater contamination were combined into four alternatives. An additional component included in the three "active" alternatives is periodic sampling of monitoring wells, periodic inspection of the existing 53 vapor extraction systems, and periodic vapor sampling of "at risk" homes over the groundwater plume.

Consistent with EPA Region 2's Clean and Green policy, EPA will evaluate the use of sustainable technologies and practices with respect to any remedial alternative selected for the Site.

Alternative 1 – No Action

Capital Cost:	$0
Annual Cost:	$0
Present-Worth Cost:	$0
Duration Time:	0 years

The "No Action" alternative is considered in accordance with NCP requirements and provides a baseline for comparison with other alternatives. If this alternative were implemented, the current status of the Site would remain unchanged. No remedial actions would be implemented as part of this alternative. Groundwater would continue to migrate and contamination would continue to attenuate through dilution, dispersion, biodegradation, and discharge to surface water bodies.

This alternative does not include institutional controls or long-term groundwater or vapor monitoring.

Alternative 2 – Aerobic Cometabolic Bioremediation

Capital Cost:	$6,790,000
Annual Cost:	$410,000
Present-Worth Cost:	$12,000,000
Duration Time:	30 years

ACB involves a process whereby micro-organisms, while consuming organic substrates such as methane or propane and oxygen, produce an enzyme which fortuitously destroys contaminants. ACB is an innovative technology that would be investigated during the pre-design phase of the project, including determination of design parameters through a pilot study, prior to its remedial design and implementation.

The ACB alternative includes the following components.

Pre-design Investigations of Aerobic Cometabolic Bioremediation

Groundwater samples would be collected for enzyme and molecular analyses and microcosm studies. The pre-design investigation of aerobic cometabolism would be accomplished in two phases. The first phase would involve collection of samples from 8 to 10 monitoring wells for standard groundwater chemistry parameters, enzyme probe assays, and molecular techniques. The wells would be selected to represent various conditions at the Site (e.g., high concentration areas, low concentration areas, background wells). Results from the Phase 1 sampling events would be compiled and analyzed with the groundwater chemistry and contaminant results, the enzyme probe results, the Deoxyribonucleic acid (DNA) results, and historical data to determine the extent of ACB in the aquifer and to estimate an overall contamination degradation rate. The second phase of the investigation would involve microcosm studies using Site groundwater. Groundwater would be collected from selected locations and sent to a specialty laboratory. The microcosm studies would measure TCE degradation and enzyme activity in Site groundwater; these results would then be used to estimate Site-specific intrinsic cometabolic degradation rates.

Pilot Study of Enhanced Aerobic Cometabolic Bioremediation

A pilot study would be conducted in the 50 µg/L plume (as shown in Figure 4) and in more dilute areas of the plume to evaluate the effectiveness of enhanced ACB at this Site, to obtain Site-specific design parameters, and to test system configurations that would be suitable for Site conditions. A work plan would be developed and approved by EPA that describes the locations and design of the pilot study.

A conceptual approach for the pilot study in the plume core is described here. First, groundwater screening would be conducted at the pilot study area from two borings to delineate the vertical distribution of the contaminant plume. Based on the groundwater screening data, amendment releasing wells and multi-level monitoring wells would be installed. To avoid sparging the contaminated groundwater, which potentially could cause vapor intrusion issues, a passive device that delivers a gas phase amendment (e.g., oxygen) to groundwater by diffusion from pressurized tubing, or similar devices, could be used. Four amendment release wells (two 2-inch and two 4-inch) screened from the water table to approximately 40 feet bgs would be drilled within the 50 µg/L TCE contaminant plume perpendicular to groundwater flow. The passive device would be installed inside the amendment release wells (two 1.8-inch and two 3.8-inch). The distance between amendment release wells would be approximately 5 feet. Six monitoring wells or continuous multichannel tubing (CMT) monitoring systems would be installed to monitor the progress of ACB. One well each would be installed upgradient and side gradient and four wells would be installed downgradient of the amendment release wells at different distances. If groundwater screening data indicate large vertical variation in contaminant distribution, CMT systems would be used, which may provide vertically discrete information on amendment distribution and ACB. The amendment could be oxygen and/or a primary substrate identified for testing prior to the pilot study.

Once the pilot study begins, an operator would visit the system as frequently as every two weeks, or more or less frequently if warranted in the pilot study work plan, to replenish the pressurized gas in the passive diffusion wells. Groundwater samples would be collected monthly for approximately 18 months. Groundwater samples would be analyzed for the primary substrate, dissolved oxygen, VOCs and other parameters identified as necessary. Selected samples would be analyzed using enzyme activity probes. Results of the pilot study and the Site-wide ACB investigation (described above) would provide Site-specific data for use during the remedial design of the enhanced ACB system.

It should be noted that the pilot study described above is for cost estimating purposes. Actual design, operation and monitoring details of the pilot study would be specified in the pilot study work plan for EPA's review and approval.

Implementation of Enhanced Aerobic Cometabolic Bioremediation

Parameters determined during the pilot testing would be used to design and implement a full scale enhanced ACB system at this Site.

A conceptual ACB system is described here. It is currently assumed that two transects of passive diffusion wells would be installed in or immediate downgradient of the 50 µg/L TCE plume. A total of 10 groundwater screening locations would be drilled to define the treatment zone. Groundwater screening samples would be analyzed for VOCs. It is estimated that approximately 160 passive gas diffusion wells would be installed to create a treatment zone approximately 800 feet long. The passive gas diffusion wells would be 4-inch diameter polyvinyl chloride (PVC) wells screened from the water table to approximately 40 feet bgs. Six monitoring wells would be installed downgradient of the treatment zone(s). Operational requirements would be developed as part of the remedial design, based on results from the pilot test.

Long-term Monitoring

Under this alternative, groundwater samples would be collected periodically from the monitoring well network of 35 wells strategically located in and around the groundwater plume. The analytical results would be used to evaluate the migration of and changes in the contaminant plume over time. The monitoring well samples would be collected in the late spring or early summer to allow adequate time to evaluate changes in the geometry of the plume in order to plan the periodic vapor sampling during the winter heating season.

Vapor intrusion caused by volatilization from the groundwater contaminant plume has been monitored and mitigated by EPA for several years. Under the long-term monitoring program, a periodic inspection would be conducted of the 53 existing vapor extraction systems to ensure that the systems are working properly. In addition, EPA would conduct periodic vapor sampling in the areas of the Site considered likely to experience vapor intrusion, based on changes in the groundwater plume as determined by the periodic monitoring well sampling and previously conducted vapor sampling. Since 2003, EPA has conducted vapor sampling at 209 homes over the groundwater plume, with many of the homes sampled multiple times. During the initial years of the planned, future periodic vapor sampling, the vapor monitoring would focus on structures that had never been sampled (approximately 18 homes) and/or homes that had been sampled for vapors only once (approximately 35 homes). This would ensure that each home will be sampled at least twice. In addition, after the first few years of annual monitoring, homes to be sampled periodically would be selected based on changes in the contaminant plume, especially in any areas where the groundwater contaminant levels appeared to be increasing, and proximal to properties already experiencing vapor intrusion. Vapor sampling would include collection of three air samples (sub-slab, basement, and first floor) at each building. If vapor sampling indicates the presence of vapors exceeding screening criteria as well as other lines of evidence, a vapor extraction system would be installed. For cost estimating purposes, it is assumed that 50 residences would be sampled annually for 30 years, and a total of 10 residences would require installation of a vapor mitigation system.

Green Remediation Considerations

Under this alternative, green remediation objectives can be implemented by planning field activities that minimize fuel usage and impact to the environment. Planning that can minimize environmental impact includes, but would not be limited to:

- Minimize number of field mobilizations
- Use ultra low sulfur diesel or fuel-grade biodiesel as fuel (drillers)
- Use non-phosphate detergents for decontamination
- Schedule sampling to minimize shipping
- Use of in-situ treatment and natural degradation processes to minimize energy usage and generation of greenhouse gas (GHG)

Five-Year Review

A review of Site conditions would be conducted every five years, which would typically include an evaluation of the extent of contamination and an assessment of contaminant migration and attenuation over time. The progress of ACB would also be monitored, and the continuation of the remedy and long-term monitoring program would be evaluated. The first five year review would be due within five years of the construction of the enhanced ACB remedy to ensure that the groundwater remedy is protective of human health.

Duration of this Alternative

The enhanced ACB system would be operated until the groundwater aquifer has been restored to drinking water standards. In addition, the long-term monitoring program would continue as long as TCE concentrations in groundwater are above the Cleanup Levels. For cost estimating purposes, it was assumed that this alternative would last for 30 years.

Alternative 3 - Groundwater Extraction and Ex-Situ Treatment (Pump and Treat)

Capital Cost:	$7,980,000
Annual Cost:	$940,000
Present-Worth Cost*:	$17,470,000
Duration Time:	30 years

* annual Operation and Maintenance costs for pump and treat is for 15 years and for long-term monitoring is for 30 years.

The pump and treat alternative includes the major components described below.

Pre-Design Investigation

Groundwater screening would be conducted to obtain detailed geological information and contaminant distribution in the area where groundwater extraction wells would be installed. It is currently assumed that groundwater screening would be conducted at 20 locations and 5 groundwater samples would be collected from each boring. The pre-design investigation would also include installation of four monitoring wells, and one round of groundwater samples would be collected from the monitoring well network. Two rounds of synoptic water level measurements would be collected (one in summer, one in winter) for use in the groundwater model. Data collected during the pre-design investigation would be used in the remedial design.

Groundwater Modeling

The preliminary three-dimensional groundwater model used in the FS would be updated for the remedial design. Water level measurements collected during the pre-design investigation would be used to calibrate the model. Contaminant distribution data collected for the RI and pre-design investigation (including geologic information) would be incorporated for fate and transport simulations. The updated groundwater model would be used to select the final location(s) of groundwater extraction well(s) and the discharge option for the treated groundwater.

Groundwater Extraction Wells

Groundwater extraction wells would be designed to capture the 50 µg/L TCE plume to enhance the restoration of the aquifer. Based on the preliminary groundwater modeling results in the FS, it is assumed that three groundwater extraction wells would be installed. Each extraction well would have a 20-foot screen and a pumping rate of 30 gallons per minute (gpm). The extracted groundwater would be piped to a treatment plant. A pumping test would be conducted to collect data for hydraulic conductivity and transmissivity analysis of the aquifer, which would subsequently be used for capture zone analysis. It is assumed that four piezometers would be installed in the vicinity of the proposed extraction wells. A step test would be conducted first to obtain the proper yield of the extraction well, followed by a 72-hour pumping test. The extracted groundwater from the pump test would be treated on-Site and discharged to Whortlekill Creek.

Ex-Situ Groundwater Treatment

Precipitation, filtration, air-stripping, liquid phase carbon adsorption, and vapor-phase carbon adsorption are process options retained for ex-situ treatment of extracted contaminated groundwater. During the RI, metals and wet chemistry parameters were analyzed. Iron, manganese, total suspended solids (TSS), and hardness were measured from monitoring wells located in or immediately downgradient of the 50 µg/L TCE contour. In general, iron concentrations in the deep monitoring wells are greater than in the shallow monitoring wells. Iron concentrations varied significantly from location to location, and in some cases, from sample event to sample event. It is assumed that green sand would be used for iron treatment. The actual need for iron removal and the technology for iron removal would be determined by conducting a pilot test at the groundwater extraction wells.

A low-profile air stripper was selected as the representative process option to remove the VOC contaminants. During the remedial design, other treatment technologies (including liquid phase carbon adsorption) would be considered as more information becomes available. The water quality of treated water would conform to the groundwater and surface water discharge standards. Since TCE and 1,1,1-TCA are subject to NYSDEC air emission regulations, the use of vapor phase activated carbon is assumed to be required but would be further evaluated as part of the NYSDEC review process.

Discharge of Treated Groundwater

Injection, surface recharge, and discharge to surface water were retained technologies for discharge of treated groundwater. Because of the heterogeneous and complex subsurface conditions at the Site, injection and surface recharge may not be optimal in clay or silty soil. In addition, the contaminant plume is located in a residential area; obtaining land for the treatment plant and a surface recharge facility would be especially challenging. It was assumed that surface discharge would be to Whortlekill Creek and that Whortlekill Creek could accommodate the discharge. The three discharge options would be re-evaluated during the design phase of the project. The appropriateness of discharging treated water into Whortlekill Creek would be fully evaluated.

Long-term Monitoring

Groundwater samples would be collected periodically from the monitoring well network of 35 wells strategically located in and around the groundwater plume. The analytical results would be used to evaluate the migration of and changes in the contaminant plume over time. The monitoring well samples would be collected in the late spring or early summer to allow adequate time to evaluate changes in the geometry of the plume in order to plan the periodic vapor sampling during the winter heating season.

Vapor intrusion caused by volatilization from the groundwater contaminant plume has been monitored and mitigated by EPA for several years. Under the long-term monitoring program, a periodic inspection would be conducted of the 53 existing vapor extraction systems to ensure that the systems are working properly. In addition, EPA would conduct periodic vapor sampling in the areas of the Site considered likely to experience vapor intrusion, based on changes in the groundwater plume as determined by the periodic monitoring well sampling and previously conducted vapor sampling. Since 2003, EPA has conducted vapor sampling at 209 homes over the groundwater plume, with many of the homes sampled multiple times. During the initial years of the planned, future periodic vapor sampling, the vapor monitoring would focus on structures that had never been sampled (approximately 18 homes) and/or homes that had been sampled for vapors only once (approximately 35 homes). This would ensure that each home will be sampled at least twice. In addition, after the first few years of annual monitoring, homes to be sampled periodically would be selected based on changes in the contaminant plume, especially in any areas where the groundwater contaminant levels appeared to be increasing, and proximal to properties already experiencing vapor intrusion. Vapor sampling would include collection of three air samples (sub-slab, basement, and first floor) at each building. If vapor sampling indicates the presence of vapors exceeding screening criteria as well as other lines of evidence, a vapor extraction system would be installed. For cost estimating purposes, it is assumed that 50 residences would be sampled annually for 30 years, and a total of 10 residences would require installation of a vapor mitigation system.

Green Remediation Considerations

In addition to the green remediation practices listed in Alternative 2, Alternative 3 would present many opportunities to incorporate green remediation best practices during the pre-design investigation, design, and construction of the treatment system. Key green remediation practices to be considered include:

- Use direct push technology for groundwater screening to minimize waste production (drill cuttings) and the use of fuel;
- Manage use of cement/grout to minimize waste produced during groundwater screening and well installation;
- Ensure wells are properly developed to increase efficiency;
- Consider on-Site treatment and discharge of pump test effluent instead of containment and off-Site disposal;
- Dispose of drill cuttings at a recycling facility, if possible;
- Optimize the sizing of pumps, blowers, and equipment to minimize energy consumption and material use;

- Incorporate elements of the Green Building Council's Leadership in Energy and Environmental Design (LEED) standards;

- Minimize the building footprint and impact of construction on land resources;

- Use green concrete for the building foundation and any concrete needed for the project;

- Use EPA's Greenscapes practices to manage runoff and soil impacts during construction of the treatment facility;

- Use electricity from renewable resources for pump and treat system operation; and

- Require remediation contractors to use clean diesel technology and low sulfur fuels to minimize generation of air contaminants.

<u>Five Year Review</u>

A review of Site conditions would be conducted every five years, which would typically include an update of the extent of contamination, an evaluation of contaminant migration and attenuation, and an assessment of the effectiveness of the treatment system. Based on the results, decisions would be made concerning whether the operation of the pump-and-treat system should be continued and the necessity of the long-term monitoring program.

<u>Duration of this Alternative</u>

The overall duration of the pump and treat alternative is the time required for the entire plume to meet the Cleanup Levels. For the 50 µg/L plume, the pump and treat system would be operated until TCE concentrations in the monitoring wells within the capture zone are reduced to the Cleanup Levels or continued groundwater extraction is concluded to no longer be effective for Site cleanup. After the pump and treat system is shut down, the contaminant plume would be monitored to ensure that the entire plume meets the Cleanup Levels.

It currently assumed that the pump and treat system would be operated for 15 years and the long-term monitoring program would be conducted for 30 years.

Alternative 4 - In-Situ Chemical Oxidation

Capital Cost:	$10,720,000
Annual Cost:	$4,600,000
Present-Worth Cost*:	$25,530,000
Duration Time:	30 years

* annual operating costs for treatment for years 2 to 4.

The In-Situ Chemical Oxidation (ISCO) alternative would include the major components described below.

ISCO Implementation Strategy

The ISCO technology has been successfully used to treat source contamination where residual soil contamination or highly contaminated groundwater was found in limited areas and volumes. Delivery of the oxidant can be accomplished by using injection wells, temporary injection points, or injection wells and extraction wells forming a treatment loop, so that the bulk of the contaminated volume can be treated. The contamination at this Site consists of a very dilute (with maximum detected concentration of 94 µg/L) and large plume, with the 50 µg/L TCE plume covering approximately 17 acres under a residential area. Treating such a large and dilute plume using ISCO technology would be challenging and usually would not be cost effective. Oxidants involving radicals are short-lived (e.g., Fenton's reagent, iron catalyzed persulfate). The injection points may need to be as closely spaced as approximately 5 to 10 feet apart, and treating the entire 50 µg/L contaminant plume would require access to many private properties. Among the ISCO oxidants, permanganate has the longest life in the subsurface after overcoming the soil oxidant demand. However, permanganate is also very reactive to soil. The soil oxidant demand can vary from a few grams per kilogram (g/kg) to more than 20 g/kg of soil. It was estimated that approximately 5 million pounds (lbs) or more of permanganate would be needed just to satisfy the soil oxidant demand of the 50 µg/L plume, assuming the soil oxidant demand for potassium permanganate is 3 g/kg, the thickness of the 50 µg/L TCE plume is 20 feet, and the soil bulk density is 1.8 grams per cubic centimeter (g/cm^3). To treat the entire 50 µg/L plume, the cost of permanganate itself could reach in excess of $11 million. Fenton's reagent is cheaper compared to permanganate, but using Fenton's reagent has not been completely proven to reduce TCE concentrations to below the Cleanup Levels. Obtaining access to every private property within the 50 µg/L contaminant plume would be extremely challenging. Permanganate may potentially reduce TCE concentrations to meet the Cleanup Level, but it would be costly to treat the dilute plume. Furthermore, permanganate would temporarily alter the groundwater quality.

An alternative strategy would be to treat the contaminant plume at selected locations to enhance the restoration of the aquifer. However, quantifying aquifer improvement may be difficult. Treating a plume is significantly more challenging compared to treating the source because the plume is a dynamic, moving system. Oxidant injected at one location would move downgradient with the groundwater flow. The treated area might be re-contaminated by un-treated contaminated groundwater flow from upgradient, although at lower concentrations. In addition, since most of the contaminant mass is in groundwater, continuous oxidant injection may displace the contaminated groundwater and result in more oxidant reacting with soil than with the dissolved contaminants. Therefore, intermittent injection may be more effective. It was assumed that four treatment bands perpendicular to the groundwater flow would be utilized along the 50 µg/L TCE plume. Oxidants would be injected into the subsurface periodically.

Pre-Design Investigation

To implement ISCO treatment, the treatment area would need to be delineated first and the delineation activities would be dictated by the layout of the ISCO treatment. Groundwater screening would be conducted at each treatment band to determine the lateral and vertical extent of the treatment band. In addition, groundwater screening would be conducted in the vicinity of Oak Ridge Road to confirm the northern boundary of the 50 µg/L plume. It was assumed that a total of 30 groundwater screening locations and a total of 150 groundwater screening samples would be collected and analyzed for VOCs. Furthermore, monitoring wells would be installed upgradient and downgradient of each treatment band to monitor the progress of the ISCO treatment. It was assumed that two monitoring wells would be installed upgradient of treatment band No. 1, and four monitoring wells would be installed downgradient of each treatment band. Therefore, a total of 16 monitoring wells would be installed to monitor the progress of ISCO treatment (existing monitoring well cluster EPA-12 would be used as a downgradient well for treatment band No. 4). Monitoring wells could be installed as clusters at each selected location to monitor the vertical change of the plume as a result of treatment.

For the contaminant plume outside the 50 µg/L TCE contour, natural attenuation processes through dilution, dispersion, biodegradation, and discharge to surface water bodies would be the mechanism to restore the aquifer. Results of the periodic groundwater sampling from the 35 monitoring wells would be used to evaluate aquifer restoration.

ISCO Treatment

A bench scale test would be necessary to understand the soil oxidant demand prior to full scale field implementation. TCE can be degraded by a wide variety of oxidants, including but not limited to permanganate, Fenton's reagent, activated persulfate, and calcium peroxide. However, because of concerns about the need for recurring access, a long-lasting oxidant, such as permanganate, would be preferred. Permanganate might last for more than six months in the subsurface after overcoming the soil oxidant demand. Therefore, it was assumed that permanganate would be used. The final selection of oxidant would be determined subsequent to the bench scale tests.

As discussed under the pre-design investigation, four rows of injection wells would be installed perpendicular to the groundwater flow. The following design parameters were used in the FS for cost estimation purposes.

- The total width of the four treatment bands was estimated to be 1,600 feet.
- Based on the groundwater flow rate of 200 feet/year and the estimated permanganate longevity of 6 months (after overcoming the soil oxidant demand), the treatment bands were expected to extend to 100 feet downgradient of the injection wells.

- The radius of influence for injection wells was assumed to be 15 feet; accordingly, the number of injection wells within each row ranges from 10 to 18. Approximately 54 injection wells in total would be installed in the four injection rows.

- Assuming a soil oxidant demand of 3 g/kg, the quantity of permanganate during initial treatment (the first year) was approximately 1.1 million lbs for all four treatment bands.

- The distance between each band would be approximately 700 feet. Based on the groundwater flow rate of 200 feet/year, it would take approximately 4 years for 1 pore volume of groundwater to flush from one injection band to the next downgradient band. Therefore, it was assumed that the oxidant injection operation would be active for 4 years.

- Since the soil oxidant demand within the treatment bands would be significantly reduced after the first round of injection, it was assumed that permanganate use would be reduced to a quarter of the initial quantity after the first year.

- It was assumed that permanganate would be injected at a 10 g/L concentration. A large quantity of water would be required to make the permanganate solution. It was assumed that the to-be-built potable water supply system would have sufficient capacity to accommodate the water demand for oxidant injection.

The Site-specific soil oxidant demand would be tested during the pre-design investigation. The final layout and design parameters for the full scale ISCO treatment would be determined during the remedial design.

Even though groundwater contamination within the treatment bands would be significantly reduced for the duration that the oxidant would be effective, groundwater contamination upgradient, side-gradient, and downgradient would not be treated. The remaining contamination would decrease through natural processes such as dilution, dispersion, biodegradation, and discharge to surface water bodies.

It is important to note that the ISCO treatment would be conducted after the local residences are connected to the alternate water supply because the chemical may have temporary adverse impacts on the groundwater quality and could render the water unusable for the period of ISCO treatment. For example, if permanganate were used, the water may exhibit high concentrations of manganese and purple discoloration. As previously indicated above, the alternate water supply would also be needed to supply the water to make up the permanganate solution.

Long-term Monitoring

Groundwater samples would be collected periodically from the monitoring well network of 35 wells strategically located in and around the groundwater plume. The analytical results would be used to evaluate the migration of and changes in the contaminant plume over time. The monitoring well samples would be collected in the late spring or early summer to allow adequate time to evaluate changes in the geometry of the plume in order to plan the periodic vapor sampling during the winter heating season.

Vapor intrusion caused by volatilization from the groundwater contaminant plume has been monitored and mitigated by EPA for several years. Under the long-term monitoring program, a periodic inspection would be conducted of the 53 existing vapor extraction systems to ensure that the systems are working properly. In addition, EPA would conduct periodic vapor sampling in the areas of the Site considered likely to experience vapor intrusion, based on changes in the groundwater plume as determined by the periodic monitoring well sampling and previously conducted vapor sampling. Since 2003, EPA has conducted vapor sampling at 209 homes over the groundwater plume, with many of the homes sampled multiple times. During the initial years of the planned, future periodic vapor sampling, the vapor monitoring would focus on structures that had never been sampled (approximately 18 homes) and/or homes that had been sampled for vapors only once (approximately 35 homes). This would ensure that each home will be sampled at least twice. In addition, after the first few years of annual monitoring, homes to be sampled periodically would be selected based on changes in the contaminant plume, especially in any areas where the groundwater contaminant levels appeared to be increasing, and proximal to properties already experiencing vapor intrusion. Vapor sampling would include collection of three air samples (sub-slab, basement, and first floor) at each building. If vapor sampling indicates the presence of vapors exceeding screening criteria as well as other lines of evidence, a vapor extraction system would be installed. For cost estimating purposes, it is assumed that 50 residences would be sampled annually for 30 years, and a total of 10 residences would require installation of a vapor mitigation system.

Green Remediation Considerations

In addition to the green remediation practices discussed for Alternative 2 and Alternative 3, green remediation practices that could be implemented under this alternative include but would not be limited to the following elements.

- Minimize clearing of trees during the monitoring well and injection well installation;
- Plan the injection activity and shipment of oxidant to the Site to minimize the use of fuel in transportation;
- Use ultra low sulfur diesel or fuel-grade biodiesel as fuel for injection pump operation or use electricity from renewable sources for injection pump operation; and
- Investigate the possibility of using groundwater instead of potable water for ISCO treatment.

Five Year Review

A review of Site conditions would be conducted every five years, which would typically include an evaluation of the extent of contamination and an assessment of contaminant migration and attenuation over time. The effectiveness of ISCO treatment would also be evaluated..

Duration of this Alternative

The duration of the ISCO treatment would be determined by the time required for the contaminant to travel to the treatment bands. It is currently estimated to require 4 years for one pore volume to migrate through the bands. However, because of the subsurface heterogeneity, it is unlikely that contaminants would be treated to Cleanup Levels within the treatment zone after 4 years because TCE from upgradient of the treatment zone would re-contaminate the area, although at lower concentrations. It was assumed that this alternative would last 30 years.

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy for a site, EPA considers the factors set forth in CERCLA Section 121, 42 U.S.C. 9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR 300.430(e)(9), and OSWER Directive 9355.3-01. The detailed analysis consists of an assessment of the individual alternatives using each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative considering the nine evaluation criteria.

The following "threshold" criteria are the most important and must be satisfied by any alternative in order to be eligible for selection:

- Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with applicable or relevant and appropriate requirements addresses whether a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and regulations or provide grounds for invoking a waiver.

The following "primary balancing" criteria are used to make comparisons and to identify the major tradeoffs between alternatives:

- Long-Term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once Cleanup

Levels have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

- Reduction of toxicity, mobility, or volume (TMV) through treatment is the anticipated performance of the treatment technologies with respect to these parameters that a remedy may employ.
- Short-Term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until Cleanup Levels are achieved.
- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
- Cost includes estimated capital and annual operation and maintenance costs, and net present-worth costs.

The following "modifying" criteria are used in the final evaluation of the remedial alternatives after the formal comment period, and may prompt modification of the preferred remedy that was presented in the Proposed Plan:

- State acceptance indicates whether, based on its review of the RI/FS reports and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred remedy at the present time.
- Community acceptance refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports.

A comparative analysis of the remedial alternatives for OU1, based upon the evaluation criteria noted above, is presented below.

Overall Protection of Human Health and the Environment

For all four alternatives, protection of human health from the contaminated groundwater is provided through installation of a potable water system throughout the impacted community under the OU 2 ROD. Alternative 1 - No Action would not include any monitoring or remedial measures, and as such, would not provide any additional protection of human health or the environment. Alternative 2 – Aerobic Cometabolic Bioremediation includes evaluation of intrinsic cometabolic degradation of TCE and pilot testing followed by implementation of measures to enhance ACB. Because of the presence of favorable aerobic conditions in the aquifer, it is likely that cometabolic degradation of TCE is occurring, which would provide TCE destruction and would protect human health and the environment. Alternatives 2, 3, and 4 would accelerate the cleanup of the plume by reducing groundwater contaminant concentrations within the plume. Alternatives 2, 3, and 4 would also rely on certain natural processes to achieve the cleanup levels for areas outside of the treatment zones. The long-term monitoring program for groundwater and vapor would monitor the migration and fate of the contaminants and also ensure human health is protected. Alternative 1 would not meet the RAOs. Alternatives 2, 3, and 4 would meet the RAOs (defined on page 27).

Compliance with ARARs

Alternative 1 would not comply with chemical-specific ARARs because no action would be taken. Alternatives 2, 3, and 4 would comply with chemical-specific ARARs through treatment and certain natural processes (dilution, dispersion, biodegradation, and discharge to surface water bodies). Alternatives 2, 3, and 4 would comply with action-specific ARARs for all associated well-drilling activities. Alternative 3 would also comply with action-specific ARARs by controlling emissions of hazardous vapors and complying with effluent discharge requirements. Alternatives 2, 3, and 4 would comply with location-specific ARARs by minimizing any wetland impact from their implementation (e.g., well-drilling activities).

Long-Term Effectiveness and Permanence

Alternative 1 is not considered a permanent remedy since no action would be taken. Alternative 2 would provide long-term effectiveness and permanence through aerobic cometabolic degradation of TCE and accelerated destruction of the toxic compounds through enhancements to the process, thereby decreasing the time for aquifer restoration. Alternatives 3 and 4 would provide long-term effectiveness and permanence by treating contaminated groundwater within the 50 µg/L TCE plume to shorten the time required for overall aquifer restoration. Groundwater contamination outside the 50 µg/L plume would decrease through certain natural processes including dilution, dispersion, biodegradation, and discharge to surface water bodies. Alternatives 2, 3 and 4 also would provide periodic vapor sampling and vapor intrusion mitigation to ensure human health is protected.

Reduction in Toxicity, Mobility or Volume

Alternative 1 would not reduce TMV through treatment since no treatment would be implemented. Alternative 2 would reduce TMV through cometabolic degradation of TCE through certain natural processes and measures to enhance these processes. Alternative 3 would reduce the mobility and volume of the contaminant plume through groundwater extraction and reduce the toxicity of water through ex-situ treatment using air-stripper and/or liquid phase carbon adsorption units. Alternative 4 would reduce the toxicity of the contaminant plume through in-situ destruction of the contaminants. The volume and mobility of the contaminant plume would also be reduced by the ISCO process.

Short-Term Effectiveness

Alternative 1 would not have any short-term impact since no action would be taken. Alternative 2 would have some impact to the community during the pilot testing and enhancement pre-design investigation and installation of wells. Construction of the treatment system may require access to private properties. Alternative 3 may also require access to private properties and would involve the use of heavy construction equipment. *The traffic on local roads would be impacted. Alternative 4 would also have some impact* on the community since access to private properties would be necessary.

Implementability

Alternative 1 involves no action and thus has no implementability issues. Alternative 2 involves an innovative technology. Understanding of the cometabolic process at the Site and selection of proper equipment are still under development but at a rapid rate. Property access may add to the implementation challenges. Alternative 3 would be easy to implement technically, but challenging to implement administratively. Obtaining land for the treatment system and piping of influent and effluent lines would be difficult in the fully-developed residential area. Discharge of the treated effluent would also need to be resolved. Like the other action alternatives, land access would be needed to implement Alternative 4; however, access to a larger number of private properties would be required. Also an experienced operator would be needed in order to effectively distribute the oxidant in the subsurface via multiple injection wells. Implementation of ISCO in widespread and dilute groundwater plumes is typically not a proven and cost-effective technology.

Cost

The estimated capital, annual cost, and present-worth costs for each alternative are presented in the table below. All costs are presented in U.S. dollars and were developed using a discount rate of 7%.

Remedial Alternative	Capital Costs	Annual Operating Costs	Total Present Worth Cost
1	$0	0	0
2	$6,790,000	$410,000	$12,000,000
3	$7,980,000	$940,000	$17,470,000
4	$10,720,000	$460,000	$25,530,000

According to the capital cost, annual operating cost, and total present-worth cost estimates, Alternative 1 has the lowest cost and Alternative 4 has the highest cost when comparing all alternatives.

State Acceptance

NYSDEC concurs with the proposed remedy.

Community Acceptance

The public generally supported EPA's preferred alternative during the public meeting. The comments received are summarized and addressed in the Responsiveness Summary, which is attached as Appendix V to this document.

PRINCIPAL THREAT WASTE

No materials which meet the definition of "principal threat wastes" were identified during the RI/FS.

SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, EPA has determined that for OU 1, Alternative 2, Aerobic Cometabolic Bioremediation, best satisfies the requirements of CERCLA Section 121, 42 U.S.C. Section 9621, and provides the best balance of tradeoffs among the remedial alternatives with respect to the NCP's nine evaluation criteria listed at 40 CFR Section 300.430(e)(9).

Dilute groundwater plumes, such as the one found at the Site, are particularly difficult to address through active remediation because of the relatively low levels of contamination and the size of the plume. Traditional treatment technologies work best when applied to much higher levels of contamination. At the Site, EPA has determined that it is appropriate to utilize an innovative technology – aerobic cometabolic bioremediation – to accelerate the reduction of contaminant levels in the aquifer. ACB involves a process whereby micro-organisms present in the aquifer consume organic substrates and oxygen under aerobic conditions and produce an enzyme which destroys contaminants such as TCE. Aquifer conditions at the Site are favorable for reduction of the Site contaminants through this technology. Implementation of Alternative 2 will provide the best overall protection of human health and would reduce contaminant levels in the aquifer. EPA believes that it will be the most effective in the long term in restoring the quality of the groundwater and eliminating vapors associated with the groundwater plume. It is also cost effective and will be a permanent solution.

Description of the Selected Remedy

Alternative 2 – Aerobic Cometabolic Bioremediation

Capital Cost:	$6,790,000
Annual Cost:	$410,000

Present-Worth Cost:	$12,000,000
Duration Time:	30 years

Alternative 2 will consist of the following components:

- A pre-design investigation and pilot study of ACB to determine the rate and the parameters for full-scale enhancement of aerobic cometabolic degradation in the aquifer.

- Remedial design and implementation of full-scale enhancement of the ACB remedy to achieve restoration of the groundwater to drinking water standards within a reasonable time period.

- Long-term groundwater monitoring to track the movement of and changes in the contaminated groundwater plume.

- Vapor monitoring of homes located above the groundwater plume for vapor intrusion and implementation of vapor mitigation systems in homes that exceed protective levels.

ACB is an innovative technology that will be investigated during the pre-design phase of the project, and design parameters will be determined through a pilot study before the remedial design and implementation.

The Aerobic Cometabolic Bioremediation Alternative includes the following components.

<u>Pre-design Investigations of Aerobic Cometabolic Bioremediation</u>

Groundwater samples would be collected for enzyme and molecular analyses and microcosm studies. The pre-design investigation of aerobic cometabolism would be accomplished in two phases. The first phase would involve collection of samples from 8 to 10 monitoring wells for standard groundwater chemistry parameters, enzyme probe assays, and molecular techniques. The wells would be selected to represent various conditions at the Site (e.g., high concentration areas, low concentration areas, background wells). Results from the Phase 1 sampling events would be compiled and analyzed with the groundwater chemistry and contaminant results, the enzyme probe results, the DNA results, and historical data to determine the extent of ACB in the aquifer and to estimate an overall contamination degradation rate. The second phase of the investigation would involve microcosm studies using Site groundwater. Groundwater would be collected from selected locations and sent to a specialty laboratory. The microcosm studies would measure TCE degradation and enzyme activity in Site groundwater; these results would then be used to estimate Site-specific intrinsic cometabolic degradation rates.

Pilot Study of Enhanced Aerobic Cometabolic Bioremediation

A pilot study will be conducted in the 50 µg/L plume and in more dilute areas of the plume to evaluate the effectiveness of enhanced ACB at this Site, to obtain Site-specific design parameters, and to test system configurations that will be suitable for Site conditions. A work plan will be developed and approved by EPA that describes the locations and design of the pilot study.

