Superfund Proposed Plan

U.S. Environmental Protection Agency, Region II

Shenandoah Road Groundwater Contamination Superfund Site
Town of East Fishkill, Dutchess County, New York

August 2012

◄ MARK YOUR CALENDAR ►

August 29, 2012 – September 27, 2012:
Public comment period for the RI/FS Reports and this Proposed Plan.

Wednesday, September 12, 2012
From 7:00 to 9:00 PM
Public meeting at East Fishkill Fire District Administration Building, 2502 Route 52, Hopewell Junction, NY

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered for the contaminated groundwater at the Shenandoah Road Groundwater Contamination Superfund site (Site) and identifies the preferred remedy with the rationale for this preference.

This Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA), in consultation with the New York State Department of Environmental Conservation (NYSDEC). 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 (CERCLA) of 1980, as amended, and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The nature and extent of the groundwater contamination at the Site and the associated human health and ecological risks that are summarized in this Proposed Plan are described in greater detail in the August 2012 Remedial Investigation Report (RI) and the August 2012 Human Health Risk Assessment Report (BHHRA), respectively. The remedial alternatives that are summarized in this Proposed Plan are described in greater detail in the August 2012 Feasibility Study Report (FS). 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.

The **Administrative Record** file contains the documents upon which EPA based its selection of the preferred remedy and is available at the following locations:

East Fishkill Community Library
348 Route 376
Hopewell Junction, NY 12533
(845) 221-9943
Hours: Mon-Thurs: 10:00 AM - 8:00 PM
Fri: 10:00 AM - 6:00 PM
Sat: 10:00 AM - 5:00 PM

EPA Region II - Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
(212) 637-4308
Hours: Mon-Fri: 9:00 AM - 5:00 PM

This Proposed Plan is being provided as a supplement to the above-noted documents to inform the public of EPA and NYSDEC's preferred remedy and to solicit public comments pertaining to all of the groundwater remedial alternatives evaluated.

The remedy described in this Proposed Plan is the preferred remedy for the Site which includes monitored natural attenuation (MNA) for the groundwater plume and extraction and treatment of the source contamination.

Changes to the preferred remedy or a change from the preferred remedy to another remedy may be made

if public comments and/or additional data indicate that such a change would result in a more appropriate remedial action. The final decision regarding the selected remedy will be made in a Record of Decision (ROD) after EPA has taken into consideration all public comments.

EPA is soliciting public comment on all the alternatives considered in the Proposed Plan and in the FS report, since EPA may select a remedy other than the preferred remedy, based on overall public input.

COMMUNITY ROLE IN SELECTION PROCESS

EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, the RI and FS reports and this Proposed Plan have been made available to the public for a 30-day public comment period which begins on August 29, 2012.

A public meeting will be held during the public comment period at the East Fishkill Fire District Administration Building on Wednesday, September 12, 2012 at 7:00 P.M. to present the findings and conclusions of the RI/FS reports, to elaborate further on the reasons for recommending the preferred remedy and to receive public comments.

Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary section of the ROD, the document which formalizes the selection of the remedy.

Written comments on the Proposed Plan should be addressed to:

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SCOPE AND ROLE OF ACTION

This Proposed Plan presents a long-term remedial action which focuses on the cleanup of the Site groundwater. The long-term remedial action includes the cleanup actions performed under EPA removal authorities: 1) the removal of contaminated soil 2) the installation of a permanent public water supply (PWS) for the community and 3) the ongoing operation of a source extraction and treatment system.

The primary objectives of this action are to remediate the groundwater at the Site which could potentially come in contact with human and ecological receptors.

The groundwater treatment alternatives summarized herein are fully described in the FS. EPA encourages the public to review the FS for additional details about the Site and EPA's preferred remedy.

SITE BACKGROUND

Site Description

The Site is located within the Town of East Fishkill (East Fishkill), Dutchess County, New York in an area known as Shenandoah, approximately one mile southwest of the intersection of Interstate 84 and the Taconic State Parkway and one-and-one-half miles southeast of the Hudson Valley Research Park, as shown on Figure 1. The Site is in a rural area consisting of residential subdivisions intermingled with extensive farmland and patches of woodlands. The topography is dominated by a northeast/southwest trending valley and ridge complex.

Residential well sampling conducted at the Site by the New York State Department of Health (NYSDOH) in April and May of 2000 indicated that 24 residential wells were contaminated with tetrachloroethene or PCE, a volatile organic compound (VOC) and the primary contaminant (or chemical) of potential concern (COPC), above the federal and state maximum contaminant level (MCL) of 5 micrograms per liter (µg/L). One well was also found to be contaminated with the VOC trichloroethene or TCE above the MCL of 5 µg/L.

As further discussed below, the majority of the impacted homes within the Shenandoah Town Water District (STWD) have been connected to the municipal water supply (East Fishkill PWS System) and use septic systems for sanitary wastewater disposal.

Site History

Between 1965 and 1975, Jack Manne, Inc. rented property and a building at 7 East Hook Cross Road in East Fishkill (the Facility) and operated a business to clean and repair computer chip racks supplied to it under a contract with International Business Machines (IBM). Available information indicates that during these operations, solvents, including PCE, and metals, including lead, were disposed of in a septic tank and an in-ground pit located at the Facility. Additionally, nitric and sulfuric acid wastes were reportedly disposed of in another pit at the Facility.

In Fall 2000, EPA and NYSDEC determined that the probable source of the PCE contamination in the nearby residential wells was linked to historical operations at the Facility.

In 2001, EPA notified IBM and Jack Manne of their status as potentially responsible parties (PRPs).

Site Geology/Hydrogeology

The northern portion of the Site is underlain by unconsolidated Pleistoicene glacial deposits that overlie complexly folded and faulted, and highly fractured and weathered dolostone, a calcium/magnesium carbonate, of the Lower Paleozoic Wappinger Group and the Poughquag quartzite (valleys). The southern portion of the Site occupies the east flank of Shenandoah Mountain which is underlain by up-thrown fault blocks of the Precambrian gneissic basement rock (ridges). The heterogeneous glacial overburden deposits range from zero to 100 feet thick and include glacial till, ice-contact deposits and glacio-lacustrine deposits. The surficial geology is dominated by glacial sediments except where a few small dolostone and quartzite outcrops occur at the surface.

The glacial overburden and bedrock aquifers represent two distinct aquifer systems in the East Fishkill area. Underlying the Facility is a shallow saturated bedrock zone in the gneiss bedrock that contains remnants of pure-phase PCE liquid (also known as a dense non-aqueous phase liquid or DNAPL) which constitute a continuing source of contamination for the plume. Groundwater flows in gneiss bedrock from the Facility to the north, east and south. To the north groundwater flows from the gneiss into the quartzite and dolostone and then into the overlying glacial deposits. This transition occurs along Shenandoah Road between its intersections with Griffin Lane and Jackson Road. Groundwater then flows northward within both the bedrock and the glacial ice-contact deposits in the direction of the wetland north of Townsend Road (NYSDEC HJ-54). This northern wetland is the discharge zone for most of the groundwater originating at the Facility.

A small portion of the groundwater which originates at the Facility flows to the east and may discharge to an unnamed stream and its associated wetland (NYSDEC HJ-59) that lie east of Shenandoah Road between Shenandoah Mountain and Hosner Mountain.

Based on the pattern of PCE detections and the magnitude of those detections, the groundwater flow direction, away from the Facility to the east, moves in the direction of Burbank Road and Shenandoah Road. The highest concentrations found in residential wells occur in wells on Burbank Road directly east of the Facility on the other side of the ridge. This suggests that groundwater transport through the vertical joint system in this ridge has also been significant. Detection of PCE in residential wells south of the former Facility suggests groundwater flow to the south along an apparent structural discontinuity (shear zone), most likely discharging into the unnamed stream between the two mountains.

Overall, the hydrogeology is quite complex in the area of the Site. However, in spite of the discharge of groundwater originating at the Facility into streams to the north and east, groundwater and surface water samples show that no dissolved PCE or its degradation products of TCE or cis-1,2-dichloroethene (cis-1,2 DCE) reach any of the streams draining the Site. This occurs because various attenuation mechanisms in the bedrock aquifers remove, dilute or disperse the PCE as it is flowing toward these streams.

Site Characterization and Response

In June 2000, following the discovery of contamination in the residential wells, EPA initiated an emergency response action at the Site and began delivery of bottled water to the affected residences. Of the then 60 known contaminated residential wells, 20 had contamination exceeding the removal action level (RAL) for PCE (70 µg/L). Under the Superfund Program, if any contaminant concentration exceeds its RAL, EPA is authorized to take immediate, short-term action to address that contamination. As a result, point-of-entry treatment (POET) systems were installed by EPA in homes where wells were contaminated at or above MCLs to ensure a safe supply of water. POET systems include a cartridge particulate filter, two granular-activated carbon (GAC) tanks and an ultraviolet light. These actions were taken to protect the health of the public until a more permanent solution could be implemented.