A conceptual approach for the pilot study in the plume core is described here. First, groundwater screening will be conducted at the pilot study area from two borings to delineate the vertical distribution of the contaminant plume. Based on the groundwater screening data, amendment releasing wells and multi-level monitoring wells will be installed. To avoid sparging the contaminated groundwater, which potentially could cause vapor intrusion issues, Waterloo Emitters, or equivalent, a passive device that delivers gas phase amendment (e.g., oxygen) to groundwater by diffusion from pressurized tubing, or similar devices, could be used. Four amendment release wells (two 2-inch and two 4-inch) screened from the water table to approximately 40 feet bgs will be drilled within the 50 µg/L TCE contaminant plume perpendicular to groundwater flow. A passive device will be installed inside the amendment release wells (two 1.8-inch and two 3.8-inch). The distance between amendment release wells will be approximately 5 feet. Six monitoring wells or CMT monitoring systems will be installed to monitor the progress of ACB. One well each will be installed upgradient and side gradient and four wells will be installed downgradient of the amendment release wells at different distances. If groundwater screening data indicate large vertical variation in contaminant distribution, CMT systems will be used, which may provide vertically discrete information on amendment distribution and ACB. The amendment could be oxygen and/or a primary substrate identified for testing prior to the pilot study.

Once the pilot study begins, an operator will visit the system every two weeks to replenish the pressurized gas in the passive diffusion wells. Groundwater samples will be collected monthly for approximately 18 months. Groundwater samples will be analyzed for the primary substrate, dissolved oxygen, VOCs and other parameters identified as necessary. Selected samples will be analyzed using enzyme activity probes. Results of the pilot study and the Site-wide ACB investigation (described above) will provide Site-specific data for use during the remedial design of the enhanced ACB system.

It should be noted that the pilot study described above is for cost estimating purposes. Actual design, operation and monitoring details of the pilot study will be specified in the pilot study work plan for EPA's review and approval.

Implementation of Enhanced Aerobic Cometabolic Bioremediation

Parameters determined during the pilot testing will be used to design and implement a full scale enhanced ACB system at this Site.

A conceptual ACB system is described here. It is currently assumed that two transects of passive diffusion wells will be installed in or immediate downgradient of the 50 µg/L TCE plume. A total of 10 groundwater screening locations will be drilled to define the treatment zone. Groundwater screening samples will be analyzed for VOCs. It is estimated that approximately 160 passive gas diffusion wells will be installed to create a treatment zone approximately 800 feet long. The passive gas diffusion wells will be 4-inch diameter PVC wells screened from the water table to approximately 40 feet bgs. Figure 9 shows a conceptual placement of ACB amendment release locations. Six monitoring wells will be installed downgradient of the treatment zone(s). Operational requirements would be developed as part of the remedial design, based on results from the pilot test.

Long-term Monitoring

Under this alternative, groundwater samples will be collected periodically from the monitoring well network of 35 wells strategically located in and around the groundwater plume. The analytical results will be used to evaluate the migration of and changes in the contaminant plume over time. The monitoring well samples will be collected in the late spring or early summer to allow adequate time to evaluate changes in the geometry of the plume in order to plan the periodic vapor sampling during the winter heating season.

Vapor intrusion caused by volatilization from the groundwater contaminant plume has been monitored and mitigated by EPA for several years. Under the long-term monitoring program, a periodic inspection would be conducted of the 53 existing vapor extraction systems to ensure that the systems are working properly. In addition, EPA would conduct periodic vapor sampling in the areas of the Site considered likely to experience vapor intrusion, based on changes in the groundwater plume as determined by the periodic monitoring well sampling and previously conducted vapor sampling. Since 2003, EPA has conducted vapor sampling at 209 homes over the groundwater plume, with many of the homes sampled multiple times. During the initial years of the planned, future periodic vapor sampling, the vapor monitoring would focus on structures that had never been sampled (approximately 18 homes) and/or homes that had been sampled for vapors only once (approximately 35 homes). This would ensure that each home will be sampled at least twice. In addition, after the first few years of annual monitoring, homes to be sampled periodically would be selected based on changes in the contaminant plume, especially in any areas where the groundwater contaminant levels appeared to be increasing, and proximal to properties already experiencing vapor intrusion. Vapor sampling would include collection of three air samples (sub-slab, basement, and first floor) at each building. If vapor sampling indicates the presence of vapors exceeding screening criteria as well as other lines of evidence, a vapor extraction system would be installed. For cost estimating purposes, it is assumed that 50 residences would be sampled annually for 30 years, and a total of 10 residences would require installation of a vapor mitigation system.

Green Remediation Considerations

Under this alternative, green remediation objectives can be implemented by planning field activities that minimize fuel usage and impact to the environment. Planning that can minimize environmental impact includes, but will not be limited to:

- Minimize number of field mobilizations
- Use ultra low sulfur diesel or fuel-grade biodiesel as fuel (drillers)
- Use non-phosphate detergents for decontamination
- Schedule sampling to minimize shipping
- Use of in-situ treatment and natural degradation processes to minimize energy usage and generation of GHG

Five-Year Review

A review of Site conditions will be conducted every five years, which will typically include an evaluation of the extent of contamination and an assessment of contaminant migration and attenuation over time. The progress of ACB will also be monitored, and the continuation of the remedy and long-term monitoring program will be evaluated. The first five year review will be due within five years of the construction of the enhanced ACB remedy to ensure that the groundwater remedy is protective of human health.

Duration of this Alternative

The enhanced ACB system would be operated until the groundwater aquifer has been restored to drinking water standards. In addition, the long-term monitoring program would continue as long as TCE concentrations in groundwater are above the Cleanup Levels. For cost estimating purposes, it was assumed that this alternative will last for 30 years.

Summary of the Estimated Remedy Costs

The estimated capital and total present-worth cost for the selected groundwater remedy are $6,790,000 and $12,000,000, respectively. Table 7 provides the basis for the cost estimate for Alternative 2.

It should be noted that these cost estimates are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual project cost. These cost estimates are based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the pre-design investigation, the pilot study, and the engineering design of the remedy.

Expected Outcomes of the Selected Remedy

The results of the risk assessment indicate that there is an unacceptable cancer risk from exposure to contaminated groundwater through ingestion, inhalation, and dermal contact to residents if they utilize contaminated water as a source of drinking water.

The selected remedy will allow for the following potential land and groundwater use.

<u>Land Use</u>

The land use at the Site is not expected to change in the future. The residential area includes nearly 400 homes and is expected to remain residential. Commercial development is generally limited to the area around Route 82 that traverses the Site in a northeast-southwest direction.

<u>Groundwater Use</u>

The implementation of the ACB remedy for OU1 will reduce contaminant levels in the groundwater, thus restoring the aquifer to natural conditions. Under the selected remedy for OU2 (installation of a public water line), residential and commercial use of groundwater will be terminated after that OU 2 remedy is fully operational. The Town of East Fishkill Code requires that piping from existing private drinking wells be disconnected between the wellhead and the house upon hook-up to the public water supply system. Groundwater at the Site will no longer be used as a source of drinking water accessed through private wells.

STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at a site.

For the reasons discussed below, EPA has determined that the selected groundwater remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Aerobic Cometabolic Bioremediation alternative will protect human health and the environment by biodegrading TCE to carbon dioxide and water. The long-term monitoring program will monitor the changes and migration of the TCE plume, and vapor intrusion testing will further ensure the protection of human health from potential exposure from that medium. This alternative, together with the remedy selected in the OU 2 ROD, which provides potable water to residences in the contaminant area, will provide overall protection to human health.

The contamination level at the Site, as determined during the RI, is relatively low (the highest detected TCE concentration in monitoring wells was 94 µg/L). The groundwater contamination will be reduced through aerobic cometabolic bioremediation and natural attenuation processes, such as dilution, dispersion, discharge to surface water bodies, volatilization, and decomposition through photodeionization. The aquifer is expected to achieve the Cleanup Levels within a reasonable timeframe. This alternative will also protect the environment through restoration of the aquifer.

Compliance with ARARs and Other Environmental Criteria, Advisories or Guidance

A summary of the ARARs and other federal or state advisories, criteria, or guidance and TBCs is presented below. TBCs may be very useful in determining what is protective at a site or how to carry out certain actions or requirements.

<u>Federal ARARs and TBCs</u>

- National Primary Drinking Water Standards (40 CFR 141). Drinking water standards (MCLs and non zero maximum contaminant level goals [MCLGs]). Note that these MCLs are considered relevant and appropriate requirements for groundwater which is classified as suitable for drinking water (CERCLA Section 300.430[e][2][i][b])
- OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (EPA530-D-02-004)
- National Historic Preservation Act (40 CFR 6.301)
- Statement on Procedures on Floodplain Management and Wetlands Protection (40 CFR 6 Appendix A)
- Policy on Floodplains and Wetland Assessments for CERCLA Actions (OSWER Directive 9280.0-12, 1985)
- Wetlands Executive Order (Executive Order 11990)
- Resource Conservation and Recovery Act (RCRA): Identification and Listing of Hazardous Waste (40 CFR 261); Standards Applicable to Generators of Hazardous Waste (40 CFR 262); Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities (40 CFR 264)
- Hazardous Materials Transportation Regulations (49 CFR 107, 171, 172, 177, and 179)
- Federal Resource Conservation and Recovery Act – Standards Applicable to Transporters of Hazardous Waste (40 CFR 263).
- Federal Resource Conservation and Recovery Act – Land Disposal Restrictions (40 CFR 268).
- Federal Clean Water Act – National Pollutant Discharge Elimination System (40 CFR 100 et seq.); Effluent Guidelines and Standards for the Point Source Category (40 CFR 414)

- Federal Safe Drinking Water Act – Underground Injection Control Program (40 CFR 144, 146)
- Federal Clean Air Act National Ambient Air Quality Standards (40 CFR 50); National Emission Standards for Hazardous Air Pollutants (40 CFR 61)
- Federal Directive Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites (OSWER Directive 9355.0 28)

New York State ARARs and TBCs

- New York State Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (6 NYCRR Part 703).
- New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1).
- NYSDOH Drinking Water Standards (10 NYCRR Part 5).
- Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 by New York State Department of Health
- New York Wetland Laws (Articles 24-25).
- New York Freshwater Wetland Permit Requirements and Classification (Articles 663 and 664)
- Environmental Remedial Program (6 NYCRR Part 375) – General Remedial Program Requirements (Subpart 375.1) and Environmental Restoration Program (Subpart 375.4)
- Hazardous Waste Management System General (6 NYCRR Part 370.1)
- Identification and Listing of Hazardous Wastes (6 NYCRR Part 371)
- Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (6 NYCRR Part 372)
- Waste Transporter Permit Program (6 NYCRR Part 364)
- Standards for Universal Waste (6 NYCRR Part 374-3)
- Land Disposal Restrictions (6 NYCRR Part 376)
- The New York Pollutant Discharge Elimination System (NYPDES) (6 NYCRR Part 750 – 757)
- New York State Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (6 NYCRR Part 703).
- New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1).
- General Provisions (6 NYCRR Part 200)
- Emissions Verification (6 NYCRR Part 202)
- General Prohibitions (6 NYCRR Part 211)
- General Process Emission Sources (6 NYCRR Part 212)
- New York Air Quality Standards (6 NYCRR Part 257)
- New York State DEC (6 NYCRR Part 601) Water Supply Applications
- New York State DOH State Sanitary Code Appendix 5 B Standards for water wells

Cost-Effectiveness

A cost-effective remedy is one whose costs are proportional to the remedy's overall effectiveness (NCP Section 300.430(f)(1)(ii)(D)). Overall effectiveness is based on the evaluations of: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. Based on the comparison of overall effectiveness to cost, the selected remedy meets the statutory requirement that Superfund remedies be cost-effective in that it is a permanent remedy and will restore the aquifer through destruction of the contaminants by ACB.

Each of the alternatives has undergone a detailed cost analysis. In that analysis, capital and annual operation and maintenance costs have been estimated and used to develop present-worth costs. In the present-worth cost analysis, annual operation and maintenance costs were calculated for the estimated life of an alternative using a 7% discount rate. The estimated present-worth cost of the selected OU 1 groundwater remedy is $12,000,000. EPA believes that the cost of the selected alternative is proportional to its overall effectiveness because it will restore the aquifer through destruction of the contaminants.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and alternative treatment technologies can be utilized in a practicable manner at the Site. The selected remedy provides the best balance of tradeoffs among the alternatives with respect to the balancing criteria set forth in NCP, ,40 CFR 300.430(e)(9)(iii), such that it represents the best potential to restore the natural condition of the aquifer. The selected remedy, especially when combined with the OU2 alternate water supply, provides protection of human health, long-term effectiveness and is permanent.

The selected OU 1 groundwater remedy is considered a permanent remedy and offers the best protection of human health among the alternatives evaluated.

Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment as a principal element is satisfied under the selected groundwater remedy since enhanced aerobic cometabolic bioremediation will be implemented for the Site groundwater and will restore the natural conditions of the aquifer.

Five-Year Review Requirements

Because hazardous substances will remain at this Site above levels that would allow for unlimited use and unrestricted access until the remedies are completed, pursuant to

Section 121(c) of CERCLA, a policy review will be conducted within five years of the construction of the enhanced ACB remedy to ensure that the groundwater remedy is or will be protective of human health and the environment. Five-year reviews will continue until it is determined that cleanup levels have been achieved.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan, released for public comment on July 31, 2009, identified Alternative 2 (aerobic cometabolic bioremediation) as the preferred alternative. The public supported the preferred alternative during the public meeting, and no changes have been made to the preferred alternative described in the Proposed Plan.

HOPEWELL PRECISION SUPERFUND SITE
RECORD OF DECISION

APPENDIX I

FIGURES

SUMMARY OF FIGURES

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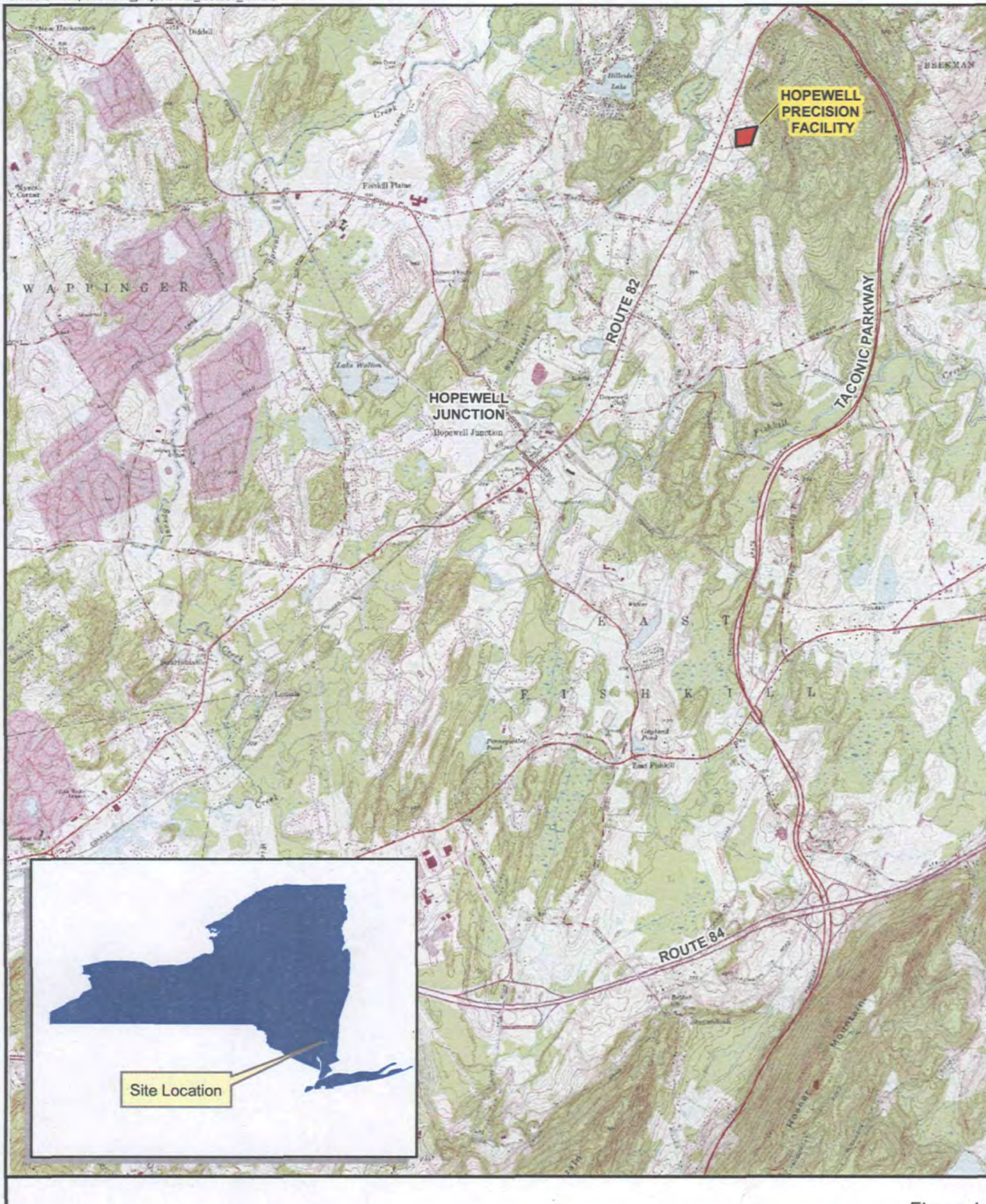

CDM

Figure 1
Site Location Map
Hopewell Precision Site
Hopewell Junction, New York

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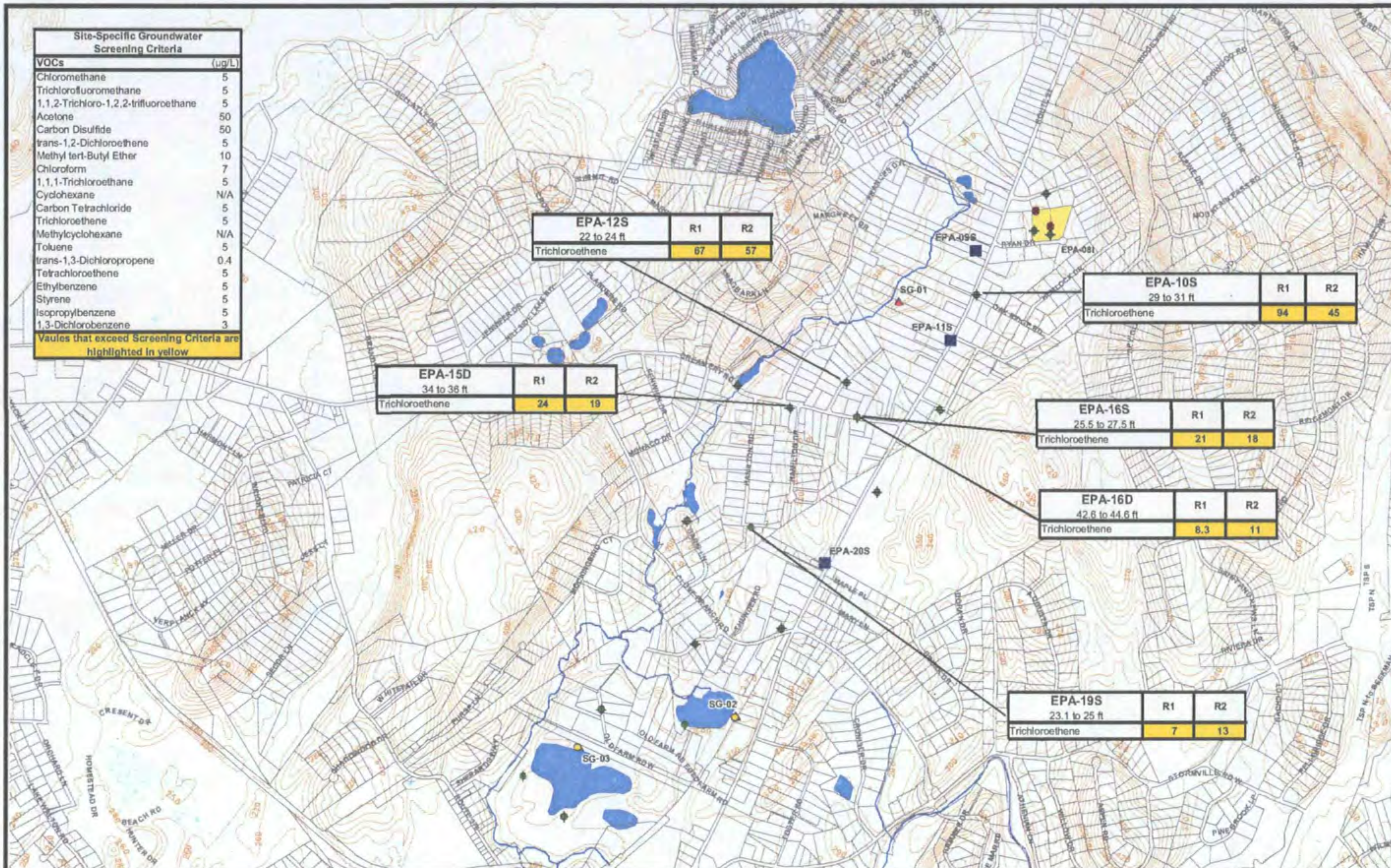
CDM

Figure 2
Site Map
Hopewell Precision Site
Hopewell Junction, New York



Site-Specific Groundwater Screening Criteria	
VOCs	(µg/L)
Chloromethane	5
Trichlorofluoromethane	5
1,1,2-Trichloro-1,2,2-trifluoroethane	5
Acetone	50
Carbon Disulfide	50
trans-1,2-Dichloroethene	5
Methyl tert-Butyl Ether	10
Chloroform	7
1,1,1-Trichloroethane	5
Cyclohexane	N/A
Carbon Tetrachloride	5
Trichloroethene	5
Methylcyclohexane	N/A
Toluene	5
trans-1,3-Dichloropropene	0.4
Tetrachloroethene	5
Ethylbenzene	5
Styrene	5
Isopropylbenzene	5
1,3-Dichlorobenzene	3
Vaules that exceed Screening Criteria are highlighted in yellow	

Legend:

- Staff Gauges
- EPA Monitoring Well with VOC Detections
- Previous Investigation Monitoring Well
- Piezometer
- Parcel Boundary
- Topographic Contours - Feet amsl
- EPA Monitoring Well with No VOC Detections

Acronyms:

amsl - above mean sea level
ft - feet
J - estimated value
R1 - Round 1
R2 - Round 2
U - not detected over method detection limit
µg/L - microgram per liter
VOCs- Volatile Organic Compounds

Notes:

Round 1 was collected in March, 2007
Round 2 was collected in July, 2007
Sample intervals are in depth below ground surface
All results are in µg/L

N

0 500 1,000 2,000 Feet

Figure 3
Monitoring Well Sampling Volatile Organic Compound Exceedances
Hopewell Precision Site
Hopewell Junction, New York

CDM

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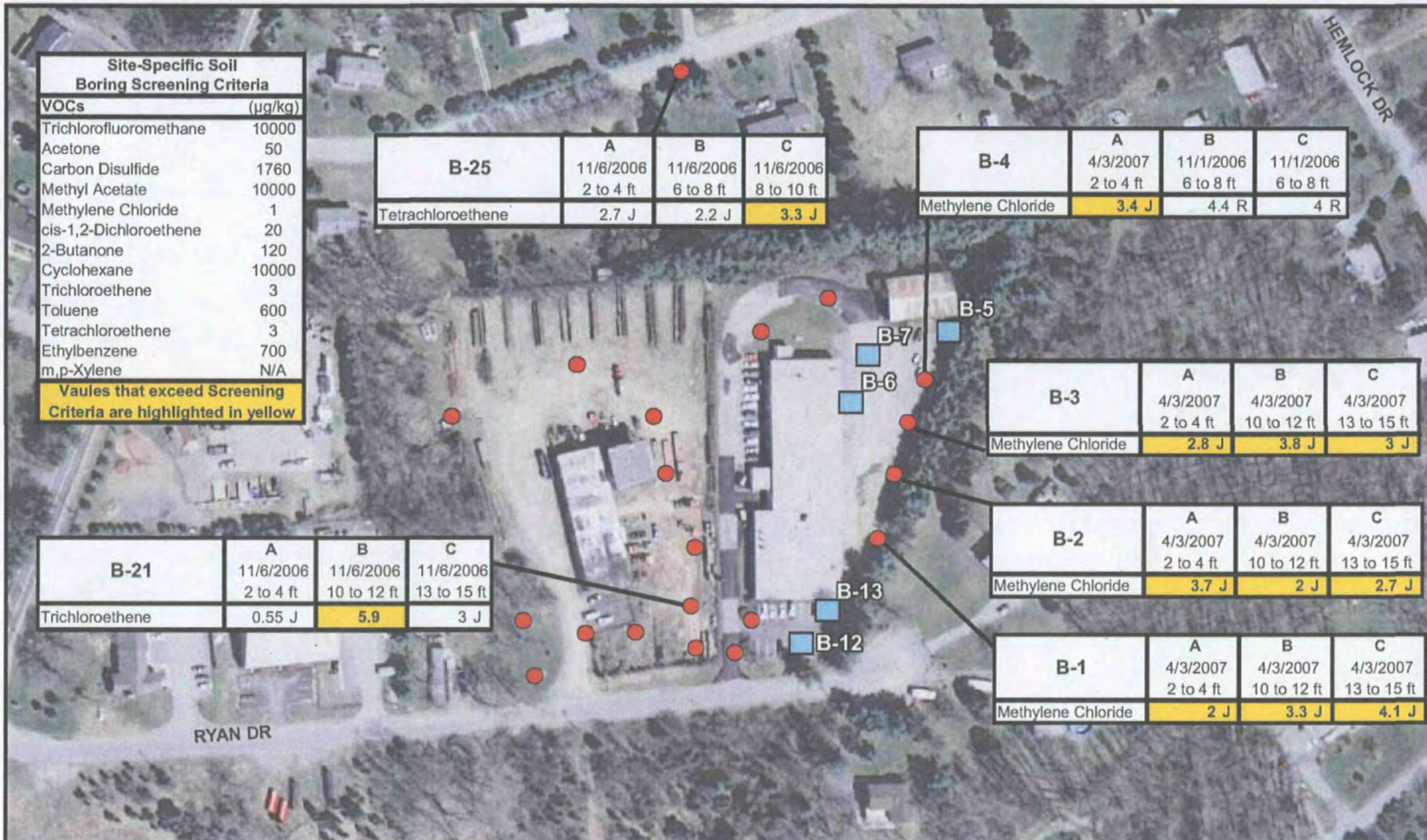
Figure 4
TCE &1,1,1-TCA Contaminant Plumes
Hopewell Precision Site
Hopewell Junction, New York

CDM



Site-Specific Soil Boring Screening Criteria	
VOCs	(µg/kg)
Trichlorofluoromethane	10000
Acetone	50
Carbon Disulfide	1760
Methyl Acetate	10000
Methylene Chloride	1
cis-1,2-Dichloroethene	20
2-Butanone	120
Cyclohexane	10000
Trichloroethene	3
Toluene	600
Tetrachloroethene	3
Ethylbenzene	700
m,p-Xylene	N/A

Vaules that exceed Screening Criteria are highlighted in yellow

B-25	A 11/6/2006 2 to 4 ft	B 11/6/2006 6 to 8 ft	C 11/6/2006 8 to 10 ft
Tetrachloroethene	2.7 J	2.2 J	3.3 J

B-4	A 4/3/2007 2 to 4 ft	B 11/1/2006 6 to 8 ft	C 11/1/2006 6 to 8 ft
Methylene Chloride	3.4 J	4.4 R	4 R

B-3	A 4/3/2007 2 to 4 ft	B 4/3/2007 10 to 12 ft	C 4/3/2007 13 to 15 ft
Methylene Chloride	2.8 J	3.8 J	3 J

B-2	A 4/3/2007 2 to 4 ft	B 4/3/2007 10 to 12 ft	C 4/3/2007 13 to 15 ft
Methylene Chloride	3.7 J	2 J	2.7 J

B-21	A 11/6/2006 2 to 4 ft	B 11/6/2006 10 to 12 ft	C 11/6/2006 13 to 15 ft
Trichloroethene	0.55 J	5.9	3 J

B-1	A 4/3/2007 2 to 4 ft	B 4/3/2007 10 to 12 ft	C 4/3/2007 13 to 15 ft
Methylene Chloride	2 J	3.3 J	4.1 J

Note: Aerial Photograph dated 2004.

Sample intervals are in feet below ground surface.

All sample results are in µg/kg.

Legend:

- Soil Sample Location with VOC Detections
- Boring Sample Location with no VOC Detections

N

0 50 100 200 300 400 Feet

Acronyms:

ft - feet

J - estimated value

R - rejected data

U - not detected above the method detection limit

µg/kg - microgram per kilogram

VOCs- Volatile Organic Compounds

CDM

Figure 5
Source Area Soil Volatile Organic Compound Exceedances
Hopewell Precision Site
Hopewell Junction, New York

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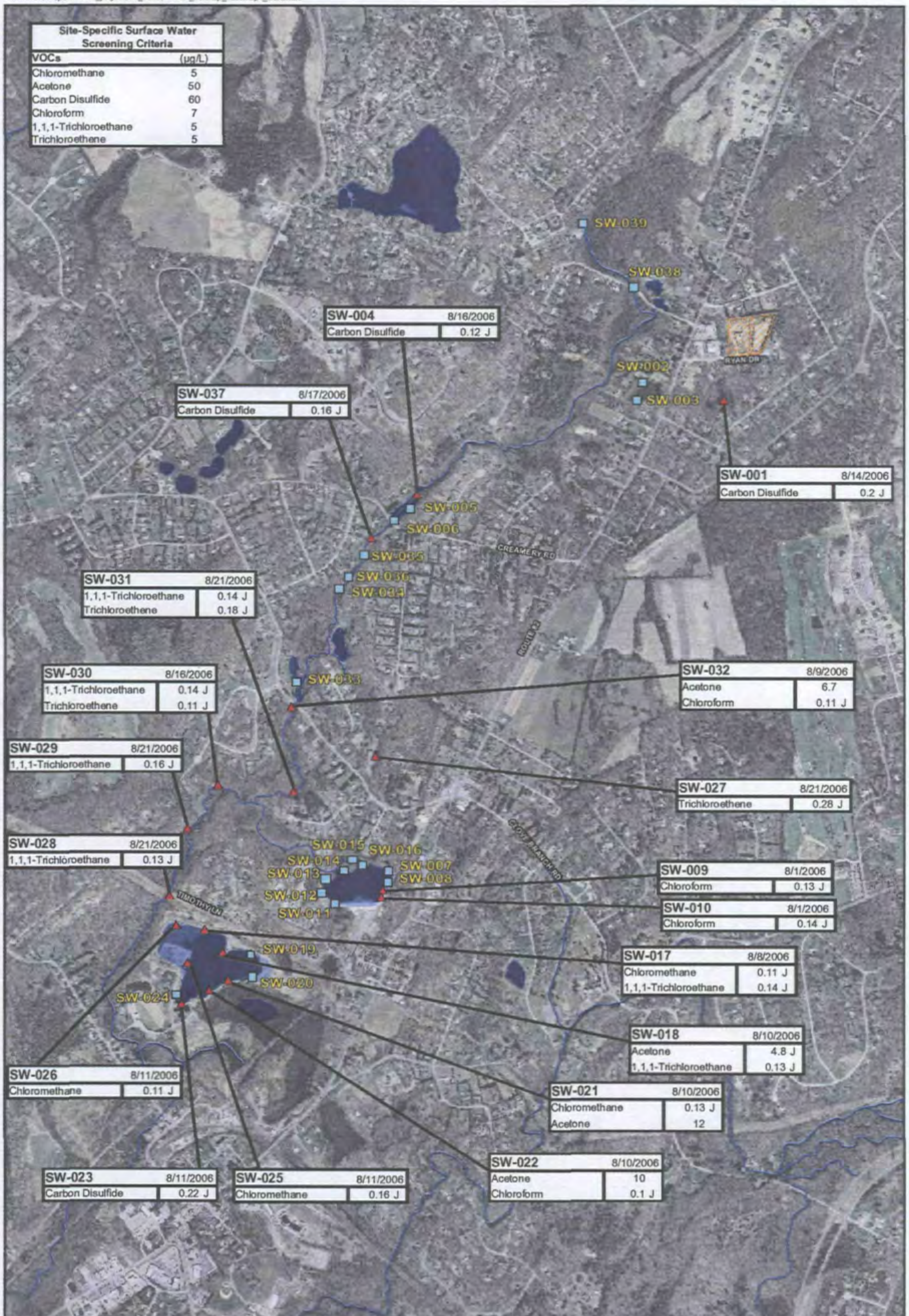

Note: All results are in µg/L

- ▲ Surface Water Sample Location with VOC Dectections
- Hopewell Precision Facility
- ■ Surface Water Sample Location with no VOC Detections

Acronyms:

amsl - above mean sea level J - estimated value
µg/L - microgram per liter VOCs- Volatile Organic Compounds

N

0 500 1,000 2,000 Feet

CDM

Figure 6
Surface Water Sample
Volatile Organic Compound Detections
Hopewell Precision Site
Hopewell Junction, New York

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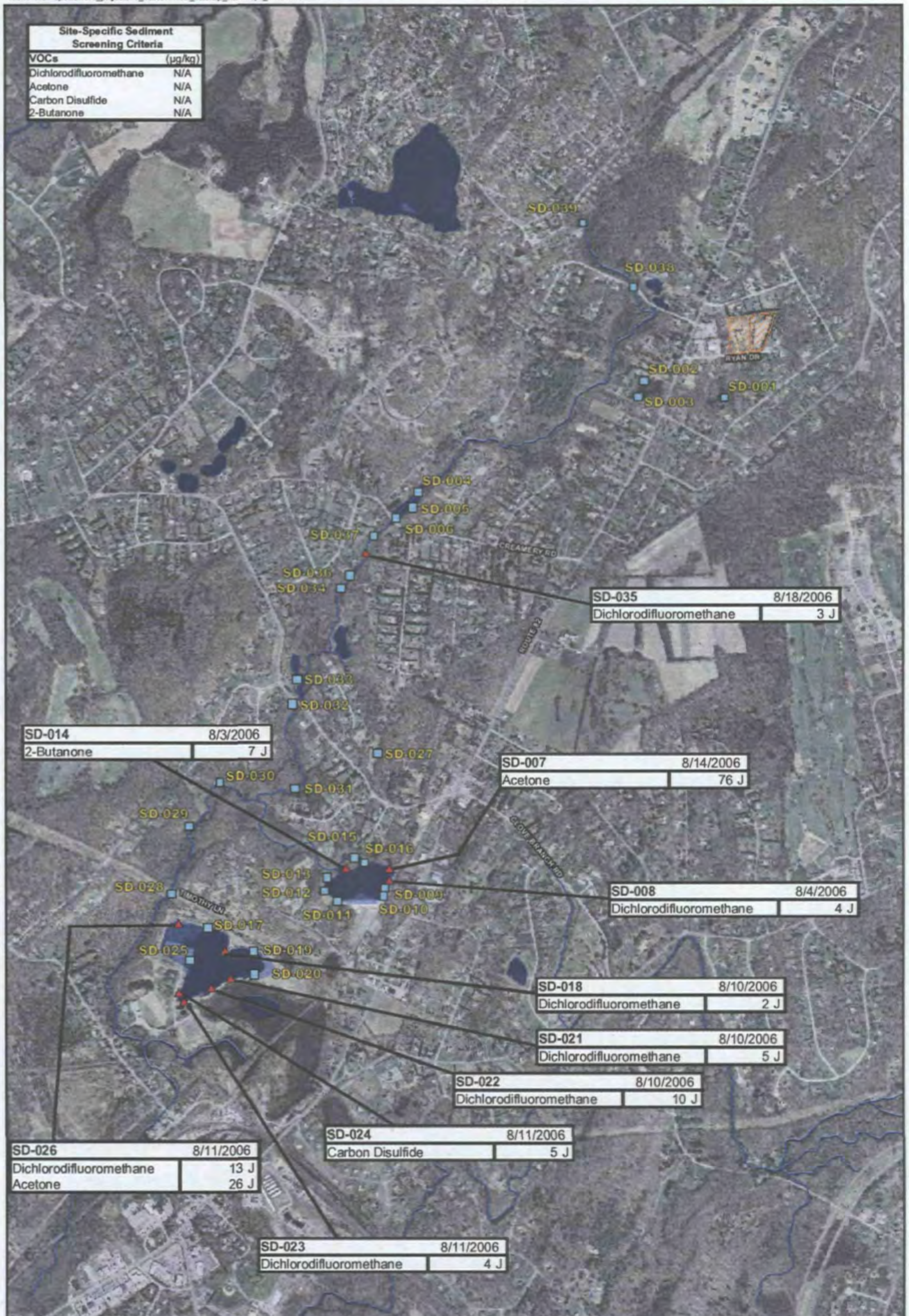

▲ Sediment Sample Location with VOC Detections
Hopewell Precision Facility
■ Sediment Water Sample Location with no VOC Detections