In November and early December 2000, EPA began removal activities at the Facility with the excavation of a septic tank and the removal of its contents to an off-site treatment and disposal facility. EPA also excavated contaminated soil associated with the septic tank and temporarily stockpiled it at the Site. Based on field screening results and post-excavation soil sampling results collected by EPA, it was evident that high levels of PCE still remained in the soil beneath the Facility. As a result, it was necessary for EPA to demolish a building at the Facility prior to excavation of the underlying contaminated soil. During the excavation of the soil, which extended to the water table, two additional PCE-disposal areas were discovered.

In May 2001, an Administrative Order on Consent for a Removal Action (RA-AOC) was executed between IBM and EPA. Under the RA-AOC, IBM assumed responsibility for the remaining soil removal at the Facility. Also, under the RA-AOC, a separate provision was included to allow for additional response work that the two parties could agree should be performed.

In August 2001, under the RA-AOC and EPA oversight, IBM removed approximately 4,800 tons of stock-piled PCE-contaminated soils associated with the former septic tank and the two PCE-disposal areas and transported them for off-site treatment and/or disposal. Prior to backfilling, at the request of EPA, IBM installed groundwater collection pipes at various locations at the base of the excavation for future groundwater monitoring.

At the same time, EPA discovered a buried acid pit behind the Facility. Field sampling of the soil surrounding the acid pit revealed high concentrations of PCE. In January 2002, IBM, under the RA-AOC and EPA oversight, excavated and transported for off-site treatment or disposal an additional 2,000 tons of contaminated soil.

Also, in August 2001, IBM proposed to evaluate and to construct an alternate water supply under the provisions of the RA-AOC. In December 2001, EPA approved IBM's final work plan to evaluate six different water supply alternatives. Subsequently, in November 2003, the EPA-approved Alternate Water Supply Evaluation Report was issued. EPA held a public meeting on November 20, 2003, identifying its preferred response action. On August 23, 2004, EPA issued its decision to use the Town of Fishkill municipal water supply as the permanent drinking water source for affected Shenandoah area residents.

Subsequently, IBM implemented EPA's decision and constructed the PWS system within East Fishkill's newly-formed Shenandoah Town Water District (STWD). The PWS system work included the installation of transmission and distributions lines, a water storage tank and all house connections. The PWS system was completed and deemed fully operational in March 2009. The STWD community is now being serviced by a permanent PWS system.

Except for eight homeowners within the STWD who elected to keep their uncontaminated residential wells, all residential wells located on Shenandoah Road, Old Shenandoah Road, Seymour Lane, Burbank Road, Jackson Road, Townsend Road, Old Townsend Road, Jaycox Lane, Stone Ridge Lane and East Hook Cross Road have been disconnected from the home plumbing systems which are no longer in use.

During the course of the RI work, IBM determined that residual PCE-related DNAPL is present in the groundwater and within the fractured bedrock underlying the Facility. As a result of this finding of DNAPL, EPA determined that conducting a non-time critical-removal action to control the DNAPL source would be beneficial. Subsequently, pursuant to the RA-AOC and with EPA oversight, IBM prepared a Non-Time-Critical Source Removal Action (NTCSRA) work plan to address the DNAPL source. Results of a long-term aquifer test, conducted during April-May 2011 as part of the RI/FS, were used to determine the configuration of the NTCSRA. The final NTCSRA Report was approved in August 2011.

In December 2011, EPA issued a Decision Document identifying the selection of the NTCSRA to control the DNAPL source contamination at the Facility. This action was taken, because both the level of PCE dissolved in groundwater in shallow bedrock underlying the Facility and the prevalence of stable and increasing concentration trends in many long-term monitoring wells within the plume indicated the presence of DNAPL underlying the Facility.

The NTCSRA operation consists of four groundwater extraction wells and two granulated activated-carbon (GAC) adsorption vessels in series to treat the contaminated groundwater. The treated groundwater would then be discharged to the designated storm water conveyance under a NYSDEC permit. A configuration of four extraction wells at the Facility provides the most robust response in the surrounding bedrock aquifer. Groundwater extraction from all four wells at the Facility is expected to achieve the overall objectives of reducing the DNAPL source in the fractured bedrock and of controlling groundwater chemical flux from the source area to the groundwater plume. DNAPL concentrations at the source were found to be as high as 16,000 µg/L of PCE. The NTCSRA capture zone is approximately 16 acres surrounding the Facility.

The principal goal of the NTCSRA is to reduce and to contain VOC concentrations in the source area at the Facility to levels that, even though they may still exceed groundwater standards, reduce the mass flux from the source significantly to levels that will permit cleanup standards to be met within the plume.

Since the NTCSRA will remain an active part of the preferred remedy, it will now be referred as "source extraction and treatment" in all future discussion herein.

RESULTS OF THE REMEDIAL INVESTIGATION

During the 2001 removal action, IBM completed an Initial Groundwater Investigation report, pursuant to the RA-AOC, to show preliminary groundwater contamination information. Subsequently, in 2002, EPA and IBM entered into a second Administrative Order on Consent to perform the Remedial Investigation and Feasibility Study (RI/FS-AOC). IBM's RI/FS Work Plan was approved in late 2005. A conceptual site model was developed for the Site (see Figure 2).

The RI sampling was conducted from 2006-2012. The RI report also includes the pre-RI sampling efforts that were conducted from 2002 until 2006. During the RI, all affected media were investigated, including surface and subsurface soils, groundwater, surface water, sediments and soil gas.

Groundwater Plume

Discrete sampling of groundwater occurred at each of the monitoring well locations shown on Figure 3. There are 11 monitoring wells that were fitted with FLUTe® systems with a total of 41 separate sampling intervals defined for these wells. The FLUTe® system is a multi-level monitoring well system where a flexible liner is installed down the well and allows for groundwater to be sampled at select intervals along the liner at specific depths. The use of a FLUTe® well alleviates the installation of multiple wells at a single location. The FLUTe® system was used at a number of monitoring well locations in order to alleviate the need for multiple wells to be drilled. There are an additional 35 regular monitoring wells in place. In addition, there are 27 residential wells which have been converted into monitoring wells. Three distinct rounds of groundwater samples were collected from the monitoring well locations. Also, during the third round of sampling, a number of residential wells which were converted to monitoring wells were sampled. Some of these wells will be part of the long-term groundwater monitoring program.

During December 2007, the initial round of sampling began for the full target compound list (TCL) (VOCs) and target analyte list (metals) parameters. Subsequently, wells were sampled for the COPCs as well as other water quality parameters. The highest concentration of PCE was detected at SRMW-18RA at 6,000 µg/l, which is the shallowest monitoring interval on the Facility. The next highest concentration of PCE detected was 490 µg/L at BRB005D (a converted residential well along the west side of Burbank Road). TCE was also detected at 50 µg/L at BRB005D. Historically, prior to the installation of the PWS, the highest PCE (2100 µg/L) and TCE (52 µg/L) concentrations in residential wells were observed at this location.

Maximum concentrations of TCE in several other residential wells along the west side of Burbank Road were also measured at concentrations ranging from 29 µg/L to 42 µg/L. Other than these locations, maximum TCE detections were also present at SHN487 (39 µg/L) and SEY001 (21 µg/L).

In March 2012, the highest concentration of TCE detected in the bedrock aquifer was 7.6 µg/L at SRMW-12RA. At SRMW-2R and SRMW-2RA, no PCE was detected, and TCE was the principal COPC and was found at 9.0 µg/L and 4.3 µg/L, respectively. TCE was not detected above 1 µg/L in any well completed in the glacial sediments.

Since March 2009 when the PWS system was installed and residential well use ceased, the highest concentrations of PCE in groundwater beyond the Facility were observed along the west side of Burbank Road. Specifically, a PCE concentration at 190 µg/L was observed in the gneiss bedrock in SEY006 which was shown to be downgradient from BRB005.

Within the bedrock aquifer to the east of the Facility, the highest concentration of PCE found was 14 µg/L at SEY005S. Neither PCE nor any of its degradation products was detected above the 5 µg/L groundwater standard in any other bedrock well east of the easternmost fault line.