Acronyms:
J - estimated value
µg/kg - microgram per kilogram
VOCs- Volatile Organic Compounds

CDM

N
0 500 1,000 2,000 Feet

Notes:
All samples were collected from 0-6 inches below ground surface
All results are in µg/kg

Figure 7
Sediment Sample Volatile Organic Compounds Detections
Hopewell Precision Site
Hopewell Junction, New York

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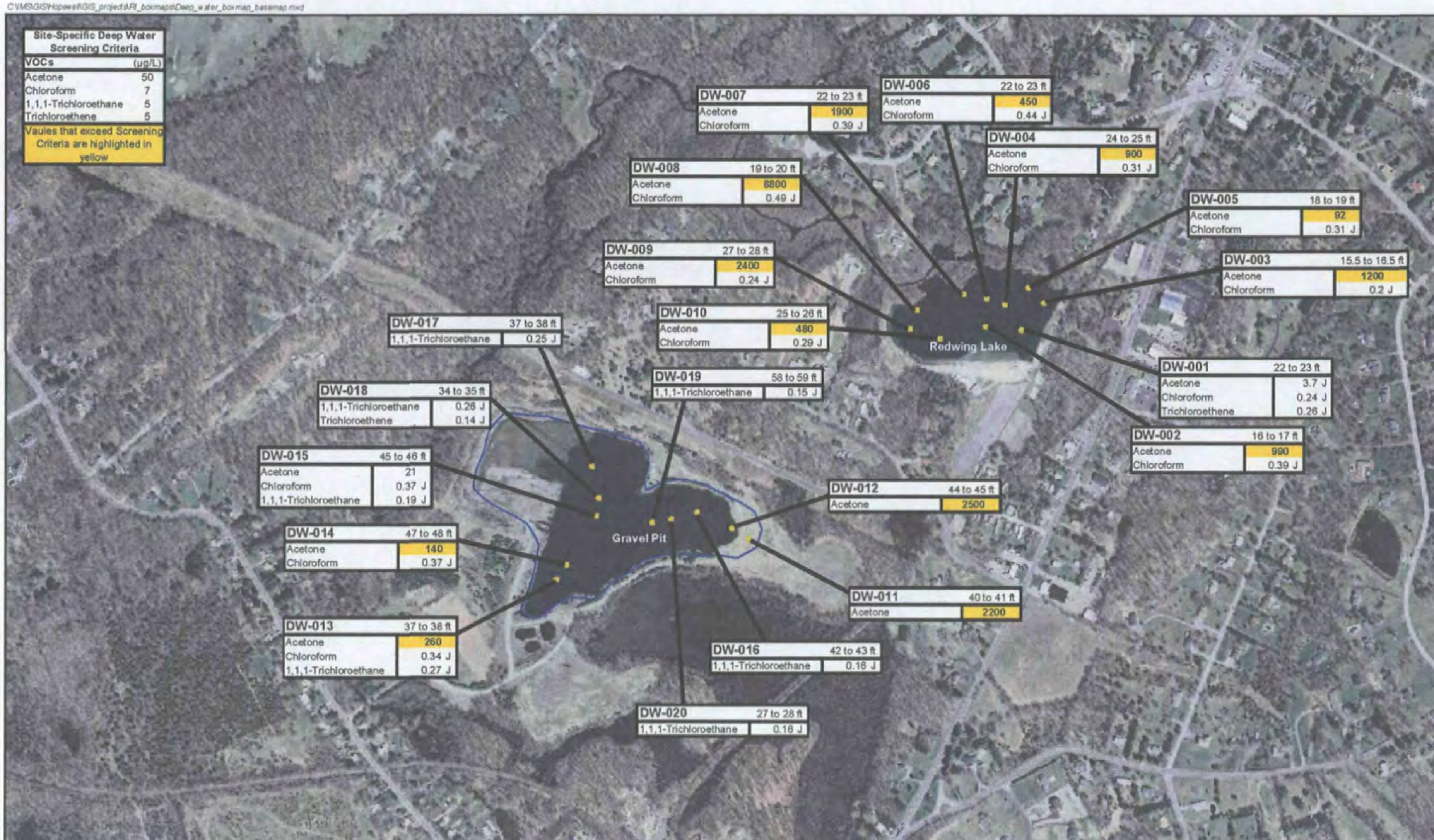

Note: Aerial Photograph dated 2004. Sample DW-11 was taken in a portion of the Gravel Pit lake that was expanded in 2006
All samples were collected in August, 2006
Sample intervals are in depth below water surface
All results are in µg/L

CDM

- Deep Water Sample
- Current Gravel Pit Extent

Acronyms:
ft - feet
J - estimated value
µg/L - microgram per liter
VOCs- Volatile Organic Compounds

N

0 250 500 1,000 Feet

Figure 8
Deep Water Sample Volatile Organic Compound Detections
Hopewell Precision Site
Hopewell Junction, New York

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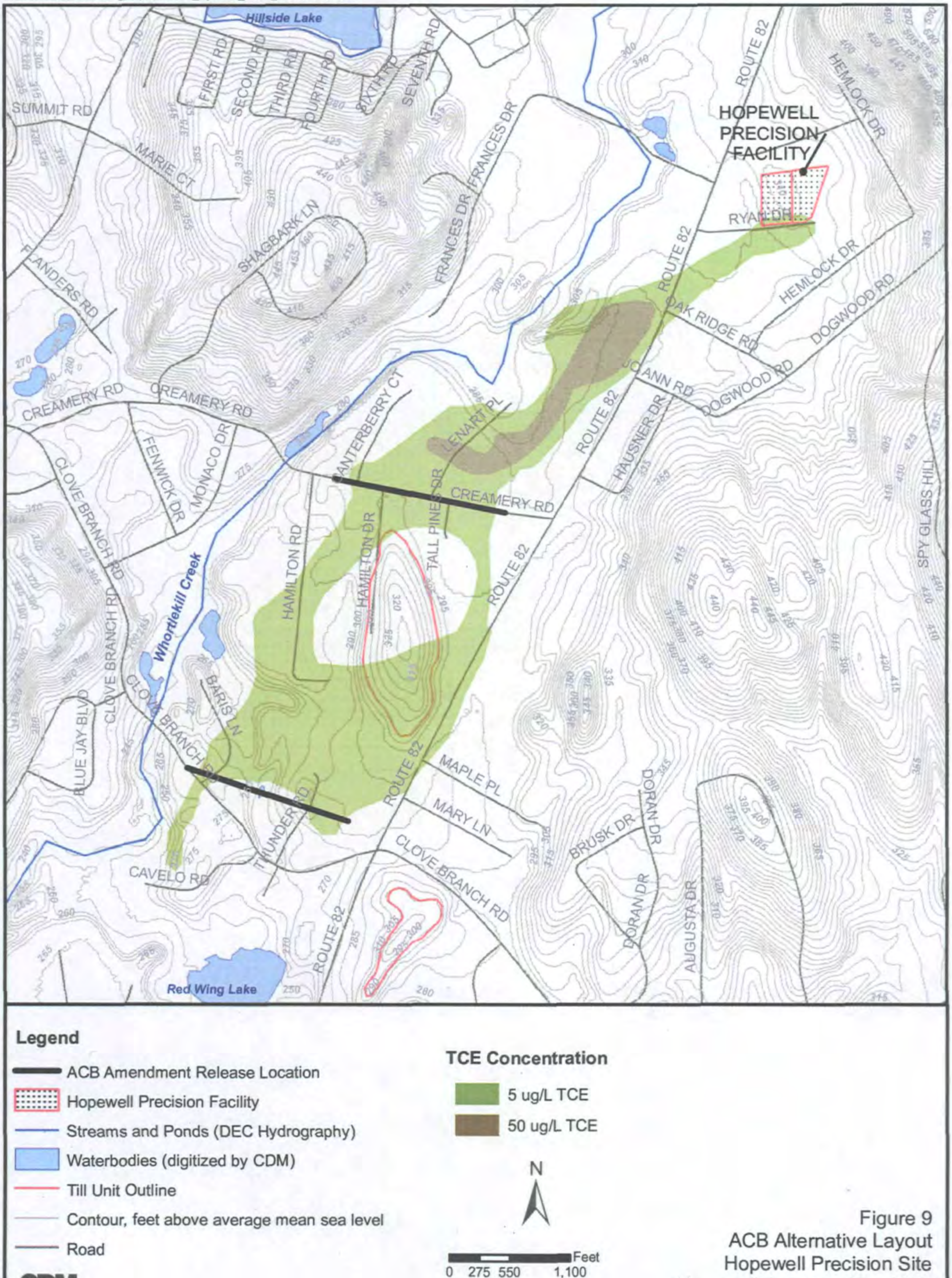


Figure 9
ACB Alternative Layout
Hopewell Precision Site
Hopewell Junction, New York

HOPEWELL PRECISION SUPERFUND SITE
RECORD OF DECISION

APPENDIX II

TABLES

SUMMARY OF TABLES

TABLE 1
Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Tap Water	Tetrachloroethene	0.099	0.66	µg/l	11/62	0.27	µg/l	UCL-N
	Trichloroethene	0.1	94	µg/l	23/62	20	µg/l	UCL-NP
	Arsenic	16	16	µg/l	1/60	16	µg/l	Maximum

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Surface Water	Trichloroethene	0.11 J	0.28 J	µg/l	4/10	0.28	µg/l	Maximum

UCL-N – 95% Modified –t Upper-Confidence Limit
UCL-NP – 97.5% Chebyshev (mean, Sd) Upper Confidence Limit
Maximum – Maximum Detected Concentration

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

This table presents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in groundwater and surface water (i.e., the concentration that will be used to estimate the exposure and risk from each COC). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC and how it was derived.

TABLE 2
SELECTION OF EXPOSURE PATHWAYS

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/ Future	Groundwater	Groundwater	Tap Water	Facility Worker	Adult	Ingestion	On-site	Quant	Facility workers may use groundwater as a potable supply of water.
				Residents	Adult	Ingestion/Dermal /Inhalation	Off-site	Quant	Current and future residents may use groundwater as a potable supply of water.
					Child	Ingestion/Dermal /Inhalation	Off-site	Quant	Current and future residents may use groundwater as a potable supply of water.
Future	Soil	Soil	Subsurface Soil	Construction Workers/	Adult	Ingestion/Dermal	On-site	Quant	Future construction workers may contact soil while working at the facility.
Current/ Future	Surface Water	Surface Water	Water Bodies	Recreational Users	Adult	Ingestion/Dermal	Off-site	Quant	Current and future recreational users may ingest/contact water through recreating in the water bodies at the site.
					Adolescent (12-18 yrs)	Ingestion/Dermal	Off-site	Quant	Current and future recreational users may ingest/contact water through recreating in the water bodies at the site.
					Child (0-6 yrs)	Ingestion/Dermal	Off-site	Quant	Current and future recreational users may ingest/contact water through recreating in the water bodies at the site.
Current/ Future	Sediment	Sediment	Water Bodies	Recreational Users	Adult	Ingestion/Dermal	Off-site	Quant	Current and future recreational users may ingest/contact with sediments through recreating in the water bodies at the site.
					Adolescent (12-18 yrs)	Ingestion/Dermal	Off-site	Quant	Current and future recreational users may ingest/contact with sediments through recreating in the water bodies at the site.
					Child (0-6 yrs)	Ingestion/Dermal	Off-site	Quant	Current and future recreational users may ingest/contact with sediments through recreating in the water bodies at the site.

Quant = Quantitative risk analysis performed.

Summary of Selection of Exposure Pathways

The table describes the exposure pathways associated with the groundwater, soil, surface water, and sediment that were evaluated for the risk assessment, and the rationale for the inclusion of each pathway. Exposure media, exposure points, and characteristics of receptor populations are included.

TABLE 3

Non-Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Absorp. Efficiency (Dermal)	Adjusted RfD (Dermal)	Adj. Dermal RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates of RfD:
Tetrachloroethene	Chronic	1.0E-02	mg/kg-day	-----	1.0E-02	mg/kg-day	Liver	1000	IRIS	12-03/07
Trichloroethene	Chronic	3.0E-04	mg/kg-day	-----	3.0E-04	mg/kg-day	CNS Liver	3000	EPA	2001
Arsenic	Chronic	3.0E-04	mg/kg-day	-----	3.0E-04	mg/kg-day	Skin	3	IRIS	12/03/07

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates:
Tetrachloroethene	Chronic	-----	-----	1.4E-01	mg/kg-day	Liver	na	NCEA	10/01/04
Trichloroethene	Chronic	4.0E-02	mg/m^3	1.0E-02	mg/kg-day	CNS Liver	1000	EPA	2001
Arsenic	na	na	na	na	na	na	na	IRIS	12/03/07

Key

na: No information available
IRIS: Integrated Risk Information System, U.S. EPA
NCEA: National Center for Environmental Assessment
HEAST: Health Effects Assessment Summary Tables
EPA: Environmental Protection Agency
CNS: Central Nervous System

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in groundwater and surface water. When available, the chronic toxicity data have been used to develop oral reference doses (RfDs) and inhalation reference doses (RfDi).

TABLE 4

Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Oral Cancer Slope Factor	Units	Adjusted Cancer Slope Factor (for Dermal)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Tetrachloroethene	5.4E-01	$(mg/kg/day)^{-1}$	5.4E-01	$(mg/kg/day)^{-1}$	2B	CalEPA	12/03/07
Trichloroethene	4.0E-01	$(mg/kg/day)^{-1}$	4.0E-01	$(mg/kg/day)^{-1}$	C-B2	EPA	2001
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1.5E+00	$(mg/kg/day)^{-1}$	A	IRIS	12/03/07

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Tetrachloroethene	5.9E-06	$(\mu g/m3)^{-1}$	2.1E-02	$(mg/kg/day)^{-1}$	2B	CalEPA	12/03/07
Trichloroethene	1.1E-04	$(\mu g/m3)^{-1}$	4.0E-01	$(mg/kg/day)^{-1}$	C-B2	EPA	2001
Arsenic	na	na	na	na	na	IRIS	12/03/07

Key:

CalEPA – California Environmental Protection Agency
EPA – U.S. Environmental Protection Agency
IRIS: Integrated Risk Information System. U.S. EPA
na: No information available

EPA Weight of Evidence:

A - Human carcinogen
B1 - Probable Human Carcinogen-Indicates that limited human data are available
B2 - Probable Human Carcinogen-Indicates sufficient evidence in animals associated with the site and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E- Evidence of noncarcinogenicity

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern in groundwater and surface water. Toxicity data are provided for both the oral and inhalation routes of exposure.

TABLE 5

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Tetrachloroethene	Liver	7.3E-04	5.4E-05	na	7.8E-04
			Trichloroethene	CNS/Liver	1.8E+00	5.0E-02	2.2E-01	2.1E+00
			Arsenic	Skin	1.5E+00	3.3E-03	na	1.5E+00
							Hazard Index Total	3.9E+00

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Tetrachloroethene	Liver	1.7E-03	1.7E-04	na	1.9E-03
			Trichloroethene	CNS/Liver	4.3E+00	1.5E-01	3.2E+00	7.6E+00
			Arsenic	Skin	3.4E+00	1.0E-02	na	3.4E+00
							Hazard Index Total	1.2E+01

Scenario Timeframe: Current/Future
Receptor Population: Adolescent
Receptor Age: 12-18 years

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Whortlekill Creek	Trichloroethene	CNS/Liver	4.9E-05	6.6E-04	na	7.1E-04
Surface Water	Surface Water	Pond on Clove Branch Road	Trichloroethene	CNS/Liver	6.6E-05	8.9E-04	na	9.5E-04
							Hazard Index Total Creek	7.9E-04
							Hazard Index Total Pond	9.5E-04

na – not applicable
Inhalation – Inhalation at showerhead
CNS – Central nervous system

Summary of Risk Characterization - Non-Carcinogens

The table presents hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure for groundwater and surface water. The Risk Assessment Guidance for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-cancer effects.

TABLE 6

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Tetrachloroethene	1.3E-06	1.0E-07	2.2E-07	1.7E-06
			Trichloroethene	7.6E-05	2.0E-06	3.5E-04	4.3E-04
			Arsenic	2.3E-04	5.1E-07	na	2.3E-04
						Total Risk =	6.5E-04

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Tetrachloroethene	7.9E-07	7.7E-08	7.9E-07	1.7E-06
			Trichloroethene	4.4E-05	1.6E-06	1.2E-03	1.3E-03
			Arsenic	1.3E-04	3.9E-07	na	1.3E-04
						Total Risk =	1.4E-03

Scenario Timeframe: Current/Future
Receptor Population: Adolescent
Receptor Age: 12-18 years

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Water	Surface Water	Whortlekill Creek	Trichloroethene	5.1E-10	6.8E-09	na	7.3E-09
Surface Water	Surface Water	Pond on Clove Branch Road	Trichloroethene	6.8E-10	9.1E-09	na	9.8E-09
						Total Risk Creek =	1.9E-06
						Total Risk Pond =	9.8E-09

na – not applicable
Inhalation – Inhalation at showerhead

Summary of Risk Characterization - Carcinogens

The table presents cancer risks for groundwater and surface water exposure for all routes of exposure combined. As stated in the National Contingency Plan, the acceptable risk range for site-related exposure is 10^{-6} to 10^{-4}.

TABLE 7 **Alternative 2: Aerobic Cometabolic Bioremediation – Cost Estimate Summary**	
CAPITAL COSTS	
1. Work Plans/QAPP/HASP/SMP	$ 109,800
2. Subcontractor Procurement	$ 16,600
3. Project Management and Administration	$ 42,800
4. Baseline Groundwater Sampling	$ 106,000
5. Vapor Monitoring	$ 281,000
6. Vapor Mitigation	$ 130,080
7. Investigation of Aerobic Cometabolic Degradation	$ 247,500
8. Pilot Study of Enhanced Aerobic Cometabolic Bioremediation	$ 898,000
9. Remedial Design	$ 600,000
10. Remedial Action Construction	$ 3,223,000
Subtotal Capital Cost	$ 5,655,000
Contingency (20%)	$ 1,131,000
TOTAL CAPITAL COSTS	**$ 6,786,000**
OPERATION AND MAINTENANCE (O&M) COSTS	
Annual Sampling Event:	
11. Annual Groundwater Sampling	$ 106,000
12. Annual Vapor Sampling	$ 239,000
Subtotal	$ 345,000
Contingency (20%)	$ 69,000
TOTAL ANNUAL SAMPLING COSTS	**$ 414,000** *
PERIODIC COST	
Unique Long-term O&M Costs	
13. Five Year Review	$ 38,000 **
PRESENT WORTH OF 30 YEARS	
14. Total Capital Costs	$ 6,786,000
15. Total Groundwater and Vapor Sampling Costs (30 years)	$ 5,137,000
16. Total Five Year Review (30 years)	$ 81,997
TOTAL PRESENT WORTH OF COSTS FOR 30 YEARS	**$ 12,000,000**

Accuracy of the cost estimate is +50% to -30%
* Assumes cost occurs every year for 30 years
** Assumes cost occurs every five years for 30 years
Note: Annual O&M for enhanced aerobic cometabolic bioremediation is not included.

HOPEWELL PRECISION SUPERFUND SITE
RECORD OF DECISION

APPENDIX III

ADMINISTRATIVE RECORD INDEX

HOPEWELL PRECISION SUPERFUND SITE
RECORD OF DECISION

APPENDIX III

ADMINISTRATIVE RECORD INDEX

Data are summarized in several of the documents that comprise the Administrative Record. The actual data, quality assurance/quality control, chain of custody, etc. are compiled at various EPA offices and can be made available at the record repository upon request. Bibliographies in the documents and in the references cited in this Record of Decision are incorporated by reference in the Administrative Record. Many of the documents referenced in the bibliographies and cited in this Record of Decision are publically available and readily accessible. Most of the referenced guidance documents are available on the EPA website (www.epa.gov). If copies of the documents cannot be located, contact the EPA Project Manager Lorenzo Thantu at (212) 637-4240. Copies of the Administrative Record documents that are not available in the Administrative Record repository file at the Town of East Fishkill Community Library can be made available at this location upon request.

HOPEWELL PRECISION SUPERFUND SITE
RECORD OF DECISION

APPENDIX IV

STATE LETTER OF CONCURRENCE

New York State Department of Environmental Conservation
Division of Environmental Remediation, 12th Floor
625 Broadway, Albany, New York 12233-7011
Phone: (518) 402-9706 • **FAX:** (518) 402-9020
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

SEP 2 8 2009

Mr. Walter Mugdan, Director
Emergency and Remedial Response Division
USEPA Region II
290 Broadway, 19th Floor
New York, NY 10007-1866

Re: Hopewell Precision Area Groundwater Contamination Site, No. 314052
Town of East Fishkill, Dutchess County
Record of Decision

Dear Mr. Mugdan:

The New York State Department of Environmental Conservation (the Department) and the New York State Department of Health (NYSDOH) have reviewed the September 2009 Superfund Record of Decision (ROD) for the Hopewell Precision Area Groundwater Contamination Site in the Town of East Fishkill, Dutchess County. EPA has divided the site into two operable units (OUs): OU 1 addresses groundwater and soil vapor and is the subject of this ROD. A remedy was selected in September 2008 for OU 2 for a waterline to provide potable water to address human health risks associated with contaminants identified in private drinking water wells.

EPA has selected Aerobic Cometabolic Bioremediation for the site. I understand that the preferred remedy consists of the following:

1. A pre-design investigation and pilot study of aerobic cometabolic bioremediation (ACB) to determine the rate and the parameters for full-scale enhancement of aerobic cometabolic degradation in the aquifer.

2. Remedial design and implementation of full-scale enhancement of the ACB remedy to achieve restoration of the groundwater to drinking water standards within a reasonable time period.

3. Long-term groundwater monitoring to track the movement of and changes in the contaminated groundwater plume.

4. Vapor monitoring of homes located above the groundwater plume for vapor intrusion and implementation of vapor mitigation systems in houses that exceed protective levels.

Based on this information, I concur with the remedy for OU 1 and believe it is protective of human health and the environment. If you have any questions, please contact Mr. David Crosby at (518) 402-9662.

Sincerely,

Dale A. Desnoyers
Director
Division of Environmental Remediation

ec: G. Litwin, NYSDOH
S. Bates, NYSDOH
W. Mugden, EPA
J. LaPadula, EPA
D. Garbarini, EPA
S. Badalamenti, EPA
L. Thantu, EPA

HOPEWELL PRECISION SUPERFUND SITE
RECORD OF DECISION

APPENDIX V

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
FOR THE
RECORD OF DECISION
HOPEWELL PRECISION SUPERFUND SITE
HOPEWELL JUNCTION, DUTCHESS COUNTY, NEW YORK

On July 31, 2009, the U.S. Environmental Protection Agency (EPA) released for public comment the Proposed Plan for Operable Unit (OU) 1 for the Hopewell Precision Superfund Site (Site). The public comment period was from July 31, 2009 through August 30, 2009. EPA held a public meeting on August 11, 2009 to present the Proposed Plan. During the public comment period, EPA received oral and written comments at the public meeting as well as written and email comments on the Proposed Plan. This document summarizes comments from the public at the public meeting on August 11, 2009, and those submitted via mail and email during the public comment period. EPA's response to each comment follows the comment.

The comments are grouped generally into the following categories:

- Operable Unit (OU) 1 Remedy
- Aerobic Cometabolic Bioremediation (ACB)
- Other Remedial Technologies
- Groundwater Contamination
- OU 2 Alternate Water Supply Remedy
- Other Issues

Operable Unit 1 Remedy

Comment 1: There should be a contingency plan should the pilot study prove ineffective. A plan should be able to be put in place quickly if the pilot study fails. This would avoid having to re-do the FS and Proposed Plan, which could take up to two years.

Response 1: Based on previous evaluations of the aquifer (e.g., favorable aerobic conditions) in the Hopewell area, EPA is confident that ACB will be a viable remedy for the trichloroethene (TCE) groundwater contamination as it has been found to be at several other sites with dilute and aerobic groundwater plumes. In addition, ACB is a rapidly developing technology, and more substrates and options, presently being tested on laboratory- and pilot-scale, are proving to be viable at full-scale each year. As a result, EPA believes that the ACB technology will advance considerably prior to its implementation at the Hopewell site, providing more options than are available today. Nevertheless, it is the EPA's plan to implement the full-scale enhancement portion of the OU 1 remedy only after all local residences and commercial establishments within the AWS hook-up area have been connected to the alternate water supply. In order to minimize any delay with the OU 1 remedy implementation, the remainder of the OU 1 remedial components, i.e., ACB laboratory studies and pilot testing, will begin immediately once the Remedial Design contractor has been procured. It is critical that these remedial components be undertaken, without any delay, at the onset of the OU 1 Remedial Design phase to adequately design and timely implement the full-scale enhancement system.

Comment 2: There should be a timeline for the pilot study, showing how long it will take to install, how long it will operate and when it will be scaled up after the performance criteria are met. How will EPA evaluate the pilot study and the breakdown chemicals of TCE such as dichloroethene (DCE) and vinyl chloride? Vinyl chloride is especially a concern since it is more harmful than TCE.

Response 2: A schedule for implementation of the OU 1 remedy will be included in the Remedial Design Work Plan. The Work Plan and other project planning documents such as the Quality Assurance Project Plan will include details on the implementation of the pilot study.

Regarding the breakdown chemicals for TCE listed in the comment, EPA would like to clarify that the chemicals listed – DCE and vinyl chloride – are breakdown products of TCE undergoing anaerobic biodegradation (degradation in the absence of oxygen). The proposed OU 1 remedy utilizes a process that occurs in the presence of oxygen. The aerobic degradation of TCE results in a different set of breakdown chemicals that are non-toxic, including carbon dioxide (CO_2), water (H_2O) and chloride (Cl-). All measurements taken in the aquifer in the Hopewell area during the remedial investigation indicate the aquifer is aerobic.

Comment 3: EPA plans to monitor the water from monitoring wells, and EPA samples all point of entry treatment (POET) systems quarterly. Perhaps more water testing should be done especially at the beginning of the pilot test in order to make sure that the TCE is not breaking down to DCE and/or vinyl chloride.

Response 3: EPA plans to conduct periodic sampling of the monitoring well network to track any changes in the groundwater contaminant plume. It should be noted that additional monitoring wells specifically designed to test the progress of the pilot study and the full scale ACB are expected to be installed. Appropriate monitoring locations and frequencies to evaluate the progress of the ACB process will be set forth in the pilot study workplan.

Regarding the breakdown products for TCE under aerobic conditions, see the response to Comment No. 2, above.

Comment 4: Vapor mitigation systems will be inspected periodically to ensure they are operating properly. Since these homes have confirmed vapor issues, the air inside these homes should be tested for breakdown chemicals. Homes that were found to NOT have vapor intrusion in the past should not be the only homes tested for vapor intrusion.

Response 4: The long-term monitoring plan for the selected remedy includes periodic inspection of the existing vapor extraction systems. These systems were installed with a gauge that shows the pressure differential between the sub-slab and the basement of the home. As long as the pressure differential is maintained, no vapors will enter the basement of the home. The periodic inspection of the pressure differential gauge will verify that the vapor extraction system is functioning as designed. Sampling would only be conducted if the pressure gauge suggests that the system is not working as designed.

Comment 5: With the current difficult economic times, will EPA be able to get funding for the Hopewell remedies?

Response 5: While EPA has not yet committed funding for the construction of the remedies for the Hopewell Precision Site, and would not typically do so for any site remedy until the design of that remedy is nearing completion, EPA does not currently anticipate any difficulty securing the funding to move ahead with the remedies for this Site.

<u>**Aerobic Cometabolic Bioremediation**</u>

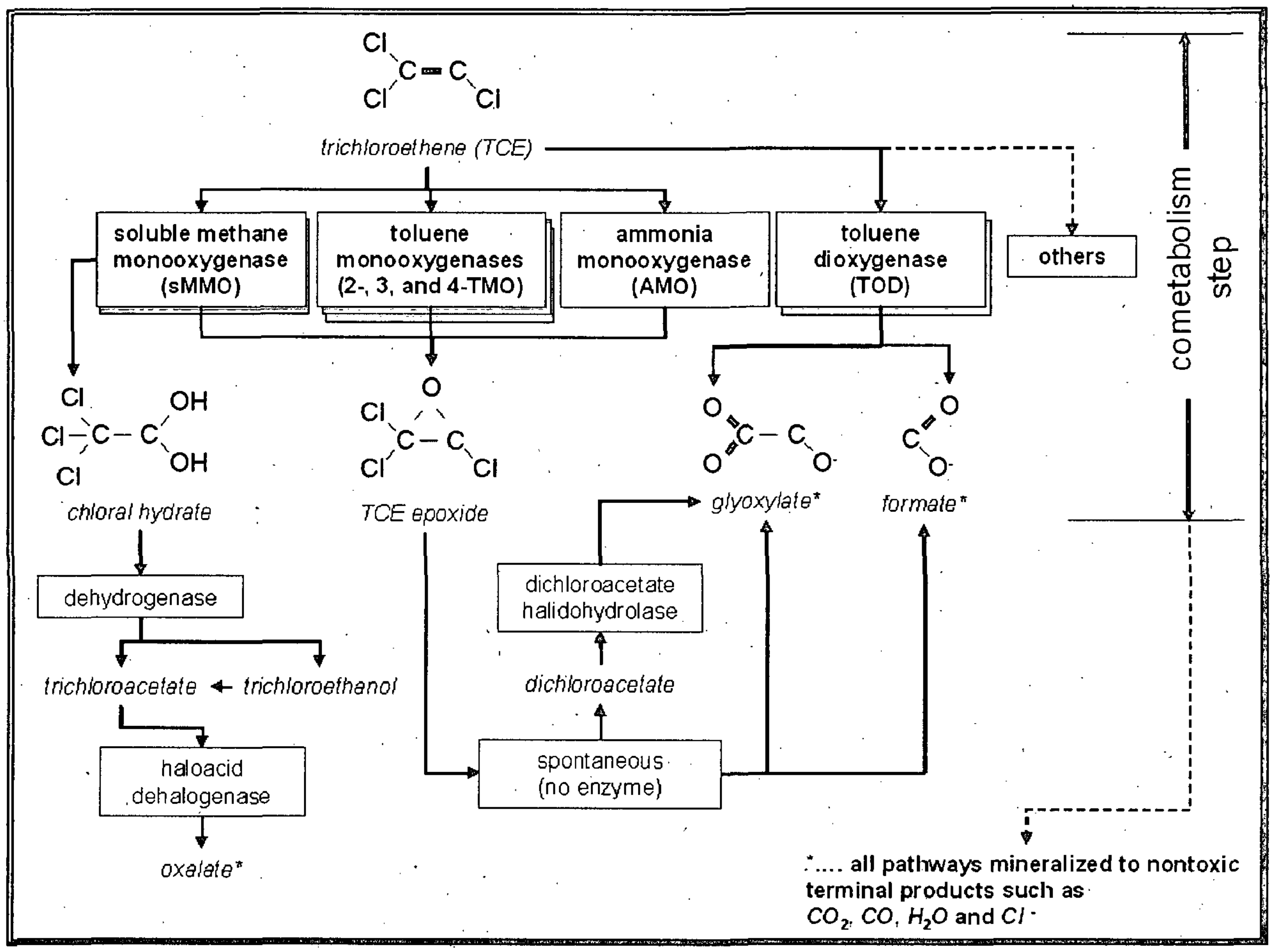
Comment 6: For the Aerobic Cometabolic Bioremediation remedy, what types of micro-organisms would break down the TCE? Are there any public health consequences as a result of ingesting these microorganisms?

Response 6: Various micro-organisms and consortia of micro-organisms can be involved in cometabolic processes depending on which micro-organisms may be present in the subsurface and which substrate(s) may be selected for use during and following the pilot study. Pseudomonas is a prevalent family of micro-organisms that are expected to be involved in the cometabolic processes at this Site. These ubiquitous micro-organisms that will be relied upon to biodegrade TCE to CO_2, CO, H_2O, and Cl- should not pose any health risk to humans since they are already present in the aquifer.

Comment 7: In regards to OU 1, what chemicals will remain after the micro-organisms break down TCE? At the public meeting it was stated that carbon dioxide (CO_2) would remain, but are there any other chemicals that would be present?

Response 7: The principal "other chemical" that would be present following cometabolic biodegradation is chloride. Any remedial process which involves stripping the chlorine molecules off of chlorinated solvents produces this non-toxic by-product. The bio-chemistry involved is fairly complex; however, other intermediate break-down products are shorter-lived, more soluble and less toxic than the parent compounds.

The graphic below shows ACB of TCE. It shows that the cometabolism step would generally be rate limiting (meaning it is the "slowest step" in a chemical reaction) and, after that step, the other reactions would occur rapidly, leading to complete mineralization into nontoxic products (i.e., CO_2; carbon monoxide (CO), water, and chloride). Furthermore, the key enzymes shown in the boxes are observed intermediates (italics) which tend to be shorter-lived, more soluble, less toxic, and less volatile than TCE. This is a positive end result, particularly as it relates to vapor intrusion concerns.



Comment 8: How does the enhanced bioremediation remedy ensure containment of the plume and capture of the chemicals in question? What kind of time frame is going to be involved in treatment?

Response 8: The ACB remedy will not contain the plume or capture the TCE, but will enhance natural organisms that produce enzymes that convert TCE to innocuous by-products as discussed in the response to Comment No. 2, above. The ACB remedy will address all areas of the contaminant plume including the dilute distal portions. The time frame for full destruction of TCE is currently uncertain; one of the first steps in testing for the enzymes will be to determine the overall degradation rate of TCE. At that time, a better estimate can be made of how long groundwater remediation may take.

Comment 9: I am interested in the proposed treatment process for the contaminants in the groundwater. EPA will be installing a system that will provide oxygen and food for the already present micro-organisms to increase the population so they can feed on the contaminants. This will require an operation and maintenance plan for these systems that will be located throughout the cleanup site. Can you provide me with your proposed operating plan for this equipment?

Response 9: EPA will conduct a pilot test and other types of testing to determine the most effective substrate to put into the groundwater to enhance the aerobic cometabolic degradation of TCE. The evaluation of the test results will be used in the remedial design, which will include development of an operation and maintenance plan for the full-scale enhanced aerobic cometabolic bioremediation system. This plan will be made available to the public.

Comment 10: Has the ACB remedy been tried at other sites?

Response 10: ACB is an innovative technology. It has been implemented at full scale at a few sites across the country, including Moffett Naval Air Station, California, McClellan Air Force Base, California and an industrial facility in Indiana.

Comment 11: In the schematic drawing of ACB shown at the public meeting, what happens to the area north of the red ACB bands? Why isn't EPA treating the northern area of the contamination?

Response 11: The purpose of the schematic drawing of ACB was to give a general idea of what the enhanced system may look like. A full evaluation of the plume and the type of substrate to be tested during the pilot test will be conducted and documented in a pilot test work plan during the remedial design phase of the project. The remedial design will then utilize this information to optimize the locations and configuration of the substrate injection points. The treatment bands may not be located in the same parts of the plume as the schematic shown at the public meeting and might encompass the northern area of contamination. The schematic drawing was intended to be a simplified conceptual figure.

Comment 12: With the enhanced ACB remedy, will there be any risk that too many bio-organisms will be created and cause health issues?

Response 12: Most of the biological agents that destroy TCE are short-lived in the natural environment and would not be expected to cause any health issues. Once the enhancement materials are no longer put into the aquifer, the organisms would basically starve to death and the populations are expected to decrease to levels similar to those that were present prior to the enhancements

Other Remedial Technologies

Comment 13: Wouldn't it be better to extract the contaminated water and remove the chemicals with an air stripper and reintroduce this water back to the aquifer?

Response 13: EPA evaluated a pump and treat alternative (Alternative 3) in the Feasibility Study. The FS evaluation indicated that the pump and treat alternative would not be cost effective because of the relatively low level of contamination (less than 90 parts per billion (ppb) of TCE) and the wide-spread size of the relatively dilute plume. Very large volumes of dilute groundwater would need to be pumped in order to capture the most contaminated portion of the plume. In addition, because the plume is in a residential area, it would be very difficult to find property on which to install and operate extraction wells, a treatment plant building to house the necessary treatment equipment, and space to build a recharge basin or to install injection wells for the treated effluent water.

Groundwater Contamination

Comment 14: What are the groundwater contaminant levels in the Hopewell area? What is the estimated volume of contaminated water in the aquifer?