In October 2011, within the bedrock aquifer to the north, the highest concentration of PCE observed, since the use of residential wells for water supply ceased was 39 µg/L at SRMW-12RA. This is the most downgradient bedrock monitoring location in this portion of the flow system. By contrast, the maximum concentration of PCE in residential wells on either side of Shenandoah Road between its intersections with East Hook Cross Road and Jackson Road ranged from 160 µg/L to 440 µg/L. This location is where the crossover of groundwater flow from the bedrock to the glacial ice-contact deposits occurs

The highest concentrations of PCE outside the gneiss bedrock since use of residential wells ceased occur in three wells that monitor groundwater quality in these glacial ice-contact deposits, SRMW-12S: 49-57 µg/L, SRMW-12SA: 48-74 µg/L and SRMW-14S: 44-53 µg/L. The concentrations of PCE in the overlying glacial ice-contact deposits (45-49 µg/L) are greater than the concentrations in the underlying glacial till (3.0 µg/L) and in the underlying shallow bedrock (20-21 µg/L).

Other VOCs detected at the Site include cis-1,2 DCE, 1,1 DCE and vinyl chloride (VC). With a maximum

concentration of cis-1,2 DCE at 42 µg/L at SRMW-17R, cis-1,2 DCE was also detected above 5.0 µg/L in samples from various depth intervals at only three wells, SRMW-15R, SRMW-16R and SRMW-17R. VC was detected only at trace levels in one well, SRMW-15R. 1,1 DCE was detected at trace levels in only three wells, SRMW-15R, SRMW-16R and SRMW-17R.

Groundwater (Facility)

In June 2009 and March and June 2012, samples were collected from three of the four collection systems constructed during the backfilling of the excavation conducted at the Facility. In the former Acid Pit area, there were three separate collection pipe installed: northern, central and southern. In the former Large Pit area, there were three connected collection pipes installed: northern, central and southern. The water that collects in these systems is shallow groundwater that accumulates within the backfill that was placed in the pit following excavation of the contaminated soil. The Acid Pit-Southern Collection Pipe and the Large Pit-Northern Collection Pipe were either dry or inaccessible during all sampling events and could not be sampled. All collection pipes in the Large Pit system were dry during the June 2012 sampling event and could not be sampled.

CPOCs that were detected in the groundwater of the various collection pipes[1] are as follows:

In the Acid Pit-Central Pipe: in June 2009, 660 and 630 µg/l PCE and 5.3J and 4.8J µg/L TCE in split samples; in March 2012, 150 µg/L PCE and 0.72J µg/L TCE; and, in June 2012, 200 µg/L PCE and 1.2J µg/L TCE.

In the Acid Pit-Northern Pipe: in June 2009, 480 µg/L PCE and 5.2J µg/L TCE; in March 2012, 160 µg/L PCE and 1.9J µg/L TCE; and, in June 2012, 350 µg/L PCE and 4.8J µg/L TCE.

In the Large Pit-Southern Pipe: in June 2009, 130 µg/L PCE and non-detect TCE; in March 2012, 87 µg/L PCE and 0.49J µg/L TCE.

In the Large Pit-Central Pipe: IN June 2009, 120 µg/L PCE and non-detect TCE; in March 2012, 94 µg/L PCE and 0.5J µg/L TCE.

Surface Water

Sampling was conducted in two New York State (NYS)-regulated wetlands (NYSDEC HJ-54 (north) and NYSDEC HJ-59 (southeast)) within the Site constituents (see Figure 3). The only Site-related COPC detected (PCE) was detected in the northern wetlands. The southeastern wetlands showed non-detect in surface water and sediments.

There were three groundwater seeps identified in the northern wetlands. The PCE that was detected in these seeps was at maximum concentrations ranging from 12 µg/L to 60 µg/L. This data were obtained where the lowest field-measured temperature was recorded (SRSP-3). Since groundwater temperatures are much lower than surface water, this indicated that this sample was collected from groundwater as it seeped out of the ground and before there was any mixing with surface water or other groundwater seepage. TCE and cis-1,2 DCE were not detected in any of the seep samples. These concentrations at SRSP-3 are very similar to the recent groundwater sampling results at well SRMW-12S, located just south of this seep on the edge of Townsend Road.

Groundwater discharging from these seeps collects in a constructed pond (SRSW-13). At the southeast inlet, the maximum concentration of PCE is 21 µg/L showing warmer surface water temperatures. The southwest inlet of the pond (SRSW-12) exhibits only a trace of PCE at 0.42J µg/L and similar water temperatures to the southeast inlet.

Water that accumulates in this pond discharges at the north end of the pond through a breach in the berm at sampling location SRMW-14. The observed maximum PCE concentration at this outlet is 9.7 µg/L, which is roughly 45% of the concentration of PCE of the groundwater entering the pond at SRSW-13.