Response 14: The maximum TCE level detected in monitoring well samples was 94 micrograms per liter (µg/L). The maximum TCE level detected in residential wells was 250 µg/L in 2003. The level of TCE in that well declined to 32 µg/L in 2009. The majority of samples in both monitoring wells and residential wells are below 20 µg/L. Many of the residential wells sampled on a periodic basis have not detected any TCE.

The TCE groundwater plume extends from south of the Hopewell Precision facility on Ryan Drive to north of Clove Branch Road. One small lobe of TCE on the western side of the Hopewell area has migrated south of Clove Branch Road (see Figure 4 in the Decision Summary section of this ROD). The volume of contaminated groundwater is difficult to estimate because of the complex glacial geology in the Hopewell area. The plume appears to flow preferentially in higher transmissive zones and is not present in areas where the stratigraphic layers have lower conductivity.

Comment 15: How frequently are the groundwater contaminant plume boundaries measured and reassessed?

Response 15: EPA has conducted annual sampling of approximately 140 to 160 residential wells in the Hopewell area over the past six years. The overall trend for TCE in groundwater has been downward, with a limited area showing a small increase in TCE levels. In general, the plume has shown little movement over the past five years since

EPA began extensive monitoring of residential wells. An area on the western side of the plume in the Lenart Place area has shown a small increase in TCE levels, to a maximum of 32 µg/L.

Nevertheless, as part of the OU 1 remedy long-term monitoring program, groundwater samples would be collected periodically from the monitoring well network of 35 wells strategically located in and around the groundwater plume. The analytical results would be used to evaluate the migration of and changes in the contaminant plume and boundaries over time.

OU 2 Alternate Water Supply Remedy

Comment 16: At the public meeting, EPA indicated that a final decision will be made on the alternative water supply for OU 2 by December of this year and stated that, when that decision is made, the Agency will hold a public availability session to present its choice and logic behind the decision. Because the alternative public water supply is a critical component to the remediation of the Hopewell Precision site, this public availability session should also be subject to formal public participation process and comment period as for OU 1 remedy.

Response 16: EPA will hold a public availability session to present its preferred choice of the water supply source (based on ongoing water source analyses of the three candidate water supply sources) and explain the logic behind the decision. Such public availability sessions are not subject to the formal public participation process. However, due to interest and concerns of the Hopewell community over alternative water supply source selection, EPA will provide a 30-day comment period which will commence before and end after the public availability session. EPA will consider oral and written comments submitted at the public availability session as well as written comments received during the 30-day comment period in making a final decision on the water supply source.

Comment 17: If the new water supply is installed before the aerobic bioremediation remedy for the groundwater, will the digging disturb the plume or otherwise impact how EPA may want to position the emitters for the aerobic bugs? Given the recommended remedies for the two OUs, is there a preferred order of implementation to ensure both are effective?

Response 17: Installation of the alternate water supply infrastructure should have no impact on the groundwater quality since the piping will only be buried to a shallow depth of approximately four feet so that pipes are below the frost line. The depth to groundwater across the Site varies from just under 10 feet to more than 20 feet below the ground surface. The positioning of the emitters for the ACB remedy should not be impacted by the alternate water supply remedy. Emitter placement is flexible enough to insure that the subsurface water pipes are not impacted by the emitters. Regarding the preferred order of implementation of both remedies, please refer to the response to Comment No. 1

Comment 18: It is now nearly one year since the alternate water supply remedy was selected. Why hasn't EPA moved faster to get us an alternate source of water?

Response 18: It took EPA longer than anticipated to go through contracting to bring its remedial design contractor on board. However, the contractor is currently working on the OU 2 remedy and is evaluating three potential sources of water for the OU 2 remedy: Little Switzerland, Beekman/Legends and the Dutchess Central Utility Corridor waterline. As indicated in the response to comment No.16, EPA's preferred source of water will be presented to the Hopewell citizens later in 2009.

Comment 19: The Little Switzerland system is broken and needs a huge replacement of all its pipes. The residents of the Hopewell hook-up area do not want to pay to fix a system that was allowed to be installed incorrectly from the beginning. In addition, copper and lead levels in the Little Switzerland water are just under the maximum contaminant levels. The Dutchess County Water system has water with PCBs, chloramines, and the price is high. The residents of the Hopewell hook-up area prefer to have Beekman water.

Response 19: As indicated in Response 18, EPA's remedial design consultant is currently evaluating these three sources of water. All aspects of the three potential sources will be evaluated, including the capacity of the aquifer (as appropriate) to supply all water users, water quality, existing infrastructure, and the complexity of bringing the water to the Hopewell area. As stated at the August 11, 2009 public meeting, EPA will conduct a public availability session later in 2009 to discuss the Agency's preferred alternate water source.

Comment 20: Why doesn't EPA perform yield capacity tests while the three water sources are being evaluated? That way EPA would know whether each potential source of water would have enough capacity to supply all the water needs.

Response20: EPA has determined that the best and most cost-effective approach is to evaluate the pros and cons of each potential source of water. Based on our evaluation and input from the residents, we will perform capacity testing on the preferred source of water. Pump tests are very complex to conduct especially with operating municipal and private water suppliers in the vicinity pumping from the same aquifers. Pump tests are expected to be expensive to perform under these conditions, and EPA wants to perform these types of tests only once. Of the three potential sources of water for the OU 2 remedy, a pump/capacity testing would not be required of the Dutchess County Utility Corridor waterline as it is already an operational waterline.

<u>Other Issues</u>

Comment 21: What actions can EPA take against Hopewell Precision, Inc. for its waste disposal activities? Can the agency issue fines and/or penalties? If so, is there any way to use those funds to help defray the cost that each homeowner will have to bear for the new alternative water supply (whichever source that may be). If not, why not?

Response 21: As on ongoing, operating facility, Hopewell Precision, Inc. is required to comply with solid and hazardous waste disposal regulations that have been promulgated by EPA pursuant to the Resource Conservation and Recovery Act (RCRA), as amended, which was originally enacted into law by Congress in 1976. According to a RCRA Compliance Monitoring and Enforcement Data Report, the first RCRA inspection of the facility was conducted by the NYSDEC on 7/31/87 and a violation was cited. The most recent inspection was conducted by EPA on 7/13/06. Hopewell Precision, Inc. is now a small quantity generator and was found to be in compliance with RCRA at the inspection. RCRA requires the tracking of all hazardous waste shipped off-site from the "cradle-to-grave" using manifest forms that provide information about the generator of the waste, the facility that will receive the waste, a description of the type and quantity of the waste (including the number of and types of containers), and how the waste will be routed to the receiving facility. According to a RCRA manifest report, the first manifest notification was made on 2/1/84.

One of the main goals of Superfund is to hold polluters accountable. There are several components to Superfund, including remediation and enforcement. The enforcement component at the Hopewell Precision Superfund Site, including cost recovery, is still pending. EPA's cost recovery efforts are aimed at recovering at least some of the government's past and future response costs, which are estimated at about $32 million in total Site cleanup costs for the OU 2 Alternate Water Supply remedy and the OU 1 ACB remedy.

Any past and future response costs that are recovered by EPA are required to be deposited back into the Superfund Trust Fund to reimburse the Fund for the monies spent. Costs recovered by EPA from a responsible party could not be used to help defray the cost that each homeowner would have to pay (i.e., in the form of water utility fees that will be charged by the water district to the homeowners) after the $19 million alternative water supply system has been constructed using funds from the Superfund Trust Fund. The $19 million capital cost for the alternative water supply system would be paid for by the Superfund Trust Fund and, therefore, the homeowners would not be responsible for it.

Implementation of the remedies for the Site is not being hampered by cost recovery efforts and, therefore, the work has not been slowed down. EPA is continuing with the work at the Site to ensure the protection of public health and the environment.

Comment 22: On Lenart Place there have been six cases of cancer. Are these related to drinking contaminated well water before POET systems were installed?

Response 22: As part of the Superfund evaluation process, EPA completes a human health risk assessment which is based on statistical probabilities of getting cancer rather than on individual assessments of the occurrence of cancer and other non-cancer health effects. EPA does not conduct health studies, but rather coordinates with other federal and State agencies that are charged with conducting health studies. At the Hopewell Precision site, EPA has acted quickly to eliminate exposure to hazardous chemicals as exposures are identified through our residential well and vapor sampling programs. EPA will work closely with the New York State Department of Health if it decides to proceed with the health study.

Comment 23: Will EPA require mandatory vapor mitigation systems on new construction homes? Will EPA sample new homes?

Response 23: Because of the presence of shallow contaminated groundwater at the Hopewell site, the possibility of vapor intrusion exists for structures existing or built in this area. Anyone that plans to construct a new home over the contaminated portion of the aquifer should consider the installation of a vapor mitigation system. Installing these systems at the time of construction is less complicated and less costly than installing a system after a house has been constructed. EPA will advise the Town that anyone building a new home over the contaminated aquifer should install a mitigation system as a conservative measure. The builder could be advised that the mitigation system should be installed as part of the building permit application process implemented by the Town. Mitigation systems that have been properly designed and installed during new construction have successfully prevented intrusion of vapors. While it is not envisioned that EPA would sample newly constructed homes, the builder may want to sample the home to demonstrate that vapor intrusion is not a concern.

Comment 24: What will be done to help people with health issues in the Hopewell area? Cancer is not the only health issue, but also neurological problems, lupus, and rheumatoid arthritis.

Response 24: EPA's Superfund program does not conduct health studies, but rather coordinates with other federal and/or State agencies that conduct these types of studies. The New York State Department of Health is presently considering conducting a health study of the Hopewell area. EPA will work closely with the New York State Department of Health if it decides to proceed with the health study.

Comment 25: The groundwater remedy will take years to implement and be completed. What can residents do to protect themselves from contamination?

Response 25: Over the past six years, EPA has been conducting annual water testing on the "at risk" residential wells in the area of the Hopewell plume. This testing allows EPA to monitor the movement of the plume and the levels of contamination. EPA also conducts quarterly sampling at homes with POET systems to ensure the systems are working as designed. EPA has conducted numerous rounds of vapor sampling in the Hopewell area and has provided vapor extraction systems at homes that exceed the established criteria for TCE. Part of the selected remedy will include long-term periodic sampling of both Site monitoring wells and vapor. These activities coupled with the implementation of the OU 1 and OU 2 remedies will ensure that the residents are protected from Site related contamination in both the short and long term.

Comment 26: EPA promised that my well would be sampled quarterly even though it does not have a POET system. Most of my neighbor's wells have POETs and EPA promised to sample my well when the POET systems were sampled. EPA has only contacted me once a year to sample my well. I would like to have it sampled quarterly.

Response 26: At the Hopewell Site, EPA has for the past 6 years been sampling residential wells that have been verified to have been impacted by groundwater contaminants and equipped with POET systems on a quarterly basis. Other potentially "at risk" wells have been sampled on an annual basis. To date, this monitoring procedure has been very effective in avoiding any potential public health issues. EPA plans to continue this sampling procedure until the alternate water supply has been installed. At such time, EPA will cease sampling all residential wells.

SUMMARY OF DOCUMENTS

Section V-A: July 2009 Proposed Plan

Section V-B: Public Notice

Section V-C: August 11, 2009 Public Meeting Transcript

Section V-D: Letters Received During the Comment Period

RESPONSIVENESS SUMMARY

APPENDIX V-A

JULY 2009 PROPOSED PLAN

Superfund Proposed Plan

Hopewell Precision Area Groundwater Contamination Site

EPA

Hopewell Junction, Dutchess County, New York

JULY 2009

PURPOSE OF THE PROPOSED PLAN

This Proposed Plan identifies the preferred remedy for Operable Unit (OU) 1 at the Hopewell Precision site (the Site), and provides the rationale for this preference. The U.S. Environmental Protection Agency's (EPA's) preferred remedy consists of the following components:

- An investigation and pilot study of aerobic cometabolic bioremediation (ACB) to determine the rate and the parameters for full-scale enhancement of aerobic cometabolic degradation in the aquifer.
- Remedial design and implementation of full-scale enhancement of the ACB remedy to achieve restoration of the groundwater to drinking water standards within a reasonable time period.
- Long-term monitoring to track the movement of and changes in the contaminated groundwater plume.
- Vapor monitoring of homes determined to be "at risk" for vapor intrusion and implementation of vapor mitigation systems in houses that exceed protective levels, based on changes in the plume.

The Site consists of the Hopewell Precision facility and the hydraulically downgradient area affected by the contaminated groundwater plume and vapors. This Proposed Plan was developed by the EPA in consultation with the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH). The preferred remedy for OU 1 addresses contaminated groundwater and vapors at the Site (see Figures 1 and 2). Dilute groundwater plumes, such as the one found at the Hopewell site, are particularly difficult to address through active remediation because of the relatively low levels of contamination and the size of the plume. Traditional treatment technologies work best when applied to much higher levels of contamination. At the Hopewell site, EPA has determined that it is appropriate to utilize an innovative technology – aerobic cometabolic bioremediation – to accelerate the reduction in contaminant levels in the aquifer. ACB involves a process whereby micro-organisms present in the aquifer consume organic substrates and oxygen under aerobic conditions and produce an enzyme which destroys contaminants such as trichloroethene (TCE). Aquifer conditions at the Site are favorable for reduction of the site contaminants through this technology.

EPA divides Superfund sites into remedial phases or OUs to prioritize and accelerate selection of a remedy, when warranted. EPA has divided the Hopewell Precision site into two OUs. OU 1, which is the focus of this Proposed Plan,

Mark Your Calendar

July 31, 2009 – August 30, 2009: Public Comment Period on the Proposed Plan.

August 11, 2009 at 7:00 p.m.: The U.S. EPA will hold a Public Meeting to explain the Proposed Plan. The meeting will be held at the Gayhead Elementary School, 15 Entry Road, Hopewell Junction, New York 12533. Telephone: (845) 227-1756.

For more information, the Administrative Record file (which will include the Proposed Plan and supporting documents), is available at the following locations:

Town of East Fishkill Community Library
348 Route 376
Hopewell Junction, NY 12533
Telephone: (845) 221-9943
Website: www.eastfishkilllibrary.org
Hours:Monday-Thursday: 10 am – 8 pm
Friday: 10 am – 6 pm
Saturday: 10 am – 5 pm

and

USEPA-Region 2
Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
(212) 637-4308
Hours:Monday-Friday, 9:00 a.m. - 5:00 p.m.

Written comments on this Proposed Plan should be addressed to:

Lorenzo Thantu
Remedial Project Manager
Eastern New York Remediation Section
U.S. Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866
Telephone: (212) 637-4240
Telefax: (212) 637-3966
Email address: Thantu.lorenzo@epa.gov

The EPA has a web page for the Hopewell Precision Site at www.epa.gov/region2/superfund/npl/hopewell.

addresses exposures to contaminated or potentially contaminated media such as the groundwater, soils, surface water, sediments and vapors associated with the Hopewell groundwater plume. OU 2 includes provision of an alternate water supply to the area with private drinking water wells that have been or have the potential to be affected by the groundwater plume from the Hopewell Precision facility. The OU 2 Record of Decision (ROD) was completed in September 2008.

OU 1 elements summarized in this Proposed Plan are further described in the June 2008 Remedial Investigation (RI) Report and the July 2009 Feasibility Study (FS) Report. EPA and NYSDEC encourage the public to review these documents to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted there.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA, also commonly known as the federal "Superfund" law), and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The Proposed Plan is being provided to inform the public of EPA's preferred remedy and to solicit public comments on the preferred remedy and the remedial alternatives that were evaluated.

The remedy described in this Proposed Plan is EPA's and NYSDEC's preferred remedy for OU 1 at the Site. Changes to the preferred remedy or a change from the preferred remedy to another remedy may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy for OU 1 will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all of the alternatives considered in this Proposed Plan.

COMMUNITY ROLE IN SELECTION PROCESS

EPA and NYSDEC rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To meet this goal, the Proposed Plan, along with the supporting Remedial Investigation and Feasibility Study Reports, has been made available to the public for a public comment period which begins on July 31, 2009 and concludes on August 30, 2009.

A public meeting will be held on August 11, 2009 at 7:00 P.M. during the public comment period at the Gayhead Elementary School, 15 Entry Road, Hopewell Junction, New York, to present the preferred remedy (or "Proposed Plan") and to receive public comments.

Comments received at the public meeting, as well as written comments that EPA receives during the comment period, will be documented in the Responsiveness Summary Section of the ROD, the document which formalizes the selection of the remedy.

SCOPE AND ROLE OF ACTION

This Proposed Plan presents the preferred remedy for OU 1 at the Site. The objective of the preferred remedy is restore the groundwater to drinking water standards within a reasonable time period as well to ensure that homes over the contaminated plume do not have unacceptable levels of contaminants due to vapor migrations from the soil and groundwater and to prevent the build-up of contaminated vapors in those situations. OU 2 has been addressed in a separate Proposed Plan and ROD.

SITE BACKGROUND

Site Description

The Hopewell Precision site is located in Hopewell Junction, Dutchess County, New York. The Site consists of the Hopewell Precision facility and the hydraulically downgradient area affected by the groundwater plume and its vapors. The Hopewell Precision facility was located at 15 Ryan Drive from 1977 to 1980. The facility moved to the adjacent property at 19 Ryan Drive in 1980 and continues to operate at that location. The combined size of the two properties is 5.7 acres. The rest of the Site consists mostly of residential neighborhoods, all of which are currently served by private wells and septic systems. An alternate water supply will be provided in the near future, in accordance with the OU 2 ROD dated September 30, 2008. Almost 27,000 people live within 4 miles of the Hopewell Precision facility. Commercial development (e.g., strip malls, businesses, and gas stations) in the area is primarily along New York State Route 82, which traverses the area in a northeast-southwest direction. An area of farmland borders the eastern side of a section of Route 82. Whortlekill Creek flows in a southerly direction across the residential area and along the western border of the Site. Several ponds are present within the area, including two large former quarries (Redwing Lake and the gravel pit) that are partially fed by groundwater.

Site Geology/Hydrogeology

The Site is situated in a glaciated valley underlain by the Hudson River Formation in the northern portion of the Site and the Stockbridge Limestone in the southern portion. The bedrock is overlain by unconsolidated sediments deposited by glaciers and glacial meltwater. The glacial outwash deposits are a complex mixture of boulders, gravel, sand, silt, and clay which form discontinuous beds or lenses. Due to multiple glaciation events, subsurface units are heterogeneous and highly localized. Glacial till deposits are also present in some areas of the Site, including a tear drop shaped mound between Creamery Road and Clove Branch Road. Glacial tills generally have low permeability and limited ability to transmit groundwater.

The unconsolidated deposits at the Site have been grouped into three hydrostratigraphic units: 1) sand and gravel unit (including silty sand, silty gravel, and mixtures of sand, silt, and gravel), 2) silt and clay (including silty clay); and 3) the till mound between Creamery Road and Clove Branch Road. The sand and gravel units transmit groundwater more readily than the silt and clay units and act as preferential flow paths for groundwater contamination. All of these units are localized and discontinuous, and they are likely to create multiple complex flow pathways throughout the unconsolidated deposits.

In general, groundwater flow is towards the valley from the upland areas on the east and west sides of the valley. In the valley, groundwater flow is generally towards the southwest along the valley axis. The glacial till mound located between Creamery Road and Clove Branch Road impedes groundwater flow within the valley. Groundwater flows preferentially in silty sand and gravel units. The vertical gradient in most monitoring wells is upwards, indicating groundwater discharges into the valley and Whortlekill Creek which runs along the axis of the valley and also flows toward the southwest. The contaminant flow velocity at the Site was estimated to average from 0.8 to 1.1 feet per day in the permeable preferential flow pathways. The depth to groundwater across the Site varies but is generally about 15 feet below the ground surface. The groundwater at the Site is classified by NYSDEC as Class GA, indicating it is considered a source of drinking water.

Dissolved oxygen readings were collected during groundwater sampling to evaluate the aerobic nature of the aquifer. The dissolved oxygen readings ranged from 3.4 to 6.4 milligrams per liter (mg/L) in the background monitoring wells. As the groundwater flows across the facility toward the plume core, no apparent decrease in dissolved oxygen was observed (e.g., readings greater than 5 mg/L in plume core wells during both sampling rounds) and the aquifer conditions remained aerobic. Downgradient and beyond the plume core area, dissolved oxygen readings showed more variation, but generally remained well in the aerobic range.

Site History

Hopewell Precision manufactures sheet metal parts that are assembled into furniture. The property at 19 Ryan Drive was vacant land prior to 1980, and the company has been the sole occupant of the building. Since 1981, the former facility at 15 Ryan Drive has been used by Nicholas Brothers Moving Company for equipment storage and office space.

Processes at Hopewell Precision include shearing, punching, bending, welding, and painting. The painting process includes degreasing prior to application of the wet spray paint application. Hopewell Precision currently uses a water-based degreaser, but the company used TCE and 1,1,1-trichloroethane (1,1,1-TCA) in a vapor degreasing machine until 1998.

EPA was made aware of Hopewell Precision in October 1979 through a letter from a former Hopewell Precision employee. During an on-site inspection at the former facility (15 Ryan Drive) in November 1979, EPA observed solvent odors coming from an open disposal area. At the time of the 1979 inspection, Hopewell Precision was dumping one to five gallons per day of waste solvents, paint pigments, and sodium nitrate directly onto the ground. In August 2003, a former employee reported that the common practice for disposal of waste solvents at the former facility was to pour the material on the ground outside the building. Waste paints and thinners were dumped on a daily basis and waste solvents from the degreasers were dumped on a biweekly basis while he worked at Hopewell Precision in 1979 and 1980. The results of EPA's November 1979 inspection were sent to the NYSDEC, along with a memorandum recommending that the facility be required to drum the solvents and dispose of them in a proper manner rather than open dumping.

NYSDEC installed three monitoring wells at the former facility in May 1985 and sampled the wells in March 1986. The analytical results for Monitoring Well B-3, located between the current and former buildings, indicated the presence of 1,1,1-TCA at 23 micrograms per liter (μg/L) and TCE at an estimated 4 μg/L. In 1985, the Dutchess County Department of Health sampled four private drinking water wells near the Site, and no volatile organic compounds (VOCs) were detected in any of the samples.

NYSDEC performed a Hazardous Waste Compliance Inspection of Hopewell Precision in May 1987. The inspector observed eleven 55-gallon drums of waste paint and thinners; six 55-gallon drums of waste 1,1,1-TCA; and one 55-gallon drum of unknown material. During another inspection in October 2002, NYSDEC observed four full or partially full 55-gallon drums of waste paint and solvent at the facility.

In February 2003, as part of an effort to make final decisions on whether to archive historic sites, EPA sampled 75 residential wells near the Hopewell Precision facility. Analysis of these samples revealed that five residential wells were contaminated with TCE ranging from 1.2 μg/L to 250 μg/L. At that time, NYSDEC, on behalf of NYSDOH, requested that EPA conduct a removal action at the Site, including installation of carbon filter systems on the residential wells.

From February to November 2003, EPA collected groundwater samples from hundreds of private drinking water wells in the vicinity of Hopewell Precision. TCE and 1,1,1-TCA were detected in numerous private well samples, at individual concentrations up to 250 μg/L for TCE and 11.7 μg/L for 1,1,1-TCA. EPA subsequently installed point of entry treatment (POET) systems to remove VOCs at 41 homes where TCE exceeded or approached the maximum contaminant level (MCL). NYSDEC installed POET systems at 14 homes in the southern part of the groundwater plume, to remove 1,1,1-TCA that exceeded its New York State drinking water standard, but that fell below the Federal MCL.

In April 2003, EPA also collected water and sediment samples from small, unnamed ponds located about 300 feet south-southwest (downgradient) of the Hopewell Precision facility. TCE was detected at concentrations of 4 μg/L and 3.4 μg/L in the water samples and 88 micrograms per kilogram (μg/kg) in one of the two sediment samples. EPA collected additional samples from two unnamed ponds located approximately 900 and 4,500 feet southwest of Hopewell Precision in May 2003. TCE was detected at an estimated concentration of 3.6 μg/kg in a sediment sample from the closer pond, but was not detected in a water sample from the same location or in sediment and water samples collected from the distal pond on Creamery Road.

In July 2003, EPA collected 19 soil samples at and downgradient of the Hopewell Precision facility. TCE was detected in two on-site soil samples and 1,1,1-TCA was detected in one on-site sample, but neither contaminant was detected in any off-site samples. Additional sampling was conducted at the Hopewell Precision facility in December 2003. TCE was detected in five soil samples, at depths ranging from 0 to 12 feet. The maximum detected concentration was 3.7 μg/kg; TCE was not detected in background samples from the same depth range.

In October and December 2003, EPA installed and sampled temporary shallow monitoring wells on both properties, 15 and 19 Ryan Drive. The results indicated TCE concentrations up to 144 μg/L in groundwater at depths ranging from 10 to 30 feet below the ground surface.

EPA has conducted vapor intrusion indoor air testing at the Site. Since February 2004, EPA has collected sub-slab and/or indoor air samples from over 200 homes in the area above the groundwater plume. EPA installed sub-slab ventilation systems (SVSs) at 53 homes with vapors above the action level to reduce the residents' exposure to indoor air contaminants associated with the Site. The SVS systems are designed to vent vapors from beneath the foundation, thereby preventing the entry into the structure. In addition, at selected locations, EPA conducts annual vapor sampling during the winter heating season to monitor the migration of vapors to structures that may be at potential risk in the area of the groundwater plume.

The Site was listed on the National Priorities List in April 2005.

SUMMARY OF REMEDIAL INVESTIGATION SAMPLING

In December 2005, EPA initiated a remedial investigation and feasibility study (RI/FS) as part of the long-term Site cleanup phase. The RI/FS evaluated the nature and extent of groundwater, soil, sediment, surface water, and vapor contamination at the Site, and will help EPA determine the appropriate cleanup alternatives for the identified contamination prior to selection of a comprehensive cleanup plan for the Site. EPA completed all RI field activities during the Summer of 2007 and publicly released the RI Report in June 2008 and the OU 1 FS Report, the subject of this Proposed Plan, in July 2009.

The field activities performed as part of the RI for OU 1 included two rounds of monitoring well sampling, soil sampling at the properties occupied by Hopewell Precision, surface water and sediment sampling in Whortlekill Creek and two ponds, and vapor sampling. Residential well sampling results were summarized in the Proposed Plan for OU 2. The results of the sampling related to OU 1 are summarized below.

Monitoring Well Results

During the RI, two rounds of groundwater samples were collected from 35 monitoring wells installed during the RI and from three monitoring wells installed by NYSDEC at the Hopewell Precision facility. Two wells, EPA-07S and EPA-07D, are background wells. All of the wells were installed in the unconsolidated sediments, with shallow wells generally screened just below the groundwater table and deep wells screened just above the top of weathered bedrock. The analytical results were compared to the Federal MCLs and the New York State Drinking Water Standards. The following summary focuses on the seven contaminants that were determined to be related to activities at the Hopewell Precision facility. The site-related contaminants include TCE, 1,1,1-TCA, 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), chloromethane, methyl ethyl ketone (MEK) and tetrachloroethene (PCE). Although the discussions below do not include the results from the residential wells (see Proposed Plan for OU 2), the results from these wells were included in all mapping of the groundwater contaminant plumes. Figure 1 indicates the locations of monitoring wells and Figure 2 shows the mapped TCE and 1,1,1-TCE groundwater plumes. The monitoring well results will be discussed from north to south, based on proximity to the Hopewell Precision facility.

<u>Upgradient of the Hopewell Precision Facility</u>: Monitoring wells EPA-07S and EPA-07D were installed upgradient of the Hopewell Precision facility to determine background groundwater conditions. No site-related contaminants were detected in either well during Round 1. During Round 2, 1,1,1-TCA was detected at trace levels in both upgradient wells (0.052 J μg/L at EPA-07S and 0.065 J μg/L at EPA-07D), below the screening criterion of 5 μg/L. The "J" qualifier indicates the results were estimated. No other site-related contaminants were detected in the Round 2 samples at EPA-07S or EPA-07D.

<u>Hopewell Precision Facility</u>: Five wells at the Hopewell Precision facility were sampled (EPA-05, MW-B1, MW-B3, EPA-08S, and EPA-08I). In Round 1, TCE and 1,1,1-TCA were detected in MW-B3 at 0.58 J μg/L and 0.11 J μg/L, respectively, both below the screening criteria of 5 μg/L. In Round 2, 1,1,1-TCA was detected in four of the five wells at concentrations ranging from 0.094 J μg/L at EPA-08S and MW-B3 to 0.05 J μg/L at MW-B1. PCE was only detected in one of the five wells, EPA-08I, in the Round 2 sample at 0.076 J μg/L, below the screening criterion of 5 μg/L. PCE was not detected in any of the Round 1 samples. TCE was detected in two of the five wells, MW-B3 and EPA-08S, at 0.56 μg/L and 3.1 μg/L, respectively. None of the

detections of site-related contaminants in these wells exceeded screening criteria.

Oak Ridge Road to Hamilton Road: Ten wells are located between Oak Ridge Road and Hamilton Road (EPA-10S, EPA-10D, EPA-12S, EPA-12D, EPA-14S, EPA-15D, EPA-16S, EPA-16D, EPA-19S, and EPA-19D). At 6 of the 10 wells (EPA-10S, EPA-12S, EPA-15D, EPA-16S, EPA-16D, and EPA-19S), TCE was detected above the screening criterion of 5 μg/L during both sampling rounds. Levels ranged from 94 μg/L at EPA-10S to 13 μg/L at EPA-19S. 1,1,1-TCA was detected in these six wells at concentrations below the screening criterion of 5 μg/L, ranging from 2.7 μg/L in EPA-16D to 0.67 μg/L in EPA-15D. No PCE or chloromethane was detected in these six wells.

Four of the 10 wells (EPA-10D, EPA-12D, EPA-14S, and EPA-19D) had no site-related contaminants above the screening criteria of 5 μg/L. EPA-10D, EPA-12D, and EPA-19D are likely screened below the plume core and EPA-14S is located on the western edge of the plume. TCE was detected in all four wells at low levels, ranging from 1.9 μg/L at EPA-10D to 0.1 J μg/L at EPA-14S. 1,1,1-TCA was detected in two of the four wells, EPA-12D and EPA-19D, at 2.4 μg/L and 0.54 μg/L, respectively. PCE was detected in EPA-10D, EPA-14S, and EPA-19D at concentrations ranging from 0.61 μg/L at EPA-10D to 0.099 J μg/L at EPA-14S.

Hamilton Road to the Gravel Pit: Eleven wells were located downgradient of the plume core, between Hamilton Road and the gravel pit (EPA-18S, EPA-18D, EPA-21S, EPA-21D, EPA-23S, EPA-23D, EPA-24S, EPA-25S, EPA-25D, EPA-26S, and EPA-26D). Concentrations of site-related contaminants in these wells were below the screening criteria of 5 μg/L. 1,1,1-TCA was detected in 8 of the 11 wells ranging from 3.7 μg/L in EPA-23S to 0.08 J μg/L in EPA-26D. TCE was detected in two of 11 wells, EPA-21S and EPA-21D, at 0.29 J μg/L and 0.52 μg/L, respectively. PCE was not detected in any of these wells during Round 1, but was detected in four of the 11 wells (EPA-18D, EPA-21S, EPA-21D, and EPA-23D) during Round 2, at concentrations ranging from 0.23 J μg/L at EPA-23D to 0.11 J μg/L at EPA-18D. TCE was not detected in samples collected from EPA-25S and EPA-25D during Rounds 1 and 2.

Other Site Monitoring Wells: No site-related contaminants were detected during either round of sampling at EPA-09S, EPA-11S, EPA-11D, EPA-17S, EPA-20S, or EPA-22S. EPA-09S is likely to the west of the plume and EPA-11S, EPA-11D, EPA-17S, EPA-20S, and EPA-22S are likely to the east of the plume. The results for Round 1 indicated that EPA-13S, EPA-13D, EPA-17D, and EPA-22D were also outside of the plume boundary. However, PCE was detected at concentrations an order of magnitude below the screening criterion of 5 μg/L in each of these wells during Round 2.

Chloromethane was detected in three monitoring wells, EPA-19S, EPA-23D and EPA-25S, at concentrations ranging from 0.46 J μg/L at EPA-25S to 0.19 J μg/L at both EPA-23D and EPA-19S. Levels were below the screening criterion of 5 μg/L. No 1,1-DCE, cis-1,2-DCE, or MEK was detected in either round of monitoring well samples.

Summary of Groundwater Contamination: As shown in Figure 2, the shape of the TCE plume is indicative of the heterogeneous nature of the aquifer and the presence of preferential flow paths. The area of highest concentration, or the plume core, is denoted by the 50 μg/L contour. This area extends from just south of Oak Ridge Road to just north of Creamery Road. The shape of the plume mirrors the potentiometric surface and shows the groundwater turning to the west in this area as it flows preferentially between a low conductivity till to the north and the till mound to the south. The till mound is further defined by an area where TCE is not detected. The plume appears to flow around the till to both the east and west. There are low-level detections of TCE both to the west and south of the 5 μg/L contour and low levels of TCE discharge to the stream, Redwing Lake and the gravel pit.

Figure 2 also shows the outline of the 1,1,1-TCA plume to the 1 μg/L level. The 1 μg/L level was chosen because the majority of the detections were approximately 1 μg/L; detections above the screening criterion (5 μg/L) are rare. The concentrations and extent of the 1,1,1-TCA plume are significantly different than the TCE plume. 1,1,1-TCA is not detected in the groundwater in the eastern TCE lobe. The lower overall concentrations of 1,1,1-TCA may reflect the history of disposal practices at the Hopewell Precision facility. It may also be caused by 1,1,1-TCA's low vapor pressure and greater tendency to partition to the atmosphere or soil vapor. In addition, 1,1,1-TCA degrades approximately three times faster than TCE in groundwater.

Soil Results

Several VOCs were detected in soil samples as described below. The soil screening criteria were the most conservative of available federal and New York State standards.

15 Ryan Drive Sample Results: A total of 33 soil samples were collected from the former facility location varying in depth from 2-4 feet bgs to 13-15 feet bgs. Four site-related contaminants were detected. TCE was detected in 10 samples from five borings, ranging in concentration from 0.29 J μg/kg to 5.9 μg/kg; only one sample exceeded the screening criterion of 3 μg/kg. TCE was predominantly detected in the deeper samples, at 10-12 feet and/or 13-15 feet. PCE was detected at B-21 at 13-15 feet at 2.6 J μg/kg, and at B-24 at 13-15 feet at 1.7 J μg/kg, below the screening criterion of 3 μg/kg. Cis-1,2-DCE was detected in borings B-21 and B-24 in the deepest samples, with concentrations of 0.47 J μg/kg and 0.58 J μg/kg, below the screening criterion of 20 μg/kg. MEK (2-butanone) was detected once, in B-16 at 10-12 feet at 11 μg/kg, below the screening criterion of 120 μg/kg.

19 Ryan Drive Sample Results: A total of 39 soil samples were collected from the current location of the Hopewell Precision facility, varying in depth from 2-4 feet to 13-15 feet. One site-related contaminant was detected. TCE was detected in four samples from two borings (B-10 and B-11) south of the building, ranging in concentration from

0.44 J µg/kg to 1.4 J µg/kg. All concentrations were below the screening criterion of 3 µg/kg.

Background Sample Results: Three background samples were collected from one boring (B-25) in a background/upgradient location (north) of 15 and 19 Ryan Drive. Two contaminants identified as related to site activities were detected in these samples. However, as they are upgradient from the Site, they are from sources other than the Site. PCE was detected in all three samples at concentrations ranging from 2.2 J µg/kg to 3.3 J µg/kg. The PCE detection at B-25 at 8-10 feet (3.3 J µg/kg) exceeded the site-specific screening criterion of 3 µg/kg. Cis-1,2-DCE was detected below the 20 µg/kg screening criterion in all three samples, ranging from 0.52 J µg/kg to 1.2 J µg/kg.

Summary of Soil Contamination: The low concentrations and limited distribution of site-related contaminants indicate that no significant soil source remains at the facility. PCE and cis-1,2-DCE were not detected in the groundwater samples at the facility, so the concentrations in soil do not appear to impact the local groundwater.

Surface Water Results

Surface water samples were collected at 37 locations downgradient of the Hopewell Precision facility, and two background samples. Analytical results for surface water samples were compared to New York State surface water standards. Sampling areas included: Ryan Drive wetland area, Unnamed Pond 1, Unnamed Pond 2, a pond on Clove Branch Road, Redwing Lake, the gravel pit and Whortlekill Creek.

Ryan Drive Wetland Area: One sample, SW-001, was collected from the Ryan Drive Wetland area. No site-related contaminants were detected.

Unnamed Ponds 1 and 2 and Pond on Clove Branch Road: Two samples, SW-002 and SW-003, were collected from Unnamed Pond 1. No site-related contaminants were detected in either sample.

Three samples, SW-004 through SW-006, were collected from Unnamed Pond 2. No site-related contaminants were detected.

One sample, SW-027, was collected from a pond on Clove Branch Road. TCE was detected at 0.28 J µg/L, but did not exceed the 5 µg/L screening criterion.

Redwing Lake: Ten samples, SW-007 through SW-016, were collected from Redwing Lake. No site-related contaminants were detected.

Gravel Pit: Ten samples, SW-017 through SW-026, were collected from the gravel pit. Site-related contaminants 1,1,1-TCA and chloromethane were both detected at SW-017, below the 5 µg/L screening criteria for these compounds. 1,1,1-TCA was detected at SW-018 and chloromethane was detected at SW-021, SW-025 and SW-026. No site-related contaminants exceeded screening criteria.

Whortlekill Creek: Ten samples, SW-028 through SW-037, were collected from Whortlekill Creek. Site-related contaminants 1,1,1-TCA and TCE were both detected at SW-030 and SW-031. 1,1,1-TCA was detected at SW-028 and SW-029 and TCE was detected at SW-033. Concentrations did not exceed the 5 µg/L screening criteria.

Background: Two background samples, SW-038 and SW-039, were collected from Whortlekill Creek upstream of the Hopewell Precision facility in areas that should not be impacted by activities at the facility. No site-related contaminants were detected.

Summary of Surface Water Contamination: Potentiometric data show that the southern portion of Whortlekill Creek is characterized as a gaining stream. This is supported by detections of site-related contaminants at locations immediately north and south of Clove Branch Road, indicating very low levels of contaminated groundwater discharge into the water bodies. In addition, the southern portion of the creek does not flow in a distinct channel; the water is very slow moving, and prone to marshy areas. However, no site-related contaminants identified in surface water samples exceeded their screening criteria.

Sediment Sample Results

Sediment samples were collected at the same locations as surface water samples. Analytical results were compared to New York State sediment criteria. The sediment sampling areas include: Ryan Drive wetland area, Unnamed Pond 1, Unnamed Pond 2, a pond on Clove Branch Road, Redwing Lake, the gravel pit and Whortlekill Creek.

Ryan Drive Wetland Area: One sample, SD-001, was collected from the Ryan Drive Wetland area. No site-related contaminants were detected.

Unnamed Ponds 1 and 2 and Pond on Clove Branch Road: Two samples, SD-002 and SD-003, were collected from Unnamed Pond 1. No site-related contaminants were detected.

Three samples, SD-004 through SD-006, were collected from Unnamed Pond 2. No site-related contaminants were detected.

One sample, SD-027, was collected from a pond on Clove Branch Road. No site-related contaminants were detected.

Redwing Lake: Ten samples, SD-007 through SD-016, were collected from the Redwing Lake. MEK (2-butanone) was detected at 7 µg/kg at SD-014; no screening criterion is available for MEK. No other site-related contaminants were detected.

Gravel Pit: Ten samples, SD-017 through SD-026, were collected from the gravel pit. No site-related contaminants were detected.

Whortlekill Creek: Ten samples, SD-028 through SD-037, were collected from Whortlekill Creek. No site-related contaminants were detected.

Background: Two samples, SD-038 and SD-039, were collected from Whortlekill Creek in areas that should not be impacted by activities at the Hopewell Precision facility and were designated as background samples. No site-related contaminants were detected.

Summary of Sediment Contamination: No site-related contaminants were detected in any sediment samples with the exception of MEK (2-butanone) in one sample from Redwing Lake. The sediments in the area are generally free of site-related contaminants.

Deep Water Sample Results

Ten deep water samples were collected from Redwing Lake and from the gravel pit. Results were compared to surface water criteria.

Redwing Lake: TCE was detected below the 5 µg/L screening criterion at DW-001 at 0.26 J µg/L. No other site-related contaminants were detected.

Gravel Pit: Ten samples, DW-011 through DW-020, were collected from the gravel pit. 1,1,1-TCA was detected at DW-013, DW-015, DW-016, DW-017, DW-018, DW-019, and DW-020, ranging from 0.15 J µg/L to 0.37 J µg/L. TCE was detected at DW-018 at 0.14 J µg/L. Concentrations of both compounds did not exceed the 5 µg/L screening criteria.

Summary of Deep Water Contamination: Site-related contaminants 1,1,1-TCA, and TCE were detected in deep water samples; however, all concentrations were well below the screening criteria. Results of the deep water samples were similar to the surface water in that most site-related contaminants were found in the gravel pit at very low levels. The presence of very low levels of site-related contaminants indicates that groundwater discharges to the two ponds that were formerly gravel pits.

Sub-slab and Indoor Air Results

Sub-slab and indoor air investigations included two rounds of sampling for sub-slab air and one round for indoor air. The first round of sub-slab sampling included 64 properties in the winter of 2006, and the second round included 135 properties in the winter of 2007. The only round of indoor air sampling was conducted at 44 properties in the winter of 2007. Air analytical results were compared to the screening criteria developed by EPA Region 2 risk assessors. The analytical results are discussed by rounds and are described as clusters by street names.

Round 1 Sub-Slab Air Sample Results

Seventy-three samples were collected in February and March 2006 from various locations southwest of the Hopewell Precision facility, primarily in the area where the groundwater plume is dominated by 1,1,1-TCA.

Sub-Slab TCE: TCE was only detected in two samples during Round 1. The sample from Cavelo Road exceeded the screening criterion with a concentration of 18 micrograms per cubic meter (µg/m^3). The sample from Hamilton Road contained 1.5 µg/m^3, below the site-specific screening criterion. There were no other detections of TCE during Round 1 sub-slab air sampling.

Sub-Slab 1,1,1-TCA: 1,1,1-TCA was detected at 31 sample locations; none exceeded the screening criteria. A cluster of detections is located south of Clove Branch Road and north of Cavelo Road. Concentrations within this cluster range from 3 µg/m^3 to 94 µg/ m^3; all below the site-specific screening criterion. A second cluster is located north of West Old Farm Road, with concentrations ranging from 8.8 µg/m^3 to 270 µg/m^3. There were no detections of 1,1,1-TCA east of Route 82. Blue Jay Boulevard and Mockingbird Court had two detections at 0.89 µg/m^3 and 5.5 µg/m^3. Two detections were observed north of Clove Branch Road, west of Route 82 and south of Creamery Road, at 1.8 µg/m^3 to 270 µg/m^3.

Sub-Slab PCE: PCE was detected in 23 samples; none exceeded the screening criterion. A small cluster of detections were located east of Route 82 and north of Clove Branch Road, with concentrations ranging from 1.2 µg/m^3 to 7.1 µg/m^3. One detection was found south of Clove Branch Road, west of Route 82 with a concentration of 3.8 µg/m^3. The majority of detections were found in an area bounded by Old Farm Road to the south, Clove Branch Road to the north, Route 82 to the east and Purse Lane and Mockingbird Court to the west. Concentrations of PCE ranged from 1.2 µg/m^3 to 14 µg/m^3. There were two detections of PCE north of Creamery Road and west of Route 82, at 1.1 µg/m^3 and 1.2 µg/m^3.

Sub-Slab Other Site-Related Compounds: MEK (2-butanone) was detected in 17 samples at concentrations ranging from 2.2 to 16 µg/m^3. All detections were below the screening criterion. The detections were sporadic, with the majority of detections on Clove Branch Road, southern Route 82 and west of Farm Road. The highest concentration was detected at Blue Jay Boulevard.

Chloromethane was detected in 11 samples with concentrations ranging from 0.33 to 1.4 µg/m^3. All detections were below the screening criterion. More than half of the detections of chloromethane were located along Clove Branch Road. Cis-1,2-DCE was detected in two samples and 1,1-DCE was detected in one sample at concentrations below screening criteria.

Round 2 Sub-slab Sample Results

Sub-slab samples were collected in February and March 2007 from 135 buildings lying over the TCE/1,1,1-TCA groundwater plume.

Sub-Slab TCE: TCE was detected in 30 samples during Round 2; 16 exceeded the screening criterion. Detections generally lie along a north-south line from Creamery Road to Clove Branch Road and ranged in concentration from 1 μg/m^3 to 280 μg/m^3. This cluster is surrounded to the east and west by non-detects.

Sub-Slab 1,1,1-TCA: Eighty-one samples had 1,1,1-TCA concentrations ranging from 0.76 μg/m^3 to 120 μg/m^3. Detections did not exceed the screening criterion. Detections were scattered, from immediately bordering the Hopewell Precision facility to areas southwest of the facility. Detections immediately surrounding the facility ranged from 1.1 μg/m^3 to 19 μg/m^3. Further south of the facility, 1,1,1-TCA was detected in a cluster north of Creamery Road, ranging from 1.9 μg/m^3 to 21 μg/m^3. West of Route 82, detections follow Route 82 to Clove Branch Road, ranging from 0.76 μg/m^3 to 32 μg/m^3. West of Route 82, the largest cluster of detections was found between Creamery Road and West Old Farm Road, with the majority of detections west of Hamilton Drive. Concentrations ranged from 0.78 μg/m^3 to 120 μg/m^3.

Sub-Slab PCE: PCE was detected in 54 samples during Round 2. Three samples exceeded the site-specific screening criterion; two were located east of Route 82 with detections of 170 μg/m^3 to 9,800 μg/m^3. The third location was west of Route 82 with a concentration of 250 μg/m^3. Detections greater than 10 μg/m^3 but below the screening criterion were observed throughout the area south of Creamery Road and north of West Old Farm Road. A cluster of PCE detections was found west of Route 82 and east of Cavelo Road, ranging from 1.1 μg/m^3 to 10 μg/m^3. Sporadic detections below 10 μg/m^3 were observed throughout the sample area.

Sub-Slab Other Site-Related Compounds: Cis-1,2-DCE was detected in four of the samples at concentrations ranging from 1.1 to 15 μg/m^3, one detection exceeded the screening criterion. 1,1-Dichloroethene was detected in 10 samples at concentrations ranging from 0.55J to 2 μg/m^3, with all concentrations below the screening criterion.

Round 2 Indoor Air Sample Results

Forty-three air samples were collected during Round 2 in March 2007, at locations that exceeded the sub-slab screening criteria during Round 2. Three samples were generally collected at each residence, including a sub-slab sample, an indoor sample, and an ambient (outdoor) air sample. The following samples were collected: 14 indoor samples, 17 sub-slab samples, and 12 ambient samples. If buildings were closely spaced, one ambient air sample was designated to be representative of multiple structures. The properties sampled during Round 2 are scattered throughout the sampling area. No VOCs were detected in the ambient air samples so they will not be discussed further.

Sub-Slab and Indoor TCE: TCE was detected in 13 sub-slab air samples, with 10 exceeding the sub-slab criterion. Concentrations ranged from 0.24 μg/m^3 to 150 μg/m3. TCE was detected in seven indoor air samples. All exceeded the indoor screening criterion. Concentrations ranged from 0.89 μg/m^3 to 20 μg/m^3.

Sub-Slab and Indoor 1,1,1-TCA: 1,1,1-TCA was detected in 13 sub-slab air samples collected during Round 2; none exceeded the screening criterion. Concentrations ranged from 4.9 μg/m^3 to 51 μg/m^3. 1,1,1-TCA was detected in four indoor air samples: none exceeded the screening criterion. Concentrations ranged from 0.86 μg/m^3 to 2.6 μg/m^3.

Sub-Slab and Indoor PCE: PCE was detected in five sub-slab air samples; none exceeded the screening criterion. Concentrations ranged from 1.5 μg/m^3 to 16 μg/m^3. PCE was detected in six indoor air samples. One sample exceeded the site-specific screening criterion with a concentration of 560 μg/m^3. A second sample was just below the screening criterion at 98 μg/m^3. The remaining detections of PCE ranged from 1.1 μg/m^3 to 5.9 μg/m^3.

Summary of Vapor Sample Results

TCE is the primary contaminant detected above its screening criterion. 1,1,1-TCA was frequently detected, however, all of the detections were below the screening criterion. PCE was also frequently detected but only one sample, collected from an automotive garage, exceeded the screening criterion. MEK, 1,1-DCE, cis-1,2-DCE and chloromethane were all detected in at least one sample, but the detections were sporadic.

The distribution of vapors in the subsurface is controlled by processes and stratigraphy similar to those controlling the distribution of contamination in groundwater. The areas of vapor detections generally correlate with areas of groundwater detections. However, there does not appear to be a direct correlation between the magnitude of groundwater contamination and the magnitude of vapor contamination in a given area. The large area of till south of Creamery Road appears to impede the vapors and groundwater contamination in that area. No homes in this area had VOC detections in sub-slab samples.

The Round 2 sub-slab air sample results were compared to the Round 2 indoor air sample results. Seven of the locations sampled showed detections of the same compounds at similar magnitudes in both Round 2 sub-slab air samples and the indoor air samples. Four of the locations had detections in the sub-slab during both sub-slab and indoor air sampling, but there were no detections in the indoor air samples. Three locations showed no correlation between the compounds detected or the magnitude of detection between the various samples. The migration of sub-slab vapors to indoor air is affected by a number of factors, including the construction and age of the building and the presence of cracks or other migration pathways in the substructure of the building.

RISK SUMMARY

The purpose of the risk assessment is to identify potential cancer risks and noncancer health hazards at the Site assuming that no further remedial action is taken. This Proposed Plan presents the results of the Human Health Risk Assessment and the Screening Level Ecological Risk Assessment.

Human Health Risk Assessment

As part of the RI/FS, a baseline human health risk assessment was conducted to estimate the current and future cancer risks and noncancer health hazards associated with the current and future effects of contaminants on human health and the environment. A baseline human health risk assessment is an analysis of the potential adverse human health effects caused by hazardous-substance exposure in the absence of any actions to control or mitigate these exposures under current and future land uses.

A four-step human health risk assessment process was used for assessing site-related cancer risks and noncancer health hazards. The four-step process is comprised of: Hazard Identification of Chemicals of Potential Concern (COPCs), Exposure Assessment, Toxicity Assessment, and Risk Characterization (see box "What is Risk and How is it Calculated").

The baseline human health risk assessment began with selecting COPCs in the groundwater, soil, surface water and sediment, using RI data, which could potentially cause adverse health effects in exposed populations. The populations evaluated are indicated below for each medium. In this assessment, exposure point concentrations were estimated using either the maximum detected concentration of a contaminant or the 95 percent upper confidence limit of the average concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably anticipated to occur at the Site. The RME is intended to estimate a conservative exposure scenario that is still within the range of possible exposures. Central tendency exposure (CTE) assumptions, which represent typical average exposures, were also developed. A complete summary of all exposure scenarios can be found in the baseline human health risk assessment.

Groundwater

Risks and hazards were evaluated for current and future adult and child residents for ingestion of untreated tap water, dermal contact with untreated tap water, and inhalation of vapors during showering or bathing. Risks and hazards were evaluated for current and future facility workers for ingestion of untreated tap water at the Hopewell Precision facility. The total incremental lifetime cancer risk estimates were:

- Adult: RME = 7×10^{-4}; CTE = 4×10^{-5}
- Child: RME = 1×10^{-3}; CTE = 2×10^{-4}
- Facility Worker: RME = 2×10^{-5}; CTE = 6×10^{-6}

These estimates of risk were above EPA's target range of 1 × 10^{-6} to 1 × 10^{-4}. Exposure to TCE and arsenic in groundwater accounted for approximately 65 and 35 percent, respectively, of the total excess cancer risk. Arsenic is considered a known human carcinogen (Group A) by EPA. However, arsenic is not related to any activities at the Hopewell Precision facility, and it was only detected in one monitoring well sample. Therefore, risks from arsenic are likely to be minimal.

Hazard indices (HIs) greater than 1.0 indicate the potential for noncancer hazards. The calculated HIs were:

- Adult: RME HI = 4; CTE HI = 3
- Child: RME HI = 12; CTE HI = 4
- Facility Worker: RME HI = 0.2; CTE HI = 0.1

The total HI for the adult and child resident, based on individual health endpoints, is above EPA's acceptable threshold of 1 and could possibly have adverse effects on the liver, kidney, central nervous system, fetus, endocrine, and skin. TCE and arsenic contribute most of the potential noncancer hazard.

The installation of a public water supply in the area affected by the Hopewell groundwater plume will eliminate risks to residents from consumption of and contact with contaminated drinking water.

Vapor Intrusion

Inhalation of vapors volatilizing from the subsurface into indoor air is also a potentially completed exposure pathway related to the groundwater contamination from the Hopewell Precision site. A quantitative evaluation of risks and hazards associated with this pathway was not completed as part of the groundwater investigation. Instead, EPA's Response and Prevention Branch conducted and addressed vapor intrusion and indoor air issues on a house-by-house basis using a multiple-line of evidence approach. A similar approach (i.e., evaluating subslab soil gas, indoor air concentrations, and other site-specific factors) will be utilized to monitor and respond to "at risk" homes (i.e., homes that lie over the contaminated groundwater plume without mitigation systems) as part of the proposed remedy.

Surface Water/Sediment

Risks and hazards were evaluated for current and future recreational users for incidental ingestion of and dermal contact with sediment and surface water. Each water body was evaluated separately. The total incremental lifetime cancer risk estimates and HIs are shown below.

Redwing Lake

- Adult: RME = 1 ×10^{-6}; RME HI = 0.3
- Child: RME = 2 ×10^{-6}; CTE = 7 ×10^{-7}; RME HI = 3; CTE HI = 0.7

Gravel Pit

- Adult: RME = 3 ×10^{-5}; CTE = 3 ×10^{-6}; RME HI = 1
- Child: RME = 5 ×10^{-5}; CTE = 1 ×10^{-5}; RME HI = 13; CTE HI = 3

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized to assess site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at a site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a Areasonable maximum exposure@ scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other noncancer health effects, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and noncancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a one-in-ten-thousand excess cancer risk@; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk) with 10^{-6} being the point of departure. For noncancer health effects, a hazard index (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a threshold level (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

Whortlekill Creek

- Adolescent: RME cancer risk: 5×10^{-6} and CTE cancer risk: 2×10^{-6}; RME HI = 0.08

Unnamed Pond 1

- Adolescent: RME = 4×10^{-7}; RME HI = 0.04

Unnamed Pond 2

- Adolescent: RME = 6×10^{-7}; RME HI = 0.05

Pond on Clove Branch Road

- Adolescent: RME = 5×10^{-7}; RME HI = 0.04

Wetland Area South of Ryan Drive

- Adolescent: RME = 1×10^{-6}; RME HI = 0.09

These estimates for recreational users are within or below EPA's target range of 1 × 10-6 to 1 × 10-4, with the exception of the total HI for a child in Redwing Lake and the gravel pit. For Redwing Lake and the gravel pit, the calculations for the child RME scenario is above EPA's acceptable threshold of 1.0. The calculations suggest the potential for adverse effects on the whole body and blood due to concentrations of antimony. Antimony is not a site-related chemical. All other total HIs are below EPA's acceptable threshold of 1.0.

Subsurface Soil

Risks and hazards were evaluated for future construction workers for incidental ingestion of, dermal contact with, and inhalation of particulates released from subsurface soil. The total incremental lifetime cancer risk estimate and HI are shown below.

- RME = 3×10^{-7}; RME HI = 0.1

This estimate is below EPA's target range of 1×10^{-6} to 1×10^{-4}. The total HI based on individual health endpoints for the RME scenario is below EPA's acceptable threshold of 1.0.

Screening Level Ecological Risk Assessment

The SLERA evaluated the potential ecological impact of contaminants in surface water and sediment at the Site. Conservative assumptions were used to identify exposure pathways and, where possible, quantify potential ecological risks. Based on a comparison of maximum detected concentrations of contaminants in site sediment and surface water to conservatively-derived ecological screening levels (ESLs), there is no potential for ecological risk from contaminants related to the Hopewell Precision site. The SLERA indicated the potential for ecological risk from contaminants not related to the site. Specifically, hazard quotients (HQs) greater than 1.0 may indicate potential risk from exposure to the following media-specific contaminants:

Sediment

VOCs: acetone and carbon disulfide
Semi-volatile organic compounds (SVOCs): acenaphthene, anthracene, benzo (a) anthracene, benzo (a) pyrene, benzo (b) fluoranthene, benzo (g,h,i,) perylene, benzo (k) fluoranthene, chrysene, dibenzo (a,h) anthracene, dibenzofuran, fluoranthene, fluorene, indeno (1,2,3-cd) pyrene, phenanthrene, and pyrene
Pesticides: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-BHC, beta-BHC, alpha-chlordane, and gamma-chlordane
Inorganics: antimony, arsenic, cadmium, chromium, copper, cyanide, iron, lead, manganese, nickel, selenium, and silver

Surface Water

SVOCs: benzo(a)pyrene and fluoranthene
Pesticides: 4,4'-DDT, gamma-chlordane, and heptachlor
Inorganics: barium, copper, iron, manganese, and vanadium

COPCs in the SLERA were comprised of different classes of contaminants; none are the identified site-related contaminants. TCE and 1,1,1-TCA were detected in some surface water samples; however, levels detected were orders of magnitude below their respective screening criteria. In addition, MEK (2-butanone) was detected in one sediment sample below its screening criterion. These site-related compounds were not retained as COPCs due to their low concentrations. Chloromethane was identified as a site-related contaminant and was retained as a COPC because no ESL was located; however, only trace levels were detected in surface water. It is unlikely any risks exist to ecological receptors from exposure to this compound.

The SLERA indicates no risk to ecological receptors from site-related contaminants. COPCs such as polycyclic aromatic hydrocarbons and pesticides are typically associated with suburban/agricultural areas such as those within the Hopewell area, and are unlikely to be related to activities at the Hopewell Precision facility. In addition, Whortlekill Creek receives surface and road runoff via overland flow and storm water drains; other surface water bodies are subject to overland flow, further contributing to the loading of non site-related COPCs. Although groundwater has been observed to discharge to several surface water bodies in the site vicinity (e.g., Whortlekill Creek, Redwing Lake, and the gravel pit), the contaminant levels discharging to water bodies are expected to remain at extremely low levels or decrease as the groundwater plume dissipates. Therefore, no further ecological investigations or risk assessments were warranted.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are media-specific goals to protect human health and the environment. These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and risk-based levels established in the risk assessment.

The overall RAO is to ensure the protection of human health and the environment. The specific RAOs identified for OU 1 at the Site are listed below.

For groundwater:

- Prevent inhalation of contaminants from groundwater.
- Restore the groundwater aquifer to drinking water standards throughout the plume within a reasonable time frame.

For soil vapor:

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

Remediation Goals

Remediation goals or cleanup levels for OU 1 were selected based on federal and state promulgated ARARs known as groundwater Federal MCLs and New York State Drinking Water Standards, respectively. These MCLs were then used as a benchmark in the technology screening, alternative development and screening, and detailed evaluation of alternatives presented in the FS Report. The cleanup levels for groundwater are the most conservative of Federal MCLs or New York State Drinking Water Standards and are shown in Table 1 below.

Table 1: Remediation Goals

Site-Related Contaminants	Remediation Goals for Groundwater (ug/L) *
Trichloroethene (TCE)	5
1,1,1-Trichloroethane (1,1,1-TCA)	5
1,1-Dichloroethene (1,1-DCE)	5
Cis-1,2-Dichloroethene (cis-1,2-DCE)	5
Chloromethane	5
Methyl ethyl ketone (MEK)	50
Tetrachloroethene (PCE)	5

* Groundwater Cleanup levels for site-related contaminants are based on the more conservative of the Federal MCLs and the New York State Drinking Water Standards.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA Section 121(b)(1), 42 U.S.C. Section 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, comply with ARARs, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants at a site. CERCLA Section 121(d), 42 U.S.C. Section 9621(d) further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section 121(d)(4), 42 U.S.C. Section 9621(d)(4).

The objective of the FS for OU 1 was to identify and evaluate remedial action alternatives for contaminated groundwater at the Site, and also to mitigate impacts to human health resulting from existing, or the potential for, soil vapor intrusion into building at a site.

Detailed descriptions of the groundwater remedial alternatives for the Site can be found in the FS report. The sections below present a summary of the four alternatives that were evaluated. All alternatives were evaluated for a duration of 30 years and used a 7 percent discount rate because these are the standard default timeframe and interest rate used for comparison purposes. The use of the 30-year timeframe does not imply that the remedy would become ineffective or be removed after 30 years.

Consistent with EPA Region 2's Clean and Green policy, EPA will evaluate the use of sustainable technologies and practices with respect to any remedial alternative selected for the Site.

<u>Alternative 1 – No Action</u>

Capital Cost: $0
Annual Cost: $0
Present-Worth Cost: $0
Duration Time: 0 years

The "No Action" alternative is considered in accordance with NCP requirements and provides a baseline for comparison with other alternatives. If this alternative were implemented, the current status of the Site would remain unchanged. No remedial actions would be implemented as part of this alternative. Groundwater would continue to migrate and contamination would continue to attenuate through dilution. This alternative does not include institutional controls or long-term groundwater monitoring.

<u>Alternative 2 – Aerobic Cometabolic Bioremediation</u>

Capital Cost: $6,790,000
Annual Cost: $410,000
Present-Worth Cost: $12,000,000
Duration Time: 30 years
Construction Time: 2 years

Under Alternative 2, a pre-design investigation of aerobic cometabolic bioremediation (ACB) would be conducted along with a pilot study, and long-term monitoring. ACB involves a process whereby micro-organisms while consuming organic substrates such as methane or propane, and oxygen, produce an enzyme which fortuitously destroys contaminants. The pilot study results will be used to design and scale-up ACB in a manner that would enhance and accelerate ACB processes.

The pre-design investigation of aerobic cometabolism would involve collection of samples from 8 to 10 monitoring wells for standard groundwater chemistry parameters, enzyme probe assays, and application of molecular biological tools (i.e., DNA analysis to provide evidence that the blueprint for the enzyme is present). The wells would be selected to represent various conditions at the Site (e.g., relatively higher and lower concentration areas, and background wells not impacted by the plume). Results would be compiled and evaluated with the groundwater chemistry, contaminant results, the enzyme probe results, the DNA results, and historical data to determine the degree to which ACB is occurring and to estimate an overall contamination degradation rate. The second step would involve laboratory microcosm studies, using Site groundwater, to simulate in-situ biodegradation of TCE in the Site aquifer. Specifically, these microcosm studies would measure TCE degradation and enzyme activity in Site groundwater; these results would then be used to estimate actual intrinsic cometabolic degradation rates.

In addition to more fully documenting the occurrence of intrinsic ACB and estimating the effective degradation rate, a pilot study would be conducted to determine the best methods to enhance the rate of ACB. The objective of the pilot study would be to investigate available primary substrates suitable for the site conditions; optimal concentrations of the primary substrate and oxygen for the enhancement; and proper layout and configurations of the enhancement system.

Based on the results of the initial aerobic cometabolism investigation and the pilot study, a full-scale system for adding the substrate will be developed and constructed. The full-scale ACB enhancement will be designed to address the entire groundwater contaminant plume, including the plume core defined by the 50 µg/L contour. Alternative 2 would consist of up to two rows of diffuser wells, with the wells estimated to be 5 feet apart. Approximately 160 diffuser wells would be installed. The wells would be flush mounted with piping connected to each well head for delivery of additive. Final configuration, however, will be determined during the remedial design. A staging area would be needed for each row.

Under this alternative, long-term monitoring would include groundwater samples collected initially annually from the monitoring well network of 35 wells strategically located in and around the groundwater plume. The analytical results would be used to evaluate the migration of and changes in the contaminant plume over time. The monitoring well samples would be collected in the late spring or early summer to allow adequate time to evaluate changes in the geometry of the plume in order to plan the vapor sampling during the winter heating season.

Vapor intrusion caused by volatilization from the groundwater contaminant plume has been monitored and mitigated by EPA for several years. Under the long-term monitoring program, a periodic inspection would be conducted of the 53 existing vapor extraction systems to ensure that the systems are working properly. In addition, EPA would initially conduct a vapor sampling program each winter heating season at homes within the areas of the Site considered to have the potential to experience vapor intrusion, based on the groundwater plume as determined by the periodic monitoring well sampling and previously conducted vapor sampling. Since 2003, EPA has conducted vapor sampling at 209 homes over the groundwater plume, with many of the homes sampled multiple times. During the initial years of annual vapor sampling, the vapor monitoring would focus on structures that have never been sampled (approximately 18 homes) and/or homes that have been sampled for vapors only once (approximately 35 homes). This would ensure that each home would have been sampled at least twice. After the first few years of annual vapor monitoring, homes to be sampled each year would be selected based primarily on other factors including, any changes in the contaminant plume, especially in any areas where the groundwater contaminant levels might show the potential to increase, and proximity to properties experiencing vapor intrusion.

<u>Alternative 3 – Pump and Treat</u>

Capital Cost: $7,980,000
Annual Cost: $940,000
Present-Worth Cost*: $17,470,000
Duration Time: 30 years
Construction Time: 1.5 years
* annual operation, maintenance and monitoring (O&M) costs for treatment for years 2 to 15.

Under Alternative 3, contaminated groundwater would be extracted from the core of the plume and treated, in order to enhance the restoration of the aquifer and to alleviate the occurrence of vapor intrusion. Since the contaminant plume is large and has generally reached a steady state, and TCE concentrations within a large portion of the plume are relatively low, it is neither practical nor cost-effective to extract and treat the entire plume. In the FS, the groundwater extraction wells are designed to capture the 50 µg/L TCE contaminant plume. A pre-design investigation would be conducted to obtain additional lithologic and hydrogeologic data and to further delineate the vertical characteristics of the plume and preferential flow paths. The existing groundwater flow model would be further developed. The final locations and configuration of groundwater extraction wells would be determined by additional groundwater modeling and the pre-design investigations. Contaminated groundwater extracted from the extraction wells would be treated with an ex-situ treatment system such as precipitation for iron and manganese removal, air-stripper and/or liquid phase carbon adsorption units for TCE/VOC removal. The treated groundwater would meet appropriate state and federal standards so that it could be re-injected into the aquifer, discharged to a local recharge basin, or discharged to Whortlekill Creek.

It is important to note that there are residential wells in operation within the 50 µg/L contaminant plume. The impact of groundwater extraction wells on the yields of the residential wells was not evaluated because the OU2 ROD selected an alternate water supply for the residential area impacted by the contaminant plume.

Under the pump-and-treat alternative, long-term monitoring of groundwater and vapor intrusion identical to Alternative 2 would be implemented for the groundwater and vapors.

Alternative 4 – In-Situ Chemical Oxidation

Capital Cost: $10,720,000
Annual Cost: $4,600,000*
Present-Worth Cost*: $25,530,000
Duration Time: 30 years
Construction Time: 2 years
* annual O&M costs for treatment for years 2 to 4.

Under Alternative 4, an oxidant would be injected into selected locations of the plume core areas (i.e., greater than 50 ug/L) to reduce dissolved TCE concentrations and to enhance the restoration of the aquifer. Because the oxidation reaction can be non-selective between contaminants in groundwater and soil constituents, in-situ chemical oxidation (ISCO) would involve high costs. In the FS, it was assumed that only selected areas within the 50 µg/L TCE plume would be treated.

Alternative 4 would consist of four rows of injection wells. Within each row, the injection wells would be approximately 30 feet apart and 10 to 18 wells would be in each row. The wells would be flush mounted, with piping connecting each well head to oxidant tanks during injection. A staging area comprised of tanks, pumps and chemicals would be required for each row. A pre-design investigation would be necessary to better define the horizontal and vertical extents of the treatment area. Depending on what oxidant was used, a bench-scale treatability study would be necessary to determine the quantity of oxidant required. Furthermore, the groundwater geochemistry within the treatment zone would be temporarily altered after the injection of the oxidant. Groundwater samples would be collected prior to and post-chemical injection to evaluate the changes in groundwater quality and the effectiveness of ISCO treatment.

Under the ISCO alternative, long-term monitoring of groundwater and vapor intrusion identical to Alternative 2 would be implemented for the groundwater and vapors.

EVALUATION OF ALTERNATIVES

In selecting a remedy for a site, EPA considers the factors set forth in CERCLA '121, 42 U.S.C. '9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR '300.430(e)(9) and OSWER Directive 9355.3-01. The detailed analysis consists of an assessment of the individual alternatives against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

- Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with applicable or relevant and appropriate requirements addresses whether or not a remedy would meet all of the ARARs of federal and state environmental statutes and regulations or provide grounds for invoking a waiver.

- Long-Term effectiveness and permanence refer to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

- Reduction of toxicity, mobility, or volume (TMV) through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, that a remedy may employ.

- Short-Term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- Cost includes estimated capital and annual operation and maintenance costs, and net present-worth costs.

- State acceptance indicates whether, based on its review of the RI/FS reports and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred remedy at the present time.

- Community acceptance will be assessed in the ROD, and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports.

A comparative analysis of the remedial alternatives for OU 1, based upon the evaluation criteria noted above, is presented below.

Comparative Analysis of Alternatives

- Overall Protection of Human Health and the Environment

For all four alternatives, protection of human health from the contaminated groundwater is provided through installation of a potable water system throughout the impacted community under the OU 2 ROD. Alternative 1 - No Action would not include any monitoring or remedial measures, and as such, would not provide any additional protection of human health or the environment. Alternative 2 – Aerobic Cometabolic Bioremediation includes evaluation of intrinsic cometabolic degradation of TCE and pilot testing followed by implementation of measures to enhance ACB. Due to presence of favorable aerobic conditions in the aquifer, it is highly likely that cometabolic degradation of TCE is occurring, which would provide TCE destruction and would protect human health and the environment. Alternatives 2, 3, and 4 would accelerate the cleanup of the plume by reducing groundwater contaminant concentrations within the plume. Alternatives 2, 3, and 4 would also rely on certain natural processes to achieve the cleanup levels for areas outside of the treatment zones. The long-term monitoring program for groundwater and vapor would monitor the migration and fate of the contaminants and ensure human health is protected. Alternative 1 would not meet the RAOs. Alternatives 2, 3, and 4 would meet the RAOs.

- Compliance with ARARs

Alternative 1 would not comply with chemical-specific ARARs because no action would be taken. Alternatives 2, 3, and 4 would comply with chemical-specific ARARs through treatment and certain natural processes (dilution, dispersion, and discharge to surface waters). Alternatives 2, 3, and 4 would comply with action-specific ARARs for all associated well-drilling activities. Alternative 3 would also comply with action-specific ARARs by controlling emissions of hazardous vapors and complying with effluent discharge requirements. Alternatives 2, 3, and 4 would comply with location-specific ARARs by minimizing any wetland impact from their implementation (e.g, well-drilling activities).

- Long-Term Effectiveness and Permanence

Alternative 1 is not considered a permanent remedy since no action would be taken. Alternative 2 would provide long-term effectiveness and permanence through aerobic cometabolic degradation of TCE and accelerated destruction of the toxic compounds through enhancements to the process, thereby decreasing the time for aquifer restoration. Alternatives 3 and 4 would provide long-term effectiveness and permanence by treating contaminated groundwater within the 50 µg/L TCE plume to shorten the time required for overall aquifer restoration. Groundwater contamination outside the 50 µg/L plume would decrease through certain natural processes including dilution, dispersion, and discharge to surface waters. Alternatives 2, 3 and 4 also would provide annual vapor sampling and vapor intrusion mitigation as necessary.

- Reduction in Toxicity, Mobility or Volume (TMV)

Alternative 1 would not reduce TMV through treatment since no treatment would be implemented. Alternative 2 would reduce TMV through cometabolic degradation of TCE through certain natural processes and measures to enhance these processes. Alternative 3 would reduce the mobility and volume of the contaminant plume through groundwater extraction and reduce the toxicity of water through ex-situ treatment using air-stripper and/or liquid phase carbon adsorption units. Alternative 4 would reduce the toxicity of the contaminant plume through in-situ destruction of the contaminants. The volume and mobility of the contaminant plume would also be reduced by the ISCO process.

- Short-Term Effectiveness

Alternative 1 would not have any short-term impact since no action would be taken. Alternative 2 would have some impact to the community during the pilot testing and enhancement pre-design investigation and installation of wells. Construction of the treatment system may require access to private property. Alternative 3 would involve the use of heavy equipment and the traffic on local roads would be impacted. Alternative 4 would also have some impact on the community since access to private properties would be necessary.

- Implementability

Alternative 1 involves no action. Because Alternative 2 involves an innovative technology, understanding of the cometabolic process and selection of proper equipment are still under development. Property access may add to the implementation challenges. Alternative 3 would be easy to implement technically, but challenging to implement administratively. Obtaining land for the treatment system and piping of influent and effluent lines would be difficult in the fully-developed residential area. Discharge of the treated effluent would also need to be resolved. Like the other action alternatives, land access would be needed to implement Alternative 4; however, access to a larger number of private properties would be required. An experienced vendor would be necessary in order to effectively distribute the oxidant in the subsurface via multiple injection wells. Implementation of ISCO in widespread and groundwater dilute plumes is typically not a proven and cost-effective technology.

- Cost

The estimated capital, annual cost, and present-worth costs for each alternative are presented in Table 2. All costs are presented in U.S. dollars and were developed using a discount rate of 7%.

Table 2: Cost Comparison for Groundwater Alternatives

Remedial Alternative	Capital Cost	Annual Cost	Present Worth	Dura-tion
1	0	0	0	NA
2	6,790,000	410,000	12,000,000	30 yrs
3	7,980,000	940,000	17,470,000	30 yrs
4	10,720,000	460,000	25,530,000	30 yrs

According to the capital cost, annual cost and present-worth cost estimates, Alternative 1 has the lowest cost and Alternative 4 has the highest cost when comparing all alternatives.

- State Acceptance

NYSDEC concurs with the preferred remedy.

- Community Acceptance

Community acceptance of the preferred remedy will be assessed in the ROD following review of the public comments received on the Proposed Plan.

PREFERRED REMEDY

Based upon an evaluation of the four alternatives, EPA recommends Alternative 2 – Aerobic Cometabolic Bioremediation - as the preferred remedy for OU 1. Implementation of this alternative would be expected to provide the best overall protection of human health, especially when combined with the OU 2 alternative water supply remedy. Alternative 2 will include testing to determine to what degree TCE levels are decreasing due to cometabolic degradation and allow calculation of degradation rates. Pilot testing will determine the types of appropriate substrate(s) that can be added to the aquifer to accelerate the rate of biodegradation of TCE. Based on the pilot test results, a system for adding the substrate will be developed and constructed. In addition, long-term monitoring of the groundwater will track and monitor changes in the groundwater contamination through collection of samples on an annual or more frequent basis from the monitoring well network around the Site. An assessment of the groundwater plume indicates that contaminant levels are generally decreasing and would be expected to continue to decrease through certain natural processes within the aquifer. Limited areas where the contaminant levels are potentially not decreasing will be monitored closely for soil vapor and groundwater. The annual monitoring well sample results would be used to track changes in the contaminant plume in order to determine homes considered "at risk" for vapor intrusion. Selected structures/homes determined to be "at risk" would be sampled periodically for vapor intrusion during the winter heating season.

A work plan detailing the testing for ACB and the pilot study would be developed along with a long-term monitoring plan during the design phase of the project. The results from the long-term monitoring program would be used to evaluate the migration and changes in the contaminant plume over time. The long-term monitoring program would be modified accordingly.

Vapor intrusion caused by volatilization from the groundwater contaminant plume has been monitored by EPA. As of July 2009, 53 homes have been outfitted with vapor mitigation systems. These systems would be inspected periodically to ensure they are operating properly. A review of groundwater and vapor data would be relied upon to determine which homes without vapor mitigation systems would be tested in that year's monitoring program. These homes would be monitored through collection of three samples (sub-slab, basement, and first floor) at each building. Vapor extraction systems would be installed, if warranted.

Basis for the Remedy Preference

EPA is proposing Alternative 2 due to the somewhat unique set of conditions at the Site (e.g., large, dilute plume) which presents a particular challenge for existing remedial tools and approaches. While the scientific understanding of ACB processes and tools for implementing and monitoring ACB continue to evolve, most field work to date has focused on monitored natural attenuation of dissolved phase plumes. Deploying ACB as an 'active' remedy will require careful attention to substrate effectiveness and cost-effectiveness of delivery systems for such large volumes. The remedy will determine the rate of aerobic degradation of TCE in the aquifer via certain natural processes, and also determine, through a pilot study, the extent to which natural conditions can be enhanced to accelerate reduction of TCE to non-toxic compounds. Long-term monitoring of the groundwater and vapors will track and monitor the groundwater contamination at the Site, in combination with the remedy selected for OU 2. The Agency believes that these combined remedies for the Site would be the most protective of human health in the long-term.

While Alternative 3 would include installation of extraction wells and a treatment system for the extracted groundwater, it would be difficult to locate extraction wells and a treatment system in the core of the plume since it is beneath a fully-developed residential area. Construction activities under Alternative 3, which would involve the use of heavy equipment (e.g., drill rigs), would impact the traffic on local roads during its construction duration of one and a half years.

Alternative 4 would also require access to private properties in order to install a number wells to inject the oxidant chemical into the aquifer. Multiple injections are likely to be necessary over time. In addition, ISCO is typically employed to reduce high levels of groundwater contamination in smaller geographic areas. It is not expected to be a cost-effective technology under the conditions at the Hopewell site, where the groundwater contamination is relatively dilute and spread over a large area.

Alternative 1, No Action, would rely solely on certain natural processes to restore groundwater quality to beneficial use, and it does not include any long-term groundwater monitoring to assess the effectiveness of this remedy.

Therefore, EPA and NYSDEC believe that Alternative 2, Aerobic Cometabolic Bioremediation, when combined with the selected remedy for OU 2, would provide the best balance of trade-offs among the alternatives with respect to the evaluation criteria.

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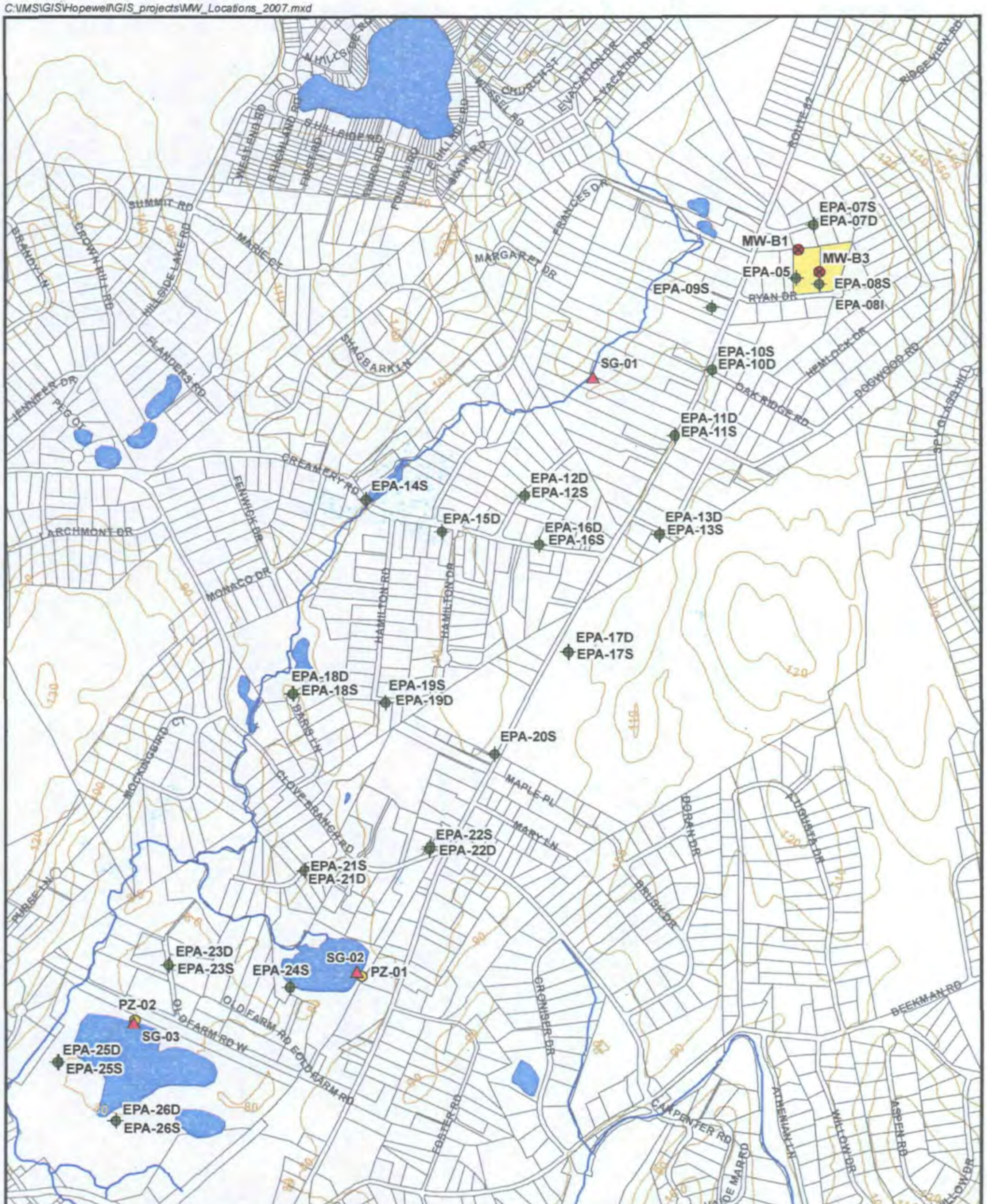

▲	Staff Guages
⊕	EPA Monitoring Well
⊗	Previous Investigation Monitoring Well
○	Piezometer
☐	Parcel Boundary
—	Topographic Contours - Feet amsl

N

0 500 1,000 2,000 Feet

amsl = above mean sea level

CDM

Figure 1
Monitoring Well and Piezometer Locations
Hopewell Precision Site
Hopewell Junction, New York

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Figure 2
Contaminant Plumes
Hopewell Precision Site
Hopewell Junction, New York

CDM

RESPONSIVENESS SUMMARY

APPENDIX V-B

PUBLIC NOTICE PUBLISHED IN THE
POUGHKEEPSIE JOURNAL
ON
JULY 31, 2009

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE HOPEWELL PRECISION AREA GROUNDWATER SUPERFUND SITE HOPEWELL JUNCTION, DUTCHESS COUNTY, NEW YORK

The U.S. Environmental Protection Agency (EPA) announces the opening of a **30-day comment period** on the Proposed Plan and preferred cleanup alternative to address contamination at the Hopewell Precision Area Groundwater Superfund site in Hopewell Junction, Dutchess County, New York. The comment period **begins on July 31, 2009 and ends on August 30, 2009.** As part of the public comment period, EPA will hold a **Public Meeting on Tuesday, August 11, 2009 at 7:00 PM** at the **Gayhead Elementary School, 15 Entry Road, Hopewell Junction, New York 12533**. To learn more about the meeting you can contact Ms. Cecilia Echols, EPA's Community Involvement Coordinator, at 212-637-3678 or 1-800-346-5009 or visit our website at www.epa.gov/region2/superfund/npl/hopewell.

The Hopewell Precision Area Groundwater Superfund site is listed on the Superfund National Priorities List. EPA recently concluded a remedial investigation/feasibility study (RI/FS), Operable Unit (OU) 1, for the site to assess the nature and extent of contamination in site media and to evaluate cleanup alternatives for the site. Based upon the results of this OU 1, EPA has prepared a Proposed Plan which describes the findings of the remedial investigation and potential remedy evaluations detailed in the feasibility study and provides the rationale for recommending the preferred cleanup alternative.

The preferred cleanup alternatives is comprised of:

- An investigation and pilot study of aerobic cometabolic bioremediation (ACB) to determine the rate and the parameters for full-scale enhancement of aerobic cometabolic degradation in the aquifer.
- Remedial design and full-scale enhancement implementation of ACB remedy to achieve restoration of the groundwater to drinking water standards within a reasonable time period.
- Long-term monitoring to track the movement of and changes in the contaminated groundwater plume.
- Annual vapor monitoring of homes determined to be "at risk" for vapor intrusion and implementation of vapor mitigation systems in houses that exceed protective levels, based on changes in the plume.

During the **August 11, 2009 Public Meeting,** EPA representatives will be available to further elaborate on the reasons for recommending the preferred cleanup alternative for OU 1 and public comments will be received.

The RI Report, FS Report, Risk Assessment, Proposed Plan and other site-related documents are available for public review at the information repositories established for the site at the following locations:

Town of East Fishkill Community Library: 348 Route 376, Hopewell Junction, New York 11787
(845) 221-9943 Hours: Mon. - Thurs., 10am - 8pm; Fri., 10am - 6pm; Sat., 10am - 5pm

USEPA Region 2: Superfund Records Center, 290 Broadway, 18th Floor, New York, NY 10007-1866,
(212) 637-4308 Hours: Mon. - Fri., 9am - 5pm

EPA relies on public input to ensure that the selected remedy for each Superfund site meets the needs and concerns of the local community. It is important to note that although EPA has identified a preferred cleanup alternative for the site, no final decision will be made until EPA has considered all public comments received during the public comment period. EPA will summarize these comments along with EPA's responses in a Responsiveness Summary, which will be included in the Administrative Record file as part of the Record of Decision. **Written comments and questions regarding the Hopewell Precision Area Groundwater Superfund site, postmarked no later than August 30, 2009 may be sent to:**

Mr. Lorenzo Thantu, Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866
Telefax: (212) 637-3966
Email: Thantu.Lorenzo@epa.gov

RESPONSIVENESS SUMMARY

APPENDIX V-C

AUGUST 11, 2009 PUBLIC MEETING TRANSCRIPT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

HOPEWELL JUNCTION SUPERFUND PROPOSED PLAN

PRECISION AREA GROUNDWATER CONTAMINATION SITE

PUBLIC HEARING: August 11, 2009

TIME: 7:00

LOCATION: GAYHEAD ELEMENTARY SCHOOL
15 Entry Road
Hopewell Junction, New York 12553
TELEPHONE: (845) 227-1756

REPORTED BY: Constance Mason Walker

APPEARANCES:

EPA Representatives:

Salvatore Badalamenti
James Cummings
Cecelia Echols
Charles Nace
Lorenzo Thantu

EPA Consultants:

PAUL CABRAL
THOMAS MATHEW
SUSAN SCHOFIELD

PRESENTATION BY EPA

CECELIA ECHOLS: Good evening everyone. I want to thank everyone for coming out for tonight's meeting regarding the Hopewell Junction Superfund Site which impacts the community.

My name is Cecelia Echols. I am the Community Involvement Coordinator for this site as many of you might already know.

We are here to discuss our next phase of the clean-up for the site and we would like for all questions to held until after the presentation has been made.

We do have a mic in the middle for you to come over and ask your questions. Please stand up and state your name and spell it so that the stenographer can accurately record your name.

Once the presentation is over we will go over the questions and answers and we will also be preparing a responsiveness summary for this public meeting and our public comment period ends August 30th.

Here at the table is Lorenzo Thantu, the Project Manager; Salvatore Badalamenti,

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he is the Section Chief for Eastern, New York; James Cummings and he is here from our Headquarters' Office; and EPA CDM Consultants; Susan Scofield, Thomas Mathew and Paul Cabral. We also have our Risk Assessor, Chuck Mace.

We also have with us New York State DOH. State your name, please.

DOH: Christine Kulow.

CECILIA ECHOLS: And --

DEC: I'm Karen Maiurano from the State DEC.

DEC: And Dave Crosby also for New York State DEC.

MS. ECHOLS: I would also like to acknowledge any local official. Please stand and state your name.

JOHN HICKMAN: Supervisor, Town of East Fishkill.

MARGE HORTON: Dutchess County Legislator.

CECELIA ECHOLS: Thank you.

MARCUS MOLINARO: State Assemblyman.

ETHEL WALKER: Deputy Supervisor,

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Town of East Fiskill.

WILLIAM BAGLEY: Town Councilman. (Inaudible.) for Council John Hall.

MS. ECHOLS: Thank you. On our agenda we will have many presentation from Lorenzo Thantu who is going to give a brief site history and talk about the phase, the clean-up for Operable Units 1 and 2.

We also have Sal Badalamenti who will give a brief overview on the Superfund remediation selection process.

And then Lorenzo will speak about Remedial Investigation ad Baseline Human Health Risk Assessment and Screening Level Ecological Risk Assessment. The OU-I Feasibility Study which is the subject of tonight's meeting; EPA Preferred Alternatives OU-1 Sitewide Remedy and Alternate Water supply Record of Decision and Remedial Design Status. That is a phase that we discussed at the last year's meeting and we will touch on that at this meeting as well.

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And I will turn this over to Lorenzo.

LORENZO THANTU: Thank you. Good evening everybody. Can you all hear me all right?

MS. ECHOLS: One more thing, the Power Point presentation is the same one that you are going to hear which is in the handout. I hope everyone received it. If not, I can give you a copy. Just raise your hands. We are going to turn off the lights for a moment.

MR. THANTU: I'll try to speak a little louder. All right. The agenda that was given to you there is a lot to talk about tonight. I see a lot of familiar faces as the last time when we were here for last year's discussion especially the summary of the remedial investigation. So, I am going to go through the stuff that I went over last year relatively quickly. I hope to get through my presentation and I will give a brief history for all of those that I see here at the meeting tonight.

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(WHEREUPON, there was discussion with the audience regarding inability to hear the Presenter due to a large industrial fan.)

MR. THANTU: First of all, Hopewell Precision, Inc. is located at 15 Ryan Drive, Hopewell Junction and the waste disposal practice, especially all the dumping was in the late '70's.

The original facility operated at 15 Ryan Drive from 1977 until 1980 and then they moved to a new location at the adjacent parcel at 19 Ryan Drive and historically, all the waste disposal took place in the lot between 15 and 19, 17 Ryan Drive. The waste and the dumping took place in the late '70's which resulted in the waste solvents into the soil. As a result there was a phenomenal amount of contamination.

This map shows you where Hopewell site is located here, between 15 and 17 Ryan Drive. 19 Ryan Drive runs along the two parcels and this shows you the site

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topography and off to the left there is the Whortlekill Creek and to the east there is Route 82 which stretches all the way down and in here you have these two big ponds. The first one is Recreational and then a little further south is the Gravel Pit. That's where the Whortlekill Gun and Rod Club is located.

The EPA got involved in early 2003 when our program looked into the historic site and stumbled onto this Hopewell Site of which we set up a number of private wells and we found that many of them were highly contaminated with Trichloroethene (TCE) and Trichlorethane (TCA) and basically all that testing was done in 2003 to 2005 -- primarily site contaminants and both fall into groundwater contamination.

So as part of the action we immediately provided bottled water to those homes, as an interim measure for the wells that were impacted by ground contamination at the Hopewell site and subsequent to that we identified 41 homes with problem wells

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and tainted with TCE contamination and we subsequently installed POET which is a carbon filtration system and from point of entry treatment. similarly, the State Department of Environmental Conservation, New York State DEC installed 14 POET systems at 14 homes that exceeded the drinking water contaminants -- TCA --

MEMBER OF THE PUBLIC: Please, we can't hear you. Try it without the microphone. We can't hear you.

(WHEREUPON, there was once again a discussion regarding the microphone and inability for the audience to hear the Presenter.)

MR. THANTU: I think I can speak a little better with the microphone. I think I can keep it going a little -- just so I don't lose my voice.

So, as part of the EPA Removal Program we started also extensive testing and all to date we have done essentially testing, vapor sampling conducted at 295 residences which included 209 homes that we

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have identified that are situated over the groundwater contaminated plume that has emanated from the Hopewell site.

And as a result of that, we have installed a Radon system which we call our subslab ventilation systems or SVS in 53 of those homes.

And since then we continue to monitor these homes with either POET systems or SVS systems on a period basis and anytime, based on the periodic monitoring, if we see any kind of impact we will install either and/or POETS and/or SVS systems at these impacted homes.

And that's the Hopewell site and Al will give you a brief review of --

SALVATORE BADALAMENTI: I would just like to go with you over the process, itself, the selection of the remedy and the processes engaged in to clean up the site.

I am sure you have heard some of this before but the first thing that occurs is that the site gets violated and ranked as to whether or not there are sufficient

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hazards there, we look at further. It gets placed on a National Priorities List and once it does, it gets nominated to the National Priority List, it becomes eligible for Federal funding for cleaning up the site under the Superfund law.

At this site and other sites if there are emergency conditions that need to be addressed like there were here, where the people were drinking from their wells, contaminated water, we can come in and take a removal action which is interim measure and in this case it consisted of the carbon filtration systems be put on wells.

After that we feel that we can look at the overall site what is impacted and what are the risks that exist and what are the best ways to address those risks. So when you do a complete remedial investigation, we do a lot of sampling of the groundwater, soils, streams and creeks, and we have remedial action objectives and once those objectives are established then we evaluate alternatives that will address

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those objectives in the feasibility study.

At that point, we evaluate the alternatives and the slightly preferred remedy and we prepare things into a proposed plan which is why we are here tonight for this portion of the remedy for the comprehensive portion of the site.

Last year we were here for the alternate water selection, alternate water supply remedy which was selected last time.

So, after hearing everybody's comments tonight, we will go back and evaluate that and we think by September of this year, we think we will be able then to make a selection for this portion of the remedy and that results in a Record of Decision.

From here it goes into the design process where we nail down the details as to how this conceptual remedy is implemented. We get plans and specifications for bidding by contractors to implement the work and then we get into a remedial action phase where we actually

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start the remedy and if there is construction during this period of operation it may be required, it depends upon what the remedy is.

Basically this is the entire process. Some people ask if we can go a little faster and we tell them that we will try to make it as fast as possible.

MR. THANTU: So, as far as the selection process and based on all the information from the earlier ground program at the Hopewell site, it was placed on the National Priorities List in April of 2005.

So, the site has been divided up into two operable units, Operable Unit 1 and Operable Unit 2 to facilitate the overall cleanup of the soils --

However, the subject of tonight's meeting is to address the entire site, addressing five contaminations: sitewide potential exposures to contaminates environmental media; groundwater, soils, surface water, sediments and vapors associated with the Hopewell groundwater

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contaminant plume and operating unit 2 addresses the water supply.

At this time I would like to give you the status on -- after my presentation on what we are doing tonight on Unit 1 preferred plan.

So, we have completed the remedial investigation study in June of last year, 2008, for the entire site. The main purpose of that remedial investigation was to fully evaluate the nature and the extent of the contamination in these five environmental medias so that so that the EPA will be able -- will enable us to determine the most appropriate clean-up plan for the entire site.

This gives you a conceptual diagram on the site. It's not exact as to what is taking place in the subsurface environment but it will give you a good idea. You can see the groundwater is flowing right to left up you have Whortlekill Creek to the far left -- Here is Hopewell Precision facility at 10 Ryan Drive and then down

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south you have these two large ponds, Redwing Lake and the gravel pit at the Whortlekill Rod and Gun Club and here are all these private wells at these private homes and as these are dissolved into groundwater -- they have a potential for some of the VOCs, Volatile Organic Compounds, -- overlay the subsurface soils and depending on the turpitude of the homes that are around the plume has a tendency of some of the vapors to make that where you can see that in people's basements and then from that possibly into other floors -- potentially like exposed to vapors from the groundwater plume.

So, just to give you an idea of the extent of the nature of the remediation, it will take about a year and a half. We collected a total of 75 samples from soil at the Hopewell facility. We also sampled surface water and sediment in the Whortlekill Creek and also six pounds including the Red Wing Lake and the Gravel Pit and the Gun Club. And we did two

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rounds of indoor sampling currently and subsequently in 2006 and 2007.

We also did two rounds of sampling on residential wells. The first round was in 2006 and we did 48 private wells. At that time all of these private wells were sampled for the downgradient away from the Hopewell facility over the southern portion of the plume.

And then round two in 2007, we did extensive sampling. We sampled 195 private wells over the entire plume. Then after that we did out temporary ground screening where we installed about 50 temporary wells from which we collected 191 samples. And with the sampling we were able to strategically locate and install 35 new program monitoring wells which allows us to sample them all and be able to fully remediate the entire plume on an as-needed basis.

So, we did two rounds of 38 wells both in 2007 which included 3 on-site wells at Hopewell Precision facility -- New York

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State Department of Health in 1985.

So, after the R I was completed in August of 2007, as a lot of you know, the EPA has been involved on this annual sampling provided both sampling.

In 2008 and 2009 we did a sampling of 13 homes separately and then we did the private wells sampling last year in 2008 where we sampled around 149 private wells.

Now, I want to talk to you about the Baseline Human Health Risk Assessment being conducted in the remedial investigation. Baseline human health risk assessment is just that, baseline, meaning we won't do a risk assessment in absence of any clean-up action. So, we can determine what our baseline risks are in order to decide whether we should implement a clean-up plan at the house.

For a human Health assessment we go through a standard process. First is the Hazard Identification, part of which we identify what the contaminant in the soil are at the Hopewell site and we identified

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seven VOCs, volatile organic compounds, TCE and TCA.

And then we did an exposure assessment where we evaluate and look at the exposure health risk pathways by which individuals could become exposed to those chemicals and what duration and what the potential of that exposure is.

And then we do the toxicity assessment where we look at the toxicity of each of the chemicals and we also look at the relationship to the magnitude of the chemicals and the severity of the adverse affect that an individual might have been exposed to those chemicals.

So, based on the exposure to the toxicity assessment the findings -- the stage risk quantifies what these risks are; cancer risks and non-cancer health hazards.

So, for the baseline risk assessment, we did a full risk assessment for several pathways for current and future adult and child residents and also we looked at current and future workers at the

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Hopewell facility so exposure pathways would be ingestion, of contaminated tap water, inhalation of vapors when you are bathing and showering with contaminated water or come in contact with the untreated tap water.

So, based on the ground and pathway analyses we identified that the risk of contamination of lung cancer health has exceed the EPA's risk -- or cancer risk exceeded 1 in 1,000,000 to 1 in 10,000. Just as an example, 1 in 10,000 cancer risk means that if you have a population of 10,000 people 1 of those people would be stricken with cancer over his or her lifetime. That's for cancer risk.

And for non-cancer health that usually target other bodily organs such as kidneys or the immune system and for that they use a different target of 1.0. So, the number 1.0 that means that there is no lung cancer health hazard. If it goes over 1.0 then we might consider taking an action.

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So, for risk -- exceed 1 in 10,000 to 1 in 1,000,000 cancer risk range and hazard was under 1 for lung cancer health hazard. And we found out that about 65% above those risks were contributed to the TCE -- (Inaudible) once that was put into place anybody that could be found potentially at risk of ground contamination obviously, that would no longer take place because they would be on a public water supply.

So, just quickly, the remaining individual health risks assessment we are also looking at the environment, sediment and subsurface water from all the ponds and Whortlekill Creek.

We looked at current and recreational uses and that would be adult and child and the future risks and there is no potential risk of contamination -- and risk assessment done for future construction workers at the Hopewell Precision facility from exposure to the contaminated subsurface soil.

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Screening Level Ecological Risk Assessment. We also looked at where an impact to the ecology of any sediment in the surface water, ponds, and the Whortlekill Creek and we compared the maximum detected concentrations that we got from the surface water and the sediment sample from the pit to at the site and to conservatively derived ecological screening levels (ESLs) and there is no potential for ecological risk from contaminants related to the Hopewell Precision site.

So, now the subject for tonight's meeting, I want to start off with going over the feasibility study. I forgot to include this part, but it is a little late.

We have identified remedial action objectives for the feasibility study, also the preferred remedy, that any must meet and the remedial objectives were identified for groundwater and vapor.

For groundwater, the first objective would be to restore the ground plume to drinking water standards within a

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reasonable time period. You don't just want us to vent inhalation or contaminants from the groundwater contaminated plume and the vapor, the objective is to vent the existing potential for any vapor intrusion into individual homes from the chemical from the groundwater plume.

The first alternative is: No Action as required by the NCP that sets for the requirements and regulations that the EPA must meet to take a clean-up action for a Super Fund Program. Obviously, No Action and the total cost is 0.

The second one, the technical term would be Aerobic Cometabolic Bioremediation, the ACB requirement. The ACB, this alternate would entail -- involved biological precesses that are already taking place in the groundwater aquifer. They live there and are microorganisms that live in the subsurface environment and -- that's because they have the ability to detoxify TCE to water carbon dioxide.

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And we found out based on the remedial investigation the water -- the aquifer conditions deal with these processes to be really taking place to the point that they could actively restore the groundwater plume. I will talk a little bit more later about how we can make them more active by enhancing it. The total cost for this would be $12,000,000.

Alternative 3 is the conventional alternative 3, extracting the contaminated water above ground through the air stripping and the carbon absorption system and under Alternative 3, we would focus on the TCE portion of the ground plume. The cost of that is $17,400,000.

The last one is Alternative 4 - In-Site Chemical Oxidation. Where you use oxygen which are chemicals and you are injecting them into the same area, the highly contaminated area, the TCE portion of the groundwater plume to detoxify the TCE and the TCA contaminants in the groundwater and the total cost of this

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alternative is $25,500,000.

So, in the end you have these four alternatives and we made a full assessment of the four alternatives giving each of the nine Superfund criteria that we have to analyze against with the exception of the one criteria with the exception of the Community Acceptance criteria, which we fully evaluated -- after we have comments from tonight's public meeting and after the comment period ends on August 30th.

So, based on the assessments we have concluded that our preferred remedy when combined with the selected remedy 2 where it was selected from last year's operable unit 2, will be alternative 2, the Aerobic Cometabolic Bioremediation.

The full testing including the investigation and also our studies to determine as to what degree these bugs can be in the groundwater aquifer are working to degrade the TCE and TCA --

Initially, the pilot studies would consist of ground water samples from about

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10 program monitoring wells and their doing laboratory studies to determine the actual rate and also to simulate what is taking place in the groundwater aquifer in the laboratory setting.

So, after the laboratory and pilot work is completed then we would do the remedial design and implementation of full-scale enhancement of these bio remediation to restore the groundwater plume and as part of this we would have to inject several types of additives to the oxygen into injection wells to enhance the microbiological activity within the subsurface environment.

We also have long term monitoring similar position and extended permission to what we have already been doing with the annual at-risk center.

First, we are going to look at the ground monitoring where we take a sample on an annual basis program monitoring wells so that we could fully update the ground plume on a yearly basis and based on the

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information we can identify the dynamics of the plume and also and also to identify those homes that could be at potential risk for vapor intrusion, so that we can check those homes to take a sample and then followup with the season based on what the ground sampling was.

We have left remedial challenges at the Hopewell site. Two big challenges that we are here to deal with, relatively low contamination, during the remedial investigation, our highest TCE hit was 94 parts per billion. The drinking water standard is 5. So, it's a very minute ground plume and also the cover is quite a bit of an area and it extends all the way from the Hopewell facility down to about one and half miles to where the groundwater pit is located.

So, with these kinds of challenges the standard remediation technology is we look by pumping a stream would be very, very ineffective to address the type of contamination. That is one reason we have

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this preferred remedy so that you get effect.

This gives you a very general idea of what the setup might look like -- the building at the Hopewell facility groundwater plume. The only difference here would be that based on all of the soil sampling we did at the Hopewell facility we did not find any real contamination in the soil that would exceed any kind of New York State DEC criteria and based on that we have concluded that there is no real source at the Hopewell site. So anything that was done to the ground has wasted away -- so the smell of all the chemicals has that have been slowly upgradient with the Hopewell plume.

So, in this case you have different pie shaped plumes contaminating the environment. Here we have two rows of injection wells. These two particular (Inaudible) and downgradient to the left, monitoring wells monitoring the see how much of the contaminants, how much of the

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of the gradient is as of the result of the bioremediation at work.

This is just a picture of what the Waterloo Emitters would look like. You have to take a path to start them in the ground and then you just have to insert a tube and then they diffuse their way loose. The emitters in this case at the Hopewell site obviously you can't put them over the monitoring wells (Inaudible.)

Just to give you some idea as to, just as an example, the configuration of what the Waterloo Emitter might look like. This is the first time I am showing you the ground plume there. This is all groundwater plume. The green area is light shaded and dark shaded TCE. Earlier I talked about the remedial alternative pumping and treatment and chemical oxidation and we talked about the 50 parts per billion Trichloroethene and that is right there. There was 50 parts per billion or more and these indicate 5 parts per billion and 50 parts per billion and

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there are two injection wells.

One is just south -- TCE parallel to Creamery Road -- (Inaudible.) so we would have one down here around Clove Branch Road and obviously at that location and a number of injection wells would be fine-tuned through the remedial design.

So, we concluded that this alternative is now and we have to give our best overall to clean the groundwater and start identifying and that it will be done in a reasonable time period and we also have to address all of the contributing issues based on the periodic sampling.

And that was the presentation on the preferred remedy.

And now I want to give you a full status on what a lot of you are here tonight with questions on the status where we are with respect to last year's probable use to make a decision -- water supply.

We have a remedial design contractor involved --

MEMBERS OF THE PUBLIC: Can you

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please speak up.

MR. THANTU: Yes. We do have a contractor on board right now that is going to be doing the remedial design for the public water system that visited the site and toured the site and who is sitting right here at the table who was introduced by Cecelia.

Given the use of CEN, the same contractor who was hired by the EPA that had done all the studies to date; remediation and so -- (Inaudible) get started, start planning to get the design, the remedial design into full swing.

So, if you are familiar with the Record of Decision, we made three potential water supplies; one in Little Switzerland, Dutchess Central Utility Corridor Waterline and the Beekman/Legends systems.

So, right now we have the water source analyses that are ongoing, to look at all the references to that, there are three water supplies based on which the -- we hope to make a decision the end of this

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calendar year or after another public hearing to go over that decision.

So, a decision has to be made. We will really be working at the bulk of the pre-design followed up by the remedial design work.

I think this again the plume -- May of last year indicating by this yellow line and so obviously we are making a very concerted decision that hooks up the area developments covering probably a lot more than just the groundwater plume.

In all we have estimated that about 317 homes in the area. And this shows you the infrastructure that would be the requirement for the hookup area and the green line has 10-inch piping and the roads by which the homes would be hooked up are mainly, they are 8-inch piping. So, this will cover the entire hook up area and we just have to decide which source we are going to get the water from.

I'm going to give you an idea on how much work we are doing and how much work we

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have started doing for the next year and a half. There is a lot of work to be done, just to put in a water supply, first of all, into place.

Just to focus on the remedial design work as you can see from here, we have to do a lot of aerial photographs and ground control surveys to prepare base mapping to prepare for hookup.

For us to deal with plans, they would have to be submitted to regulatory agencies for approval say, for instance, say you want to create a new water district you would to comply with all the requirements approvals and everything.

Also, we would have to survey all the existing utilities because you are going to be a lot of trenching, all of the piping installed, and property surveys, there are a lot of homes, so we have to do that also.

Also, to understand what kind of soil conditions you are talking about over which you are installing piping. There is

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lots of areas, especially since today you have a lot of things and it will take a lot of time so we need to flush all of that work out during the pre-design and the subsequent remedial design.

We also need to have an understanding of what kind of easements and right-of-ways we need and also if necessary, architectural and archeological surveys and there's a lot of wetlands through the area so we need to know what wetlands would be impacted and we have to deal with wetlands delineation and we have to give a plan.

And then after all that, once we -- we also have to carrying out a capacity testing of the aquifer to select the best pumping alternative to make sure the water, our selection, will give an adequate reading --

Remedial design. Typically, you go through three standard statements -- finalized and approved by the EPA. There should be a design format for remedial

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action, contractors to build so they just simply implement a full scale construction basis.

And so for the pre-remedial design work as I said earlier the planning work has started already, we did the water source analysis. We hope to complete all of the pre-remedial design activities by Spring, 2010, that might be limited by September 2010, next year and then around the same time, I think the Fall, we will have started the remedial design. That is going to be started in Spring, 2010, next year and we might exceed that by the end of the next calendar year but just to be on the safe side, 100%, it would be Spring of 2011.

And here is the contact information for sending in your comments and that should be submitted to me and the two locations, one at the EPA in New York City and there is one for the Town of East Fishkill at the Community Library.

MS. ECHOLS: Okay, we have just

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completed our presentation and we would love to hear your questions about the public water supply and if we could first address tonight's meeting for Operable Unit 1, we would appreciate and then we can move into the other phases. Thank you. If you have any questions, please come up to the mic.

MEMBER OF THE PUBLIC: My name if Fred Robbins, R-O-B-B-I-N-S. Just a brief question.

The boundaries that you show of the plume how current and accurate are those and how often do you remeasure and establish the boundaries so you can see if it is moving?

MR. THANTU: Are you talking about the groundwater plume or --

MR. ROBBINS: Yes.

MR. THANTU: The groundwater plume, that is a good question. I forgot to mention to you -- I showed it to you on the slide, going back to two years ago, 2007 and we hope to update that plume within a

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year based on the next round of groundwater sampling from the 35 monitoring wells that we have installed, but generally speaking, we have found the plume to be stable with a few exceptions on a couple of look like areas where we have seen some dynamic shift, shifting a little bit up or down, but not significant. Say like in one-year there might be like a three point sediment, the next year it might be like three point nine or four point four and that makes sense to. So, as I said earlier, we no longer have significant source at the Hopewell facility, so all the contamination is in the dissolved state in the groundwater.

MEMBER OF THE PUBLIC: Hi, my name is Joe Koestner, K-O-E-S-T-N-E-R.

I am up on Creamery Road and I do have the air, the contamination that you put the fix on and I feel good about that except I am still waiting for the water to get bad because on either side of me people have water problems.

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The bio-chemical fix that you talk about now, the last time I was at the meeting, I think it was Town Hall, we were talking about the water fix from Little Switzerland and there were some other ones that were talked about that doesn't talk about to us and what ever happened to them? Is the water fix out? Is that no longer the main mode and if you are going to go by those chemicals fix has this ever been tried elsewhere and does it work?

MR. BADALAMENTI: I think those are two separate questions.

MR. KOESTNER: Yeah, it is.

MR. BADALAMENTI: One has to do with the alternate water supply and one has to do with cleaning up the groundwater --

MR. KOESTNER: Well, you choice.

MR. BADALAMENTI: -- the aquifer. Well, we are going to do both. And not one -- one is not exclusive --

MR. KOESTNER: Oh, you are --

MR. BADALAMENTI: -- of the other. Yes.

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MR. KOESTNER: So, the water -- so we are still going to get water?

MR. BADALAMENTI: Yes, yes.

MR. KOESTNER: And if you buy all those chemicals, -- you said something about chemicals and if you do that, how long will that take to be effective?

MR. BADALAMENTI: That's the problem. That's why we need to implement the alternate --

MR. KOESTNER: The water.

MR. BADALAMENTI: -- water supply.

MR. KOESTNER: Yeah.

MR. BADALAMENTI: Restoring the aquifer is going to take quite a bit of time. It will probably be 20 to 30 years before this plume goes away.

MR. KOESTNER: I didn't hear the question and answer that this was tested somewhere else; right, somewhere else and worked; right?

MR. BADALAMENTI: It is a new innovative process. We have had one of our Washington experts here that can discuss it

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a little further. We have indications that it is a very good candidate, that it is going to work at the site and --

MR. KOESTNER: Again, when?

MR. BADALAMENTI: When?

MR. KOESTNER: Do you know when will that work? When will we get satisfaction -- other than the water, if the water comes in I have no problem at all. The water seems a positive fix but the other one is experimental and experimental on your side too and we don't know that that is going to work. I have run this. How many times where I work they used to run that kind of thing and people can come up with great ideas but they've never tried them and that concerns me.

MR. CUMMINGS: This is -- I wouldn't call it experimental. I would call it innovative and I am not trying to split hairs. This technology h as been used at full scale and I apologize, I brought about a dozen copies of a recent articles that records use of this technology at full

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scale.

MR. THANTU: That is an excellent summary of the Regin's (PH) proposal.

MR. CUMMINGS: There is also a lot of studies -- the EPA, in the pilot study always determines whether you have -- what kind of bugs are here because there are millions of different kinds of bacteria -- problems with the subsurface -- so the pilot study will determine whether the substrait to use is the best, how much oxygen to inject, to open up the process so that the bugs can do their thing.

Also, like -- the Department of Energy ha made a large facility all around the country -- the largest dissolving plumes in the world and some are interested in this problem and they have to do -- developed over a number of years through research projects, oxygen research, and they have some new additives that they came up with that will greatly accelerate and let these process occur.

So, even in the worst case, you're

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talking about 20 years, but I am more optimistic than that at this point. Again, the challenge is as we say it's a large plume so --

MEMBER OF THE PUBLIC: My name is Dutch Schimanke, S-C-H-I-M-A-N-K-E.

I came up here in '46. From Fishkill Hopewell, you can count all the houses. My water at that time, was so good, I didn't even need ice. I would like to know if you people are going to bring water in this area because it is so contaminated from somewhere down the line.

MR. BADALAMENTI: Yes.

MR. SCHIMANKE: From somewhere down the line -- they got that rail trail, it runs right through there. It's better than the two tanks we got now.

MR. BADALAMENTI: We are going to be bringing in a new water source to the community.

MR. SCHIMANKE: Okay.

MR. BADALAMENTI: And we still have to -- right now we are looking at three

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choices. The well field in the Little Switzerland area, --

MR. SCHIMANKE: Good, yeah.

MR. BADALMENTI: -- and the Beekman/Legends system, and the Dutchess Central Utility Waterline.

MR. SCHIMANKE: Well, I live near Little Switzerland and we can't get the water from there. They refused it. They wouldn't give it to us -- at that time. I don't know.

MR. BADALAMENTI: Well, all right, we will come back with the recommended source as soon as we finish our studies.

MEMBER OF THE PUBLIC: My name is John Chaoussoglou, C-H-A-O-U-S-S-O-G-L-O-U.

Good evening and I live on 17 Lenart Place. I have three question.

The first question on page 14, of this diagram.

MR. BADALAMENTI: Yes.

MR. CHAOUSSOGLOU: Well, there is clay that you omitted from there. 17 Lenart Place. There is a large layer of

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clay. That clay has prevented about six houses from being contaminated.

MR. BADALAMENTI: It's quite possible.

MR. CHAOUSSOGLOU: It is not shown here.

MR. BADALAMENTI: Well, this is a graphic. This is just --

MR. CHAOUSSOGLOU: Well, they included everything else but that. Number One.

Number two: The next question -- I wonder why you haven't included it. The next question was: In the area where the clay is there are; one, two, three, four, five houses and in those five houses we have had six people with cancer. Three of them have died and three still remain.

Now according to your estimate -- what you said before, there is no danger of cancer people other than 1 to 1,000, or to 10,000 or to 100,000? How do you explain that then, that data? If you have a small area where you have six people --

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MR. BADALAMENTI: don't know --

MR. CHAOUSSOGLOU: Okay.-- out of 17 houses or ten houses, where does the data come from that there is no danger there?

MR. MACE: My name is Chuck Mace. That's a good question. What we did in our Risk Assessment is we looked at the concentrations that are currently in the groundwater and we used a -- some formulas and some toxicity information and came up with an estimate as to the potential cancer risk going through to the general population. They did not examine each individual person, so it is a range. It is a probability of developing cancer.

I understand that you have indicated that in one small area six people have developed cancer, and that is something that in order to really get to the bottom of that you have to do more cancer studies to determine what type of cancer they are and if they are all the same type of cancer, and they have all lived in the same area for a long time, then that is more

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indicative of maybe there is something localized as opposed to if they are different cancers and some people, you know, have been exposed occupationally or through hobbies and --

I mean there are other exposures that may account for those cancers, so cancer, itself, is a group -- and I understand that a lot of people so you really need to look deeper into what type of cancers they are and some of the exposures that may have been related to those.

MR. CHAOUSSOGLOU: Thank you. Page 34, you have two bands of red there where you plan to inject the bacteria, the ACB bacteria. Am I correct?

MR. BADALAMENTI: We would be injecting oxygen --

MR. CHAOUSSOGLOU: Yes.

MR. BADALMENTI: -- or --

MR. CHAOUSSOGLOU: What happens to the north of the red band, between that area and to the south of the contamination.

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MR. CUMMINGS: I can speak to that. We tried to indicate on the slide, that's one possible configuration.

MR. CHAOUSSOGLOU: If it is possible what is going to happen to --

MR. CUMMINGS: I share that. I share your view. I believe -- there are several processes for cleaning up these sorts of large plumes. You really don't know where the possible higher contaminations are.

So, you put a barrier in at some appropriate location downgradient and have the water come to you, treat it as it comes through. But, again, in this case, this was just to give you an idea of one of the possibilities, situations we might --

I believe in fact this goes back to -- that maybe if we do a little bit more investigation to see if there are some scenes of higher level of contamination than we have seen yet, and that's where we would focus the injection.

But, this is all -- this will all

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take place during the remedial design phase. So, what you see tonight is one of probably a dozen or half a dozen possible configurations of how we will inject the kind of thing that the bugs like to eat, to produce the chemicals that destroy the contaminants and the oxygen --

MR. CHAOUSSOGLOU: Well, it would seem to me that much more often it would start at the top place not from the street level. If it moves southward rather than putting it at the top and expecting it to go backwards. I haven't seen a boat yet that goes upstream.

MR. CUMMINGS: That's what -- well, again, that is just your observation is a thoughtful one but again, and I have seen probably 300 or 400 sites around the country, we have selected to put treatment downgradient and let the groundwater bring the contamination to us.

Again, your point is well taken. I think that is going to be something we will very carefully look at, more serious

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intervention in the areas that appear to be more highly contaminated.

MR. CHAOUSSOGLOU: Thank you.

MEMBER OF THE PUBLIC: Deborah Hall, H-A-L-L.

I have a few questions. The continued -- the pilot study, what happens if it shows that what we are doing is making TCE break down the vinyl chlorides. Do you have any kind of backup plan to cut it off right away or are we going to have to wait for a whole other study while this is happening because I know that this is something that can happen with these studies.

MR. CUMMINGS: This is very important to discuss this with you. The mechanism of the pathway that she has just described do occur with a completely different biological process. There are various ways microorganisms can destroy the contaminants. In the presence of oxygen -- let me back up a step.

This is what is called Hel

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(Inaudible) aquifer. This means that there is oxygen in the aquifer. So, that is why we are going with the aerobic cometabolic process which do not produce vinyl chloride as a bi-product.

It is a completely different consortium of other organisms. They are called aerobic bacteria which in the absence of oxygen where you use nitrates, sulfates, iron and other -- to destroy a contaminant. And in that particular group of consortium microorganisms, which will in fact, which do not completely degrade TCEs can result in vinyl chloride which is -- there is actually a term for it. It is called VCE vinyl chloride (Inaudible.) when microorganisms partially neutralize the vinyl chloride does not completely destroy it, but the scientific literature indicates that the aerobic aquifer does not in fact produce vinyl chloride.

MS. HALL: Are you saying that the process does not break down --

MEMBER OF THE PUBLIC: Speak up,

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Debby.

MR. CUMMINGS: They do break down the contaminants but the pathways in the aerobic process organisms follow will take the TCE, -- carry your TCE to the vinyl chloride to the FTC --

MEMBER OF THE PUBLIC: I didn't get that -- the TCE do what?

MR. CUMMINGS: Vinyl Chloride and then ultimately if you do it right it will result in the production of ethylene which is innocuous and there is a specific bug and we can talk about this, contamination, and that goes all the way past vinyl chloride to ethylene.

Again, the microorganisms that we plan on does not use -- it uses a completely different pathway and so vinyl chloride is not one of the end products.

MS. HALL: I have another question.

MR. CUMMINGS: Well, the first one was a very good one.

MS. HALL: Is there any kind of a timeline for doing the pilot study? Do you

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have any kind of timeline like you are going to do the pilot study for ten years? Are you going to do it for five years? I mean the pilot studies from the beginning to when do you decide that it is working or that it is not working?

MR. BADALAMENTI: We will need to develop that criteria and develop work plan that will determine the length of the pilot study. As we get closer and as we get that defined we can certainly share that with you.

MR. CUMMINGS: I can speak to that. The Department of Energy has recently obtained a patent on one of the new substraits or a different substrait that will accelerate the process and so that is why Sal is hedging a little bit because we are not quite sure which substrait we are going to use but it is just to give you a rough idea of where we think we can go with this pilot.

Again, this is just to give you an idea. Not in five years. I would like to

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think that we would be able to successfully -- see one of things you have to do is you have to design, decide where to do it, install the pilot, and then you have got to wait a while the bugs get used to the stuff you are adding.

What happens is microorganisms which I think Lorenzo indicated in his presentation, are already there. They are ubiquitous but they are not there in sufficient quantities and they don't have enough oxygen to do that which we would like them to do, but rather than going into a tutorial on the technology, my hope is that within 18 to 24 months we will have implemented the pilot and we will be able to see some results, hopefully good in terms of it's effect on the quality of groundwater.

MS. HALL: Is there a contingency plan should this fail and if it does fail, if this doesn't work, for whatever reason it doesn't work, are we going to have to wait another couple of years for you to

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have another study or plan done or is there something on paper that we can to right away that we don't have to wait any longer for the next step? I want to be able to not have to wait any more, you know, for the next step. I want to have the plan in place should we have an issue.

MR. BADALAMENTI: I think that we are pretty confident that it is going to work. The only question is going to be the rate. What is a reasonable time, amount of time, required for the restoration of the aquifer and if we see an acceleration that's acceptable and we can estimate or model that the aquifer will be restored within a 10-year period, then that would be reasonable.

MS. HALL: This is my last question.

In the subslab, when it comes to vapor intrusion, many homes, there's many homes, that they did find PCEs and even though there really hasn't been any PCEs found in the water anywhere, there is one spot, so there is under one part per

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billion. Now, are you going to be testing the homes that already have vapor intrusion issues while this process is going on to make sure that -- I know that you say that it is not going to go to vinyl chloride, but how do you know that maybe the vapor intrusion it might and even if you don't see the water, it could happen in the air and I'm asking that you test the vapor intrusion, test for vinyl chloride, test for PCEs and test for all those things that could come because the water isn't always finding it.

MR. BADALAMENTI: I believe in the TL --

MR. THANTU: TL-15 --

MR. BADALAMENTI: TL-15 test sampling methodology on the vapor intrusion system at the subslab sampling we are testing for all of those --

MS. HALL: Well, you should make sure that the systems are working. You didn't say that you were going to test for vapor intrusion in the existing homes. You

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just said that you were going to make sure that those systems are working correctly and you were going out to look -- you were going to test for vapor intrusion in the other areas, in other homes. I want you to look for vapor intrusions where you know there are already vapor intrusions because we know those homes that are in fact, you know, if there is any vinyl chloride in the air, that's where it is going to go. It is going to go where there is already vapor intrusion.

MR. BADALAMENTI: Let me just understand. So, you are asking for the homes that already have the mitigation systems in place, you would like to see some additional testing --

MS. HALL: In the subslab.

MR. BADALAMENTI: I think we can accommodate that. Maybe not on an annual basis, especially if we know that the systems are working as they were intended to and --

MS. HALL: The point is, if -- we

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know the systems are working. I want to know that if there is any kind of breakdown in the areas of vinyl chloride, that's how we would find it.

MR. CUMMINGS: Response to Edison, New Jersey had a tremendous amount of experience so my suggestion to the Regional folks would be to let's go back and ask through the ERT and ask what their experience has been.

It sounds like they have tested for the viny chloride but to see, for example -- I think your question would be --

MS. HALL: One of the pilot studies --

MR. CUMMINGS: No, no, no. My question is over the subslab and one of the questions we would pose to the ERT is whether the systems adequately take care of that contaminant even if it is formed.

MS. HALL: I understand that we would still be protected but what about the -- but what I am saying is that what we are doing could break down and make vinyl

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chloride in the air and that's why I am asking you to look for. That's what I am asking you to look for. I know -- what about next door, maybe that doesn't have --

MR. CUMMINGS: Are you saying --

MS. HALL: -- and maybe it has just a little bit of vapor intrusion.

MR. BADALAMENTI: We are, as part of our long term monitoring plan, we are going to continue to sample and take subslab samplers on some homes.

MS. HALL: In some homes. All right.

MR. THANTU: As we said earlier, the long term our plan is an extended version of what we have been doing for the last two years. We will be sampling about 50 homes on a yearly basis and if you look at the groundwater contaminated plume, we have about 219 homes of which 209 have had multiple samples --

MS. HALL: I know, I know.

MR. THANTU: But the other 18 we --

MS. HALL: I understand, I

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understand. I would like you to test for vinyl chloride once the pilot study starts. That's what I am asking you.

MR. BADALAMENTI: Vinyl chloride is always analyzed for in any vapor sampling that we do.

MS. HALL: Okay. Thank you.

MEMBER OF THE PUBLIC: My name is Robert Prunella, P-R-U-N-E-L-L-A.

I have got a few questions on new construction of a home in this area. Does the EPA look at mandatory preventative, putting mitigation systems in his home when it is ultimately built and will they come in do samples on this new home and what else can I say here? How long would it take as the final -- after the house is completed, how long will it take the EPA to come in and do these tests?

MR. BADALAMENTI: I'm not sure what the building codes are with regards to new construction in the area.

MR. PRUNELLA: Like mandatory for all new homes that are being built.

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MR. BADALAMENTI: I would think it would be prudent to put some kind of ventilation system under a foundation before the house is built.

MR. PRUNELLA: That would be mandatory for all new homes in this area, yes?

MR. BADALAMENTI: No, no, no, no. It's not mandatory by EPA. It's whatever your local building code requires.

MR. PRUNELLA: Okay, now will the EPA come in and do soil samples on this new home? I was told we have to put a port in the ground for the EPA to come in and do their sampling through this port, through the slab.

MR. BADALMENTI: We test existing structures for people living in them.

MR. PRUNELLA: This is going to be a newly constructed home.

MR. BADALAMENTI: I don't --

MR. THANTU: I think I spoke to you, sir. --

MR. PRUNELLA: Right.

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MR. THANTU: -- over the phone.

MR. PRUNELLA: Yes, over the phone --

MR. THANTU: -- a couple of times. I think what I told you is that, you know, we don't have any kind of requirement to come in and sample your home right away because you are building it, but I told you that we might have some flexibility, especially that we already -- this annual thing, the sampling that if you stay in touch with me, say like the next winter heating season, I might be able to put your home on that list.

MR. PRUNELLA: As soon as the home is constructed and we have a C.O. for this property, can I contact you to come and do the testing?

MR. THANTU: That would have to be planned along with whenever our contractor is going to be out during the next winter hearing season. That's when we do the annual reassessment. You'll have to contact me say in October and I might not

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be able to but if you contact me before -- I might be able to place you on the list of the next round of samples.

MR. PRUNELLA: Good. Thank you.

MEMBER OF THE PUBLIC: My name is Sheila Conniff, C-O-N-N-I-F-F.

Jim, I could kiss you for saying what you did about the vinyl chloride derivative. --

MEMBER OF THE PUBLIC: Can you please speak up.

MS. CONNIFF: I said, Jim, I could kiss you if it turns out that the vinyl chloride will not happen, that the breakdown -- ethylene and carbon dioxide, the main components of breakdown -- the ACB system is operational. Ethylene is not harmless but it is better than vinyl chloride certainly in the water system.

I just wanted to say something briefly. I want to know the status of the written correspondence between Deborah Hall and in one of the water provision for the Legends -- given correspondence to

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yourself, Lorenzo and to Deborah and Phil -- this water system, the cost to operate it and any contingency, the quality of the water system and including but not limited to the maximum quality, the potability of the water, the cleanliness of the water, (Inaudible) PCBs. These are issues and so I am curious as to what is the status of all that?

MR. THANTU: I said to you earlier that we hoped to complete that around the end of this year and we plan to have another meeting before we start any of the bulk of the work, to tell you all which of the three water sources we are going to go with.

MS. CONNIFF: But, we want to have a say in what you choose because there's big differences between those three and this is going to be our water and we think that we should have a view before you tell us which system you choose.

MR. THANTU: That's why we want to have this meeting.

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MS. CONNIFF: This meeting?

MR. THANTU: The next meeting.

MR. BADALAMENTI: The next meeting.

MS. CONNIFF: Oh.

MR. BADALAMENTI: We told you earlier that we would like to evaluate further the three alternatives --

MS. CONNIFF: It is taking forever.

MR. BADALAMENTI: It's a long process.

MR. THANTU: We try to involve you along the long process. That's not something we can do overnight.

MR. BADALAMENTI: I think I want to respond to that a little further. In the Shenandoah Road project where IBM designed the ultimate processing -- the design process was a two-year process and the construction process is turning out to be almost a two -- more than two years.

Across the river in Ulster County another system we built at the Mohonk Road Industrial Plant Site, the design process it did include a little bit more than here.

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We built a drinking water treatment plant as well as a distribution system for hooking up all the residents to the new water supply and the design process was a three-year process.

There are a lot of details that need to be addressed when you are brining water to a house. Some of those Lorenzo went over earlier. Two years is really not an unreasonable duration for the design process. Two years constructing --

MS. CONNIFF: Well, how long did it take you guys to work on the Little Switzerland that you presented to us last year? Was that two years that you worked on that because then we are talking about three years now. And so it is taking us quite a bit longer. That's my point; okay?

MR. BADALAMENTI: Yes.

MEMBER OF THE PUBLIC: Good evening. My name is Rebecca Chaoussoglou, C-H-A-O-U-S-S-O-G-L-O-U.

I have several questions for you this evening. First, you did answer that

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it will take 20 to 30 years for the second alternative to work? That's no?

MR. CUMMINGS: We hope to do better. --

MS. CHAOUSSOGLOU: You hope to do better than that. So right now, you are projecting 20 to 30 years. I would like to know when you compare it to the other solutions, other than that first alternative, which is do nothing, how long would those solutions take to work?

MR. THANTU: You are talking about the other --

MS. CHAOUSSOGLOU: -- the three alternatives.

MR. THANTU: I know that we said to you last year that if we went to that, mother nature take it's course, a rough estimate for natural attenuation could be on the order of 30 years, but certainly for sure any of these active remedial alternatives; bio remediation, chemical oxidation or pump and treat, it will surely shorten that 30-year timeframe because of

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active remediation.

However, in the Feasibility Study we didn't do a nuts and bolts, how much time savings we would get under any of these three alternatives but we are certain that it is going to be significantly reduced.

In the case of our preferred remedy once we have done our initial laboratory studies we will have a lot better idea of what that -- what exactly the time savings is in achieving the drinking water standard.

Once we know exactly how fast the microorganisms are actively detoxifying TCE in the subsurface aquifer but right now I cannot accurately give you exactly how many years it would take, but we should know in a short time.

MS. CHAOUSSOGLOU: Okay, so to me that sounds like Alternative 3 and 4 would take less time to clean up the situation than the Alternative 2 then based on the cost? No?

MR. THANTU: No, I think our

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Alternative 3 and Jim you can add to it, I think Alternative 3 as I said earlier, because of the significant challenges that we are dealing with at the site relatively very dilutable and the contamination in the groundwater and also a very large plume area --

I think that our alterative I think has the greatest tendency to address much of the plume whereas pump and treat and chemical oxidation would really just focus on that 50 parts per billion TCE portion of the plume.

MS. CHAOUSSOGLOU: Okay, I want to again ask how often testing is supposed to be done. We were last tested in November, 2008 and we were -- we thought that it was done quarterly and we haven't been tested again in 2009.

MR. THANTU: Are you talking about sampling?

MS. CHAOUSSOGLOU: Yes.

MR. CHAOUSSOGLOU: Yes.

MR. THANTU: That we have been doing

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on an annual basis.

MS. CHAOUSSOGLOU: So, it once a year.

MR. THANTU: Once a year for 30 years.

MR. CHAOUSSOGLOU: It's supposed to be quarterly.

MR. THANTU: Excuse me?

MR. CHAOUSSOGLOU: You said it was supposed to be quarterly.

MR. THANTU: Quarterly, we have been doing that on the homes with the POET systems. The point of entry -- filtration systems. We are doing quality -- the longest on those homes --

MR. CHAOUSSOGLOU: I thought it was the homes for the people that were attached to those properties.

MR. THANTU: When talking about sampling we do our best to do annual sampling. We did that in November of last year and we plan to do that again toward the end of this year, 2009 and we have done the same things with vapor sampling in the

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winter of 2008 and just now the winter of 2009.

MR. CHAOUSSOGLOU: But, I didn't have any quarterly.

MR. THANTU: Quarterly we do a few times when it comes to those homes with the POET systems. We want to make sure that the POET systems are operating as designed so our removal. You know my colleague John Graham. He has always been the contractor coming back to Hopewell every three or four months to do the quarterly maintenance. Now after the first few years obviously that frequency could be adjusted based on the results of those homes.

MS. CHAOUSSOGLOU: Okay, before I get to the -- I wanted to ask about the water supply again. Last year you indicated that the homeowners would be responsible for that cost and our local politician and our elected politicians that are here with us tonight and I want to go on the record tonight, on notice that due to the fault of Precision, they are still

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in business and they are still profitable, they are making money.

This should not cost homeowners anything for the water that we now need because of their negligence. So, I really challenge the local officials to really help the homeowners out with this.

UNIDENTIFIED MEMBER OF THE PUBLIC: They are here.

MS. CHAOUSSOGLOU: I know they are here. That's why I am specifically addressing them. We have talked to you. We have addressed this with you and we haven't heard anything from you in the past year regarding this.

UNIDENTIFIED MEMBER OF THE PUBLIC: That's not true.

MS. CHAOUSSOGLOU: I have specifically called your office, sir and you have not returned the call me or had any information sent back to me.

MR. BADALAMENTI: Can I --

MS. CHAOUSSOGLOU: Okay.

MR. BADALAMENTI: From the EPA's

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perspective, we are trying to solve the problem first and we will eventually get after Hopewell Precision over recovery of some of those Federal dollars.

MS. CHAOUSSOGLOU: Well, it is still going to cost the homeowners to get the water into their house and they will get water bills.

MR. BADALAMENTI: Yes.

MS. CHAOUSSOGLOU: And that's not the right thing to happen and that why I am asking our local elected officials to help us out with that.

All right. Health concerns. I don't remember seeing this gentleman -- usually it's a revolving door with people from the Health Department.

UNIDENTIFIED MEMBER OF THE PUBLIC: I have been to every meeting for EPA.

MS. CHAOUSSOGLOU: But, there are a lot of different things in terms of health.

Again, I have asked our elected officials and I have challenged the Health people that are here that it is not just

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cancer. We have offered to talk to you. We have offered to open our homes to you. We have given you our names and our addresses and we offered, invited other people to talk t ou.

It is not just about cancer. There is a risk of cancer. There are numerous people that have lived here and have been exposed to that. There are neurological issues in several homes that also have cancer. There are diseases like Lupus and rheumatoid arthritis and kidney malfunction. There is -- if I didn't say neurological I apologize for repeating myself but I really challenge our elected officials to work with the agencies to look at all the health risks, because there are health risks. It is incorrect that there are no health risks.

And I may sound strong by saying this but my opinion is since this is the first time we have heard it, maybe you have heard that parents have died, maybe you have -- neighbors that have children that

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are ill, but maybe you did, but we haven't and we are still living with it and we are still living with the effects of it -- and I don't want to hear anymore that there aren't health risks.

ANN COVER: We have implored New York State - I have --

UNIDENTIFIED INDIVIDUAL FROM THE PUBLIC: I am the one who is at fault because again I have been involved and work for the New York State Department of Health.

ANN COVER: This started -- the initial person that you sent to do the initial to do the initial health survey, really, really got off on the wrong foot with this community and instead of getting people to open up and discuss their health issues doors were slammed because the initial people sent down were so obnoxious, uncaring, unconcerned, really, really lacked empathy so my question followed Rebecca's was we have thanked you.

To send us people who give a damn

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that aren't going to stand up there and say: I am off the job in 30 days, I don't care. Bring people down who talk with us and design a health survey and what are the person's issues because if you look around the room you have got a lot of older people here who have lived here a long time and you have been incredibly disrespectful to them.

So, my question is: When are you going to do this because you promised us last Spring -- were you not at the meeting? You promised us last Spring you would send somebody down who had empathy to do a health survey that looks beyond the basics, that looks into all the kids in this area that have IEPs, neurological disorders, and don't give me nonsense about: Well, it shows up on something because the information on the IEP doesn't and as a Special Educator, who works in the field of knowledge, someone who teaches Special Education, they are in college. The proponents of kids with IEPs that are in

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the plume is ridiculous, for ADHD, neurological disorders, -- motor issues, --

(Inaudible due to individual facing audience and not speaking into microphone.)

On the health issues, we don't have to go to a Registrar if our children are developmentally delayed -- there's a number of children developmentally delayed. There's a number of children in the plume that is higher than average. The incidence of kidney disorders don't need to go on the public record, that is higher than average and all the pre-cancer conditions don't have to go into the cancer registrar and that is higher than average.

CHUCK MACE: I would just like to respond from the EPA's perspective. We are truly concerned by what our risk assessment has shown that there is increased risk for cancer and non-cancer from exposure to the groundwater at the Hopewell Precision site. We have acted to install subslab to protect the indoor air and we propose to do some of

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those homes to have safe drinking water -- drinking water from contaminants. That is our charge is, we need to find out where the exposures are and we rate those exposure so we can find then.

I cannot do my job, do the health studies. We coordinate it with the agencies for toxic substances and the registry and the New York State Department of Health. They carry out the health studies when they are needed. And I do know that the meeting that we had last year that there were meetings with DOH even as we were leaving to discuss what could be done and that's their agency.

We are trying to do our best to stop the exposure so that nothing happens in the future. We have in all our documents, have indicated that there have been unacceptable exposures that are potential for health effects. We don't actually go out and measure them so we can't say there are absolutely health effects caused by these chemicals but we have identified that there

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is a great potential for that and they were high enough concerns that we acted to put the systems in --

MS. CHAOUSSOGLOU: Our objection is not to you. It is to the New York State Department of Health because we would like for more conclusive of a greater study done so that in the future when you at the National EPA go into a community you have a better idea what people are facing health wise. Our damage is done. You can't go back and bring back our neighbors, make our kids healthy again but if the Department of -- the New York State Department of Health did their job right, you would have more information for people in the future and maybe it would be better for you on the Federal level to adjust the standards and really know where you stood.

UNIDENTIFIED MEMBER OF THE PUBLIC: Well said.

MEMBER OF THE PUBLIC:

I would also like to know (Inaudible) all the people who have

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suffered from (Inaudible) what they should do.

CHRISTINE KULOW: I am from the Department of Health. (Inaudible, not near microphone) -- stop exposure through the subslab drinking water exposures -- (Inaudible.)

The best I can -- I don't have health studies. I don't do the cancer studies for the particular surveys, particular cancer surveys. The best I can offer you since I am the only one here representing the Department of Health, is to take your name and number and I will definitely contact Mr. Bowers tomorrow and express that you need -- that he needs to be in contact with you right away. Unfortunately, --

MS. KULOW: Your comments are being documented.

UNIDENTIFIED MEMBER OF THE PUBLIC: He was down here and blew us off.

MS. KULOW: Let me say I will contact the Bureau, the direct Bureau, and

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speak with them. Your comments are being recorded here as before and I will speak to the Bureau.

MS. CHAOUSSOGLOU: I would like to say I have tried contacting our elected officials to help us, meet with us to help us, we need your help because when we ask we are not responded to.

MR. THANTU: Anybody else?

MS. CHAOUSSOGLOU: I just want to bring up one thing. When you do your studies at the water sites, we also brought up the issue of soil, that when you go into the water sites we hope that you take into consideration the cost to people because the cost to everyone in the area is already quite high.

Our home values have dropped and we have other issues. We also go down into a water system where we are going to be expected to pay extraordinarily high rates because of the water systems such as Little Switzerland put it in first. They have a problem and we don't want our rates of

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water to be so high that we are paying for something that occurred because of the people on the Board.

So, I hope that when you look at the whole water, all the things that have occurred, -- our environmental impact, that situation.

MEMBER OF THE PUBLIC: Julie Malkiszher, M-A-L-K-I-S-Z-H-E-R.

A lot of damage has been done. There are a lot of health problems in our area. Our neighbors, there are several and we don't know how to help ourselves. Now, it seems the remedy that you are suggesting, will take years to do any good. Do you have any suggestion of what we can do from now on to protect ourselves from this health hazard?

MR. BADALAMENTI: Well, we are testing wells, that's still going onto to the treatment systems -- wells that we have found with contamination we have installed on a temporary basis the POET treatment systems, so that people were not getting

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exposed through the wells and we are proposing an alternate water supplied to permanently correct the problem.

That will take a little longer but in the interim people are protected with the wells and the vapor mitigation systems that we have installed.

MS. MALKISZHER: Are there other suggestions, that we should boil our water or buy water or if we are not certain that everything is taken care of?

MR. BADALAMENTI: If your well has been tested and it is still clean, --

MS. MALKISZHER: It was not clean. It was tested and then they stopped testing.

MR. BADALAMENTI: Do you have one of the treatment systems, the POET system in your home?

MS. MALKISZHER: No, not anymore.

MR. BADALAMENTI: I would guess that that means that your well is clean and you do not have a problem there.

MS. MALKISZHER: Should it be tested

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again?

MR. BADALAMENTI: We are testing and will continue to test private wells on an ongoing basis. Whether we will get to your house every year is -- may not happen.

MS. MALKISZHER: Should we request it? Should we get in touch with you?

MR. BADALAMENTI: Well --

MR. THANTU: Can you tell me where you live so I can look into it, where your address is.

MS. MALKISZHER: You want the address now?

MR. THANTU: It will be in the transcript. You can tell me later if you want it off the record. If you want to give it to me --

MS. MALKISZHER: Yes, now.

MR. THANTU: Okay, what is your address.

MS. MALKISZHER: 1367 Route 82, corner of Francis Drive.

MR. BADALAMENTI: We will look into that, the history of testing at your home,

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Ma'am and let you know when we will be around.

MS. MALKISZHER: When will I hear from you?

MR. THANTU: Currently, before we do our next round of sampling. It will be in the next few months.

MS. MALKISZHER: In the meantime, should I buy water?

MR. THANTU: Absolutely not. We said your well has been tested every year.

MS. MALKISZHER: I don't have the POET --

MR. THANTU: If you don't have the POET system your water is safe.

MS. MALKISZHER: Thank you.

STEVE QUINN, Q-U-I-N-N.

I have a question. I have a POET system in my home. In the last four years, none of my readings have been above the 5.0 level. I am just wondering if that means my well -- does that say anything about the movement --

MR. BADALAMENTI: On the incoming

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side?

MR. QUINN: The incoming side.

MR. BADALAMENTI: That test was on the incoming side?

MR. QUINN: Well, they do it two ways. They do it, you know, with the system working and without the system. Without the system working it's been under 5.0 for the last four years. What I am saying is: Does that mean my well -- is the plume moving? Do I get off the list? What is the criteria?

MR. THANTU: That's a good question you verbalized. When I spoke to one of my colleagues a few weeks ago we just looked at all of the POET data on 41 homes since we first started tracking them back in 2003. For the most part, the levels -- the plume, the TCE have dropped significantly with maybe three exceptions that have gone up. You know, with it -- like with marginal fluctuations, not significant. So for the most part, the trend for the POET data is consistent with what we have set

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for the overall plume that has generally declined with a few small localized areas where we have not achieved our goal because of certain dynamics. Like for example; last year one property well we sampled came back at 4.6 parts per billion TCE that was below the NCO, but we weren't taking a chance and we installed a POET system at that home.

MR. QUINN: So, while this is not proof, it is certainly indicator that some of the natural processes are actually working here and the plume is starting to -- Well, I would think that if there is any home -- Creamery Road having the same kinds of effects. In other words, coming down from Ryan Road or am I just unique?

MS. HALL: May I say something. My street going back quite a bit, and I also in 2003 there was a drought --

MR. QUINN: Well, I never had -- even in 2003 my initial assessment was only 7.4 --

MS. HALL: Yeah, but what I am

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saying to you is that in 2003, we went through a drought. --

MR. QUINN: Yeah, but it was the same for '04, '05, '06, '07 and '08. My survey from '09 is still fine.

MR. BADALAMENTI: These are not factors that go into what those numbers mean. Whether you are located upstream of the plume, the upper portions, how deep your well is, where it is tapping into the aquifer. There's a lot of factors, so we really can't make a prediction based on --

MR. QUINN: You can't --

MR. BADALAMENTI: -- your well and generalize that for the entire area.

CHRISTINE MITCHELL, M-I-T-C-H-E-L-L:

I appreciate all the time and effort required for these detailed analysis and I understand that it has been going on for a number of years, and my concern is, you know, I have been given a list of all the economic hiccups and should we have any concerns in regard to the ability to make these multi-million dollar commitments?

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MR. BADALAMENTI: I don't see any concern really that at some point in time --

UNIDENTIFIED MEMBER OF THE PUBLIC: I'm sorry, I didn't hear the question.

MS. MITCHELL: Will the funds be available as we needed for these operable units?

MR. BADALAMENTI: The question, I guess is related to money?

MS. MITCHELL: Funds.

MR. THANTU: When will the Superfund expire?

MS. MITCHELL: That's my concern as time goes on and the fund gets tighter.

MR. BADALMENTI: At this point in time, there is no indication we will have any difficulty in funding this project.

MS. MITCHELL: Thank you.

ASSEMBLYMAN MARCUS MOLINARO: I would like to ask just a few followup questions on the alternate water supply.

I expect that you are waiting 'til the end and we have got to be close to that

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so.

I guess -- we received calls from a number of my constituents, primarily asking what has been going on for the last twelve months, as it relates to the preparation regarding for both design development and testing on the alternatives so could you still enlighten us as to what specifically the EPA has been doing for the last twelve months in regards to developing an alternative water supply and proposal?

MR. BADALAMENTI: We have gotten off to a little bit of a slow start. We have a national contract where we have contractors that we can tap to do this work. Just at the time when our Record of Decision was signed last year, or a little bit before that, our national -- our contract for the region expired.

So, there has been a process of getting the contractors back on board and that procurement process has slowed us down a little bit. Right now we have our contractors on board available to us to

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proceed full speed ahead and we have started some of this preliminary work with selecting the source.

We hope to get back to you by the end of the year once this is reviewed and selected, or what we hope to come back with a recommendation and get some input from the public.

ASSEMBLYMAN MOLINARO: I guess I can assume that there is no expectation that any of the residents should expect any further delays in the design?

MR. BADALAMENTI: That's correct.

ASSEMBLYMAN MOLINARO: -- on a proposal.

MR. BADALAMENTI: That's correct.

ASSEMBLYMAN MOLINARO: So, living by the presentation you will have that by the end of the year and there should at least be some design alternatives and then -- provide options proposed to the residents?

MR. BADALAMENTI: As regard to the source.

ASSEMBLYMAN MOLINARO: I think it

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demands that we have concerns that that decision or at least the preferred option not be identified before having another public meeting, another public opportunity to discuss the alternatives. I think you probably imagine when you complete the review proposed here tonight three alternatives, and then the preferred option, that seems to many residents to be a conclusion and then they would only have a single option and is there a possibility and I think we request it, that public dialogue occur somewhere at the mid point in that process, the residents and elected officials can make their case offering some arguments and I guess we would be interested in making sure that there is a commitment at that public do occur prior to proposing a preferred alternative.

MR. BADALAMENTI: Yes, I misspoke and that is exactly our intention.

ASSEMBLYMAN MOLINARO: Okay, so sometime before the end of the year that public process -- do you think it would

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occur in the few months?

MR. BADALAMENTI: We think we will finish up our technical analysis by the end of the year and then we can present the process on each and get some feedback.

ASSEMBLYMAN MOLINARO: Okay. So, your intention is the end of the year you will be finished with the technical analysis, no preferred option and then --

MR. BADALMENTI: We will make a decision afterwards.

ASSEMBLYMAN MOLINARO: Afterwards.

MR. BADALAMENTI: After the public meeting.

ASSEMBLYMAN MOLINARO: Now, there are many residents here and they have heard this before, so the only delay that they should be concerned about is the contractor issue and beyond that there shouldn't be anything else?

MR. BADALMENTI: Right. That's what affected us starting a little sooner, but yes, that's correct.

ASSEMBLYMAN MOLINARO: I guess one

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of the questions that I had and which is pretty basic, you have three potential alternates. It would seem to me -- sort of a first consideration would be to write off any proposal -- I guess our question is: Now we know what the delay in that you couldn't find a contractor but wouldn't yield capacity be the first thing that you would attempt to ascertain then should your alternative not produce then it is not an alternative and do a pump test.

MR. BADALAMENTI: Yes. That is one of the critical questions. However, doing a pump test to determine what the yield of the aquifer is, will be one of the most expensive parts of selecting the source.

ASSEMBLYMAN MOLINARO: But most --

MR. BADALAMENTI: Yes, so we would like ot look at the three alternatives and try to review the pros and cons, and then do the pump test on just one that we feel is the most likely to be -- we don't want to do a pump test on all three options. We want to try to avoid that.

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ASSEMBLYMAN MOLINARO: Okay.

MR. BADALAMENTI: We would like to avoid that part.

ASSEMBLYMAN MOLINARO: Should we make assumptions that then that they will have yield capacity?

MR. BADALMENTI: Well, certainly Dutchess Water Line will not be involved in the wells, so there won't be any pumping test required and we will be able to learn what the capacity of what that system is and whether it is sufficient to serve Hopewell.

ASSEMBLYMAN MOLINARO: I understood that it is, but Little Switzerland and the Legends will have yield capacity -- in the beginning aspect of this, just reviewing it and not waiting until the end you have problems -- and I made a decision on whether to secure water so that we not waste time or waste resources and it seems to me that the yield would be a primary consideration especially if that one doesn't yield.

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MR. BADALAMENTI: You don't need capacity and quality; What quality from each of these sources isn't water as well --

ASSEMBLYMAN MOLINARO: I guess I am concerned that maybe I should have -- the action you used would be the primary consideration --

MR. BADALAMENTI: Okay.

ASSEMBLYMAN MOLINARO: Okay, so I guess that covers the questions that -- that is one other: Is there type of -- any expectation that the water option whatever that preferred option might be, I would ask that all the mitigating proposals and should they have not been moving along in a more parallel fashion?

MR. BADALAMENTI: No, we feel both of our measures are necessary. One is to provide the alternate water supply, permanently and of course the other role is to restore the aquifer so that the people down stream can utilize that water in the future.

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ASSEMBLYMAN MOLINARO: So, we are down to three options for the water supply, none of those would hinder or effect anything or alter the mitigation proposal?

MR. BADALAMENTI: No, no.

ASSEMBLYMAN MOLINARO: Thank you.

MR. CHAOUSSOGLOU: I don't want to ask this for a second time, but a point of information, please. I am concerned that the testing the water in Hopewell -- I believe earlier I guess somebody that's on vacation and his first name was Doug, Douglas.

MR. THANTU: Doug Graham (PH).

MR. CHAOUSSOGLOU: Right there, yes.

He goes over to our property's neighbor, the well, actually the property -- they are attached -- the wells are about 30 feet apart that we are going to be tested quarterly. Now, when did you change the rules, and of course, we are the ones that drink the water, not you.

MR. THANTU: Well, you have got the homes with the POET. Sorry, is that the

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house with the POET system, treatment system?

MR. CHAOUSSOGLOU: Yes. The house with the treatment system is at 15 and I am 17, the one with 33 parts.

MR. THANTU: And both you and he have the POET system?

MR. CHAOUSSOGLOU: No, I don't.

MR. THANTU: you don't have it. So, he is having his water tested --

MR. CHAOUSSOGLOU: That's right.

MR. THANTU: -- quarterly?

MR. CHAOUSSOGLOU: Right.

MR. THANTU: That's what I said, the homes with the POETs.

MR. CHAOUSSOGLOU: Yes, but before that we were promised by Doug whatever his name is, we are going to have it quarterly.

MR. THANTU: Even though you have never had a POET system?

MR. CHAOUSSOGLOU: That's right. He said that the properties that are adjacent to those.

MR. THANTU: I want to check with

QUESTIONS/COMMENTS

Doug.

MR. CHAOUSSOGLOU: Because obviously, we don't drink the water. Between 12 months makes a difference.

MR. THANTU: What is your address, sir.

MR. CHAOUSSOGLOU: 17 Lenart Place.

MS. HALL: Just yesterday there was an article in the Poughkeepsie Journal that said that dredging is in the Hudson River is stopped because of the amount of PCBs went over the safety level.

Now since the Dutchess County water system gets their water from the Hudson River, and it is known that they already do have some PCBs in that water and it is known that they use chloramines (PH) to treat that water which has been another issue out there, I am imploring you to not even consider that water system as that would be a slap in our face. That would be taking TCEs for PCBs. I would rather drill my own well down literally 25 feet and say the heck with all of you because no way am

QUESTIONS/COMMENTS

I going to drink that water and I do not want that water -- I understand you need -- it looks very expensive, too expensive -- so, I don't even know why we are even talking about that system.

Then you have Little Switzerland, that has it's own problems. It's broken. It is old. It has copper and a lot of -- just under (Inaudible) where eventually it will need to be remediated or some extra work is going to be needed to be done, whether they change the pipes. I don't want to have to pay for that.

So, we do have the Beacon water system and that has very good water and absolutely I would want the water, I want very good water and if there is a choice, that's what I would like to have because I have looked at all three of those systems, and the Beacon water system is superior to the other two.

JOHN MCLYNN: I have two further questions. One is you said there is no vinyl chloride because it is not an

QUESTIONS/COMMENTS

anerobic or aerobic so the enzymes that are going to break down, these TCEs. I think the break down is a simple element like carbon, chlorine?

MR. CUMMINGS: Carbon dioxide.

MR. MCLYNN: Oh, carbon dioxide. Then the second thing with all the enzymes, end up going in the water are there any biological consequences to us by ingesting them?

MR. CUMMINGS: There's a number of systems. The one, of course, that I provided to the Region there are a number of jurisdictions that have obtained no further action, letters from regulatory agencies. Most of these biological agents destroy contaminants are short lived in the natural environment. They could not exist long enough. Again they sit around and really destroy contaminants so I don't have specifics on the half life of --

Basically, what is happening is microorganisms are producing oxygen -- they do that in the form of biological

QUESTIONS/COMMENTS

oxidation. So, it's kind of splitting hairs with respect to the bio-ethics, but what these bugs are doing is -- unlike the anerobic processes that we talked about the bugs actually use the clorinated solvents as part of their energy production to grow. In the case of these aerobic -- modified -- more technical name, but the bugs are basically using the substrait that we provide and then producing these enzymes that just happen fortuitously to destroy the contaminants. That is Dr. John Wilson who was going to be with us on these projects, and his wife and who were actually one of the first developers -- still in the process.

Again, to the best of my knowledge it is 9:10 at night, that it might be problematic is not indicated but if I find anything to the contrary, I will certainly let the Region know and I will get back to you.

MR. MCLYNN: The other thing is will they provide a beneficial environment these

QUESTIONS/COMMENTS

aerobic organisms, or whatever you call them. When this is all done, are we going to have any kind of -- millions of microorganisms that I am going to have to kill somehow in the water?

MR. CUMMINGS: Well, they starve to death. They go away. The gentleman at the EOB -- he used a term to describe these bugs but basically they live on the edge of starvation all the time and so our objective is to up, give them a banquet, bring in all the oxygen they can stand, all the substrait they can use and they will do their thing hopefully to our mutual benefit, and then let the bug population decline due to the resources that they have to use in their lives.

Now, there is one thing that we will have to work on, and there is literature and that is you can actually have bio-fallen (PH) where they proliferate which is p artly in response to your question. But, you need to do something periodically around the point that you

QUESTIONS/COMMENTS

inject, to make sure that the bug population doesn't rise to such a high extent and that you have lost your ability to deliver the substream in the aquifer. This should not be a long term gum up the works type of thing. We should be in and out without any problem.

EDWARD CROCCO, C-R-O-C-C-O and I live at 18 Lenart Road which is right across the street from Jack and our neighbors adjacent to us all have the system for their water and we were told when they were tested that we would be tested because where we are in our place is right where the plume comes down, okay, and we have five, six -- five or six homes that were personally safe but our little cul-de-sac my wife has cancer. Her son has Lupus. My next door neighbor has rheumatoid arthritis and four or five other people with cancer who have passed away and we were safe.

We were told we were safe you can't go back and tell us that there was nothing

QUESTIONS/COMMENTS

wrong because we were in a perfectly safe zone and we were coming up safe when we were tested. And now we haven't been tested since December and they were supposed to get tested quarterly as we were told.

When you were checking the systems they would test us before they would go either way. Right next door to me we have high numbers and again, now we're talking about that Hopewell is not getting readings in Hopewell, so it is a proven fact that it has worked it's way down and passed us and that's exactly what you were saying from the get-go, that the plume came right down the street, right down my street, right in front of my house, and my well is 30 feet from the center of the road, okay, 40 feet whatever it may be.

My well is less than 100 feet, 75 feet from the neighbors who has been contaminated, but they won't look at that and they tell me it is safe and the numbers that are coming have been good in the past

QUESTIONS/COMMENTS

and thank God, whatever the cause of the contaminants are and all the other things that happened.

Now, a year ago we were here and we talked the Little Switzerland water okay, and now -- and I don't remember and I could be wrong but I don't remember having two or three alternatives that we were looking at.

We come back and we're not talking about the Little Switzerland water. Now, we are talking about two or three alternatives. If we keep getting alternates every time we come out here we will not get the system, we will not get any remedy for this.

We need to stop spending money looking for alternates. I mean you keep telling us that there are hundreds of sites like this and I'm sure we remedies that you are fixing those. Stop looking around and fix ours. Okay, and stop wasting our taxpayer's money sitting here coming up with the other alternates. Thank you.

MR. THANTU: Can I just ask you a

QUESTIONS/COMMENTS

question?

MR. CROCCO: Yes.

MR. THANTU: The first part of your commentary or your question, you are at 18 Lenart Place.

MR. CROCCO: 18.

MR. THANTU: You don't have a POET system?

MR. CROCCO: No.

MR. THANTU: And there are a few homes on Lenart Place with POET systems?

MR. CROCCO: My next door neighbor.

MR. THANTU: Earlier -- I want to tell you that earlier I said that I recently looked at all public data and for the most part all levels from POET system had come down significantly with a few exceptions. Most of the exceptions -- most of them are Lenart Place.

MR. CROCCO: That's the first one.

MR. THANTU: That also gone up and because of that I just want to tell you that I have already made plans to include all of those homes without POET systems on

QUESTIONS/COMMENTS

Lenart Place on the next round of sampling. Correct me if I am wrong, Lenart Place intersects with Creamery Road?

MR. CROCCO: Yes.

MR. THANTU: You make a right turn --

MR. CROCCO: It's the first right.

MR. THANTU: You make a right. Okay. That does go right through the center line of the plume. It is a short road and just a few homes and that should not be a problem.

MR. CROCCO: There's about 11 or 12 homes there.

MR. THANTU: That's not going to be a problem including in our including all those homes without POET systems on our next round of probable sampling.

MR. CROCCO: How does that come to be. How do you make a decision. You just make a decision?

MR. THANTU: No, I made a note to do your home, sir.

MR. CHAOUSSOGLOU: When did you make

QUESTIONS/COMMENTS

that decision?

MR. THANTU: I told you I would check with my colleague on that. I didn't say that I was only going to be doing --

MR. CHAOUSSOGLOU: Well, you just said that, didn't you?

MR. THANTU: No, no. I said that the next round of annual at-risk sampling which we have not done this year. I said to you earlier that we wanted to do it this year a little earlier -- so at that time --

MR. CROCCO: Thank you.

MS. ECHOLS: Anymore questions? Let's take a 10 minute break.

(WHEREUPON, there was a brief break taken in the proceedings.)

MS. ECHOLS: Back on the record. We have another question.

JOE KOESTNER, K-O-E-S-T-N-E-R: Before, I was under the misconception that this was about the water fix all together. I didn't remember saying that this was the fix the aquifer meeting.

That the water fix that you said

QUESTIONS/COMMENTS

before that is still going on and that is different and I am hoping that from everything I could hear it goes to the Legends, but when will that water fix -- why -- see, I didn't see it, the water which every meeting I cam to was about that, I didn't realize it was about the aquifer, so I apologize for before, but the water is what I wanted to see and I guess that is another meeting. Is that right?

MR. BADALAMENTI: Well, we started the design process one of the big choices, one of the big things that has to be remain is what is the source of the water going to be.

MR. KOESTNER: And, I am definitely pushing the Legends.

MR. BADALAMENTI: Yes, sir.

MR. KOESTNER: I've been talking to the people over there I agree that the Poughkeepsie river water is not a good source. That is just going to bring more problems and Little Switzerland is out of whack. That is crazy, so the Ledges sounds

QUESTIONS/COMMENTS

like a real options. The fellow that runs the Legends -- Have you looked at it?

MR. BADALAMENTI: We will be looking at it. That's one of the three choices.

MR. KOESTNER: When will that activity -- when can we expect to --

MR. BADALAMENTI: We hope to come back to you after looking at the technical pros and cons of each one of the three. We hope to come back to you and report that to you and get some input and feedback when you feel it might be a preferred alternative --

MR. KOESTNER: I thought we had this conversation last week on the water supply or last year.

MR. BADALAMENTI: Well, we left that conversation with the source to be selected. We never made a final decision. We knew we had problems if used the Little Switzerland infrastructure and we had people objecting to that and so in the decision we made, we said: Let's look at these three options so that's what we

QUESTIONS/COMMENTS

intend to do and --

MR. KOESTNER: What you are doing about the aquifer, it sounds like a reasonable shot, I guess. There is no other way to do that?

MR. BADALAMENTI: Yes, sir.

MR. KOESTNER: If you can clean that up, great. That's 20 to 30 years. That's a long time.

MR. CUMMINGS: That's worse case.

MR. BADALAMENTI: That's worse case.

MR. CUMMINGS: Best case, five years.

MR. KOESTNER: Really?

MR. CUMMINGS: We are already seeing -- we are --

MR. KOESTNER: He doesn't live here.

MR. CUMMINGS: We are already seeing some reduction in the levels in some locations. So, we are pretty optimistic.

MR. KOESTNER: Okay, we clean the aquifer, we get the water, both done, and I'm happy.

ANN COBER, C-O-B-E-R:

QUESTIONS/COMMENTS

What will happen to -- this is just an aside. When you do go and cap the wells what about those of us that you drilled the test wells on our property, will you continue to monitor them and when you are done you will cap t hem off properly?

MR. BADALAMENTI: Yes.

MS. COBER: Because I have to have them on my property in two spots, so I am just kind of curious.

MR. BADALAMENTI: These are EPA monitoring wells?

MS. COBER: Oh, yes.

MR. BADALAMENTI: Well, we hope to continue monitoring the plume with some of those so --

MS. COBER: I know that, but when you are done, you are going to cap them all so that it is not a --

MR. BADALAMENTI: And probably seal them and abandon them as required by New York State Department of Health.

MS. COBER: So, it won't be a State --

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MR. BADALAMENTI: Correct.

MS. COBER: Okay, because that was a little bit of a concern of myself because I do have them on my property.

MR. BADALAMENTI: Thank you for letting us put them there.

MS. COBER: We don't mind. We just want -- and I am sure I am not the only person who has brought it up, because we do have them and we want to make sure that they are capped off appropriately before you leave.

MR. BADALAMENTI: They will, I assure you.

MR. CHAOUSSOGLOU: You just referred to areas where the pollution has gone down. What about the areas where pollution goes up? What are you doing about those areas.

MR. BADALAMENTI: We need to keep a close look at that and keep monitoring it.

MR. CHAOUSSOGLOU: You do. However, you refuse to do quarterly testing.

MR. BADALAMENTI: Well, that's not the case in all situations.

QUESTIONS/COMMENTS

MR. CHAOUSSOGLOU: Well, in my situation it is the case. In our situation. I say mine, but our situation.

MS. CONNIFF: I think what he is saying is The goal of the neighbors, when you live in a house where there are two houses behind you and a house to your right, and a house tow more houses over, all have contaminated water, and you are sitting on this little island it almost seems like maybe somebody should go through there more than once a year and perhaps when they are doing the six months checkup for the rest of us, it wouldn't kill them to go in and check his water because those two houses that are totally surrounded I think I would be nervous if I lived in one of those houses too.

MR. BADALAMENTI: Well, on the other hand from the perspective of if we have been there and we have tested ten times in a row, and ten times it has been clean, there has got to be some rationale for it.

MS. CONNIFF: You haven't been ten

QUESTIONS/COMMENTS

times in a row.

Mr. CHAOUSSOGLOU: And also, sometimes it goes it up and down.

MR. THANTU: But, also as you know it also depends on water construction details where the well screen is set.

MR. BADALAMENTI: Each well may be -- one well may be 300 feet deep and another well may be 200 feet deep and the 200 feet one is dissecting the contamination and the 300 foot one is not. We know that there are preferential pathways where such as like a gravely layer where the groundwater contaminants are moving faster than in other areas. Where there is a clay area, where it's moving slower, so that is definitely happening in this area.

MR. CHAOUSSOGLOU: So, that is increasing now?

MR. BADALAMENTI: It's moving at different rates, preferential --

MR. CHAOUSSOGLOU: Yeah, but so if the area has increased contamination, so

QUESTIONS/COMMENTS

the contamination, even the clay area has increased, and you refuse to check it.

UNIDENTIFIED MEMBER OF THE PUBLIC: I have one of those problems. I have a house that is right next to where you have got all these -- I have got air contamination but the water contamination is right next to me and it scares the hell out of me. It's so close and I have already got a system on it but you know my concerns are -- maybe I get my water checked about once a year but now with this kind of rainy season, how does it affect things, does it matter?

MR. BADALAMENTI: I'm not sure whether the rain affects it very much. We know we ar much more comfortable predicting which way groundwater is going and which way contaminants are going in the groundwater. With vapors, it's unpredictable.

MS. ECHOLS: Another question?

WARREN ASKLAND, A-S-K-L-A-N-D: So far my water has been tested

QUESTIONS/COMMENTS

above the or at least 5. I know for a fact I have a shallow well. I don't think my well is more than 25 feet deep because I pulled the pipe myself. I am right on the edge of people that are contaminated. That's sort of a concern to me but every time I have been tested the water has been fine, under the acceptable 5. So I don't know. I just wanted to state that fact. I don't know if I will run into any problems in the future or what but being my well is such a shallow well.

MR. THANTU: Can I ask what your address is.

MR. ASKLAND: It's 1215 Route 82.

MR. THANTU: On the east side?

MR. ASKLAND: West side.

MR. THANTU: On the west side.

MR. ASKLAND: Yes.

MR. THANTU: What is the nearest cross street?

MR. ASKLAND: We are right across from the Phillip's farm.

MR. THANTU: So, that is above Clove

QUESTIONS/COMMENTS

Branch or below?

MR. ASKLAND: No, above.

MR. THANTU: Below.

MR. CHAOUSSOGLOU: No, above. Above, north of Clove Branch.

MR. BADALAMENTI: We are here because we feel there is a risk and that's why we are putting in the alternate water supply system.

MS. ECHOLS: I guess we have no more questions. I want to thank everyone who came out this evening and we will have a response and a summary to address all of your concerns. I will prepare it shortly and if you ever have any questions, you can always call Lorenzo and I and we will get back to you. Thank you.

(WHEREUPON, the Public Hearing was concluded at 9:25 p.m.)

--xx0xx--

C E R T I F I C A T I O N

I, Constance M. Walker, a Shorthand Reporter and Notary Public within and for the State of New York, do hereby certify that I recorded stenographically the proceedings herein at the time and place noted in the heading hereof, and that the foregoing is an accurate and complete transcript of same, to the best of my knowledge and belief.

Constance M. Walker

Constance M. Walker

Dated: August 17, 2009

RESPONSIVENESS SUMMARY

APPENDIX V-D

LETTERS RECEIVED DURING THE COMMENT PERIOD

JOHN J. HALL
19TH DISTRICT OF NEW YORK

COMMITTEES:
TRANSPORTATION AND INFRASTRUCTURE
SUBCOMMITTEES:
VICE CHAIR, AVIATION
WATER RESOURCES AND ENVIRONMENT
HIGHWAYS AND TRANSIT
VETERANS' AFFAIRS
SUBCOMMITTEES:
CHAIR, DISABILITY ASSISTANCE AND MEMORIAL AFFAIRS
OVERSIGHT AND INVESTIGATIONS
SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING

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House of Representatives
Washington, DC 20515–3219

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PHONE (202) 225-5441
FAX (202) 225-3289

DISTRICT OFFICES:
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255 MAIN STREET, ROOM 3232 G
GOSHEN, NY 10924
PHONE (845) 291-4100
FAX (845) 291-4164

PUTNAM COUNTY OFFICE BUILDING
40 GLENEIDA AVENUE, 3RD FLOOR
CARMEL, NY 10512
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FAX (845) 228-1480

August 25, 2009

Mr. Lorenzo Thantu
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866

Dear Mr. Thantu:

I am writing today to offer public comments about the Hopewell Precision Site. Specifically, I would like to address Operable Unit (OU) 1 and Operable Unit (OU) 2.

Two weeks ago, the Environmental Protection Agency (EPA) held a public availability session to discuss the proposed plan for OU 1 and to answer questions that the public may have had on OU 1 and OU 2. I appreciate the agency holding this important hearing to obtain input from local residents.

As you discussed at the public availability meeting, the EPA has recommended Aerobic Cometabolic Bioremediation. This process would involve using microorganisms already present in the groundwater to break down Trichloroethylene (TCE) into chloride, carbon dioxide, and a few other nontoxic products. While my staff was informed by the EPA that the microorganisms do not pose any health risk, I would like the agency to monitor the pilot study closely to ensure that no sudden changes in the breakdown process result in risk to local residents.

In regards to OU 2, I was pleased to learn that agency has finally secured a contractor to begin the remedial design work. At the hearing two weeks ago, you had mentioned that the EPA will be selecting a source for the alternative water supply by December 2009. That source will be either: Little Switzerland, Beekman Water, or the Dutchess Central Utility Corridor Waterline. I am aware that when the EPA makes its selection, the agency will hold a public availability session to present its preferred choice and to explain the rationale behind that decision.

To my understanding, this will be different from the public availability/public comment session from OU1 as the session would not be subject to the formal participation process. I am respectfully urging the EPA to revaluate this decision. I believe that the alternative public water supply is a critical component to the remediation of the Hopewell Precision Site. Constituents and other interested parties should be permitted to have their comments both verbal and written entered into the public record. These comments may be useful in evaluating the decision the EPA makes with respect to the alternative public water supply choice.

As you know, remediation efforts at the Hopewell Precision Site have been an ongoing issue that has affected many residents in the area. I believe that remediation and alternative public water supply plans should move forward as expeditiously as possible. I am committed to working with the EPA, state and local officials, and constituents of this affected community to ensure that the best course of action is being developed and implemented at the site.

Thank you in advance for your review and consideration of the proposals in this letter, and I look forward to working with all of those involved to achieve the best resolution for Hopewell Junction.

Sincerely,

John Hall

John Hall
Member of Congress

MARCUS J. MOLINARO
Assemblyman 103[rd] District

THE ASSEMBLY
STATE OF NEW YORK
ALBANY

RANKING MINORITY MEMBER
Committee on Election Law
Committee on
Libraries & Education Technology

COMMITTEES
Banks
Education
Housing
Local Governments

ASSEMBLY MINORITY TASK FORCES
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Outdoor Recreation
Crime in our Communities
Real Property Tax Reform
Small Businesses
Volunteer Firefighters &
Emergency Services Forums
Co-Chair, RemaINY Forums

August 24, 2009

Mr. Lorenzo Thantu
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 20[th] Floor
New York, NY 10007-1866

Dear Mr. Thantu:

As you know, I have been an interested party to the EPA's plan for the Hopewell Precision area groundwater superfund site, in Hopewell Junction, Dutchess County, New York for the past several years. Members of my district staff and I attended the recent Public Meeting held at the Gayhead Elementary School on Tuesday, August 11, 2009.

Following the very comprehensive presentation by you, the EPA staff and your outside consultants, residents of the community brought up several unanswered questions and showed much concern over the project's past, present and future proceedings. I must admit, I am in agreement with many of their concerns and I am hoping that your good offices will undertake the proper initiative to answer these questions in the next public forum.

I am writing now, so that these comments can be included in the record of public comments. My staff and I have followed up with several of the residents who voiced concerns on August 11. I would like to emphasize some of the key points that were made:

1. The EPA must move forward quickly with the Pilot Study for Aerobic Cometabolic Bioremediation (ACB). You should publish a pilot study timeline and explanation of how the EPA intends to evaluate the pilot study. Having experienced delays we need to move decisively ahead.
2. The ACB plan should have a back up plan that can be implemented quickly if the pilot study fails – it would be unthinkable to delay another one to two years in developing an alternative plan.
3. Along with more aggressive water and vapor monitoring in effected homes, perhaps there should be a schedule of testing and monitoring of homes that previous were not contaminated for any new contamination of either the water or air of those homes as the remediation plan moves forward
4. We continue to hear from residents about overriding residual health concerns for current residents, their children and future children of families living in effected homes. They feel that the studies and efforts of the EPA and NYS Health Department have been inadequate in properly addressing their issues and concerns.
5. With regard to the alternative water system solutions – by and large residents have commented that they wish to see officials move forward with the homeowner's preferred option and avail the services of the Beekman Water Company, Inc. without further delay. This issue, too, has been delayed too long and is now having a direct economic impact on the current effected homeowners in terms of sale-ability and refinance-ability of their homes.

I am very concerned that my constituents obtain thorough answers to their considerable concerns as we move forward. If there is anything that I can do to assist, please do not hesitate to contact my office.

Best personal regards,

Marcus J. Molinaro
Member of Assembly
103[rd] District

CC: Supervisor John Hickman, Town of E. Fishkill, NY
Commissioner, New York State Department of Health

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Mr. Lorenzo Thantu, Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 20th Floor
New York, N.Y. 10007-1866

Dear Mr. Thantu,

Here are my comments on the proposed plan for the Hopewell Precision area groundwater superfund site. Generally, I feel pretty positive about Aerobic Cometabolic Bioremediation. But there are a few issues and questions I have about the proposed plan.

1. There should be a contingency plan should the pilot study prove ineffective. There should be a plan that can be put in place quickly if the pilot study fails. This would avoid having to re-do the FS, feasibility study, and proposed plan which could take up to two years.

2. There should be a timeline for the pilot study. I think that a schedule for the pilot study be set (for example, it be installed in x months and operate for one year), and it be scaled up when the performance meets its criteria. Also, what I did not see is how EPA intends to evaluate the pilot study. For example, TCE breaks down to DCE and then to vinyl chloride, vinyl chloride being more harmful than TCE. EPA should monitor for VC levels and stop if they start to spike.

3. EPA plans to test the water from monitoring wells. And of course EPA gets samples from all POET systems quarterly. Perhaps more water testing should be done especially at the beginning of the pilot test in order to make sure that the TCE is not breaking down to DCE and/or VC.

4. Vapor mitigation systems will be inspected periodically to ensure they are operating properly. Since these are the homes with vapor intrusion, the air in these homes should be tested for breakdown chemicals. Homes that were found to NOT have vapor intrusion in the past should not be the only homes tested for vapor intrusion. Many homes were found to have PCE in the sub slab even though PCE was not found in the water. Perhaps the same thing could happen with the breakdown chemicals.

As for the water system we will get, in one year we have not seen any movement. Although the ROD was completed September of last year and it included the Beekman Water System as a possible water source, there have been no tests done to see if the Beekman system is a viable solution. We already know that the Little Switzerland system is broken and needs a huge replacement of all its pipes. It is bad enough that homeowners in the superfund site are losing money on their investment, and that we will need to eventually pay for water though no fault of our own, but we do not want to have to pay to fix a system that was allowed to be installed incorrectly from the beginning.

We now have learned that the copper and lead levels at the Little Switzerland site are just under the maximum contaminant level. In the last 5 years these levels have more than tripled. There is a good chance that these contaminants will need to be mitigated which will increase the price. In the Beekman water system there are just traces of these chemicals. There is no comparison!

Just about one year has passed since the last meeting discussing this issue with 100 Little Switzerland residents and 4 Hopewell Precision citizens. EPA needs to get moving on testing the Beekman system asap. We cannot understand why so much time has passed with nothing done.

Another reason why we want and need our new water is mortgage and refinancing issues. Title companies discover that the home is in a superfund site and request a date from the EPA for when we will have better water. The EPA responds that they do not know and the banks are told to deny the loan.

As far as the Dutchess County Water system is concerned, the water has PCB's, chloramines and the price is very high. We do not want Hudson River water. Can you blame us?

We have been patient. Now we need to demand that movement is taken concerning our future water. Let's at least learn if the Beekman system is viable.

Thank you for all the work you have done here. I know it is not easy and I truly appreciate the entire staff.

Debra Hall

From: "Pliakos, Mark (H USA)" <mark.pliakos@siemens.com>
Recipients: Lorenzo Thantu/R2/USEPA/US@EPA, <mpliakos@aol.com>
Subject: MARK PLIAKOS Hello and Update
Date: 10:20:39 AM August 12, 2009

Hi Lorenzo

Thank you for the effort you and the team put into providing the community information on EPA activity on this site.

I had one comment but I could not stay to the end of the meeting. Maybe you can answer:

If the new water supply is installed before the the Aerobic Bug solution, will all the digging disturb the plume or otherwise impact how you may want to position the emitters for the Aerobic bugs?

Asking the question another way: Given the two OU recommended solutions, is there a preferred order of implementation to ensure both are effective? Does doing one before the other matter either way?

Also, it was interesting to hear Deb Hall talk about ""their water" when being involved with the choice of an alternate source. When someone from LSNA used the phrase öur water"a year ago she exploded and put some unflattering things on her web site about LSNA.

Thanks again `

Mark

From: "Brandon Storie" <brandon@resourcetechnologiescorp.com>
Recipients: Lorenzo Thantu/R2/USEPA/US@EPA
Subject: Hopewell Precision Site
Date: 08/17/2009 11:41:25 AM

Dear Lorenzo Thantu,

I am writing to you about the Hopewell Precision Site. I am wondering what the advantages of Enhanced bio-remediation are. How does this ensure containment of the plume and capture of the chemicals in question? What kind of time frame is going to be involved in treatment? Is there any danger of incomplete degradation? What are the contaminant levels in this area? What is the estimated volume of contaminated water in the aquifer? I know that it must be cheaper to do this type of remediation, but what are the side effects of altering the natural balance of Bacterial nature in this environment? Why would it not be better to extract the water and remove the chemicals with an air stripper and reintroduce this water back to the aquifer?

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From: WBright55@aol.com
Recipients: Lorenzo Thantu/R2/USEPA/US@EPA
Subject: Hopewell Precision
Date: 08/12/2009 11:48:35 AM

Mr. Thantu,

I am interested in the proposed treatment process for the existing contaminants with in the ground water, you will be installing a system that will be providing oxygen and food for the already present microorganisms to increase the population so they can feed on the contaminants. This will require an operation and maintenance plan for these systems that will be located throughout the clean up site. Can you provide me with your proposed operating plan for this equipment since I am a local contractor with extensive experience with water and wastewater treatment systems. I imagine USEPA would much rather contract with a local qualified contractor then bring someone in from out of the region. So any information about how you intend to manage the equipment and what the opportunity might be for the local talent would be appreciated.

William Bright
Hudson Valley Consulting.

From: "Winters, Rich" <Rich.Winters@mail.house.gov>
Recipients: Lorenzo Thantu/R2/USEPA/US@EPA, Berry Shore/R2/USEPA/US@EPA,"Spear, Susan" <Su <Rich.Winters@mail.house.gov>
Subject: Follow-up questions from last night's hearing
Date: 08/12/2009 04:26:17 PM

Hi Lorenzo,

It was nice to meet you last night. I'd like to thank your team for coming up to the district and taking the time to answer our constituents' important questions and concerns about the remediation efforts for OU 1 and OU 2 of the Hopewell Precision Site. After listening to your presentation and the Q & A, Susan and I had some follow-up questions. We'd appreciate as much information as you could provide for each of these.

1 – What actions can the EPA take against Hopewell Precision, Inc. for its waste disposal activities? Can the agency issue fines and/or penalties? If so, is there any way to use those funds to help defray the cost that each homeowner will have to bare for the new alternative water supply (whichever source that may be). If not, why not?

2 – Last night, you indicated in your presentation that the EPA is looking to make a final decision on the alternative water supply for OU 2 by December of this year. When that decision is made, will the EPA hold a public availability session so the agency can present its choice and logic behind the decision, or will the EPA hold a public availability session and also allow for public comment both at the event and in writing?

3 – In regards to OU 1, what chemicals will remain after the microorganisms break down TCE? Last night it was stated that CO_2 would remain, but are there any other chemicals that would be present?

4 – Specifically, what types of microorganisms would be breaking down the TCE?

5 – Are there any public health consequences as a result of ingesting these microorganisms?

Thank you very much for your attention to these questions and we look forward to your response.

Sincerely,

Rich Winters

District Representative

Congressman John Hall (NY-19)

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