Beyond the pond, surface water samples were collected from eleven locations within the wetland south of Stream No. 3 (SRSW-15 to 25) and three locations in that stream (SRSW-7 to 9), which drains Wetland HJ-54. No site-related COPCs were detected in any samples collected directly from Stream No. 3. Between this stream and the constructed pond, only one site-related COPC was detected above 1 µg/L and at only one of the 11 sampling locations. SRSW-18 showed a maximum PCE concentration of 2 µg/L. TCE and cis-1,2 DCE were not detected at any of the groundwater seep locations. All other surface water locations, including Streams 1 and 2, showed non-detect for the COPCs.

[1] The letter "J" indicates estimated values.

Sediments

Site-related CPOCs were detected in several of the sediment locations that were identified and added following analysis of groundwater transport pathways within NYSDEC Wetland HJ-54 just north of Townsend Road. These locations include SRSD-11, just north of the storm water culvert beneath Townsend Road, the two inlets to the constructed pond (SRSD-12 and SRSD-13), the outlet from the constructed pond (SRSD-14) and one location northeast of the constructed pond (SRSD-22). Concentrations of site-related VOCs (corrected for moisture) in the sediment ranged from ND to 3.7 J µg/kg for PCE, ND to 1.3 J µg/kg for TCE, and cis-1,2 DCE was not detected at any sediment sampling location.

Site-related CPOCs were not detected at any other sediment sampling location, including locations SRSW-7 to -9 located within Stream Number 3, located north of the constructed pond.

Soils

Once the soil excavation and removal at the Facility was completed by EPA and IBM, EPA confirmed that NYS soil cleanup objectives (SCOs) were achieved for the ingestion of soils and protection of groundwater pathway.

In 2012, in order to ensure that no surficial soil contamination was present at the Facility, additional soil samples were taken in the 0-6 inch range to ensure that no residual contamination was present. Samples were analyzed for full TCL VOCs. COPCs were not detected. No detections were found above NYS Part 375 SCOs.

Soil Gas

In 2003, in order to evaluate soil gas conditions within the Site soils, IBM collected and analyzed foundation level soil gas samples at forty-eight (48) locations along public right-of-ways within the boundaries of the Site. Concentrations of CPOCs in these soil gas samples ranged from non-detect (with a detection limit of 10 µg/m^3) to 8200 µg/m^3 for PCE, non-detect to 99 µg/m^3 for TCE and non-detect to 39 µg/m^3 for cis-1,2 DCE.

Subsequently, EPA assessed the soil gas data and performed a vapor intrusion investigation on a building -by-building basis throughout the Site area. Since then, EPA has performed annual vapor intrusion sampling at a limited number of affected properties and has installed four residential subslab mitigation systems as a preventative measure. At this time, there are no public health issues related to vapor intrusion at the Site.

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. A baseline human health risk assessment (BHHRA) was performed to evaluate current and future cancer risks and noncancer health hazards based on the results of the RI.

A screening-level ecological risk assessment (SLERA) was also conducted to assess the risk posed to ecological receptors due to site-related contamination.

Human Health Risk Assessment

As part of the RI/FS, a BHHRA was conducted to estimate the risks and hazards associated with the current and future effects of contaminants on human health and the environment. A BHHRA 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 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 COPCs, Exposure Assessment, Toxicity Assessment, and Risk Characterization (see text box “What is Risk and How is it Calculated”).

The BHHRA began with selecting COPCs in the various media (i.e., groundwater, surface water, and sediment) that could potentially cause adverse health effects in exposed populations. The current and future land use scenarios included the following exposure pathways and populations:

- Residents (child/adult): future ingestion, dermal contact and inhalation of groundwater.
- Recreator (adult): current ingestion and dermal contact of surface water and sediment.
- Trespassers (adolescent): current ingestion and dermal contact of surface water and sediment.
- Utility Worker (adult): future inhalation of vapors from groundwater in a trench.

In this assessment, exposure point concentrations were estimated using either the maximum detected concentration of a contaminant or the 95% upper-confidence limit (UCL) 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 BHHRA.

Groundwater

Risks and hazards were evaluated for future exposure to groundwater. The populations of interest included adult and child residents exposed to groundwater and future utility workers exposed to groundwater vapors in a trench. The cancer risks for all of the receptor populations evaluated were within or below the acceptable EPA risk range of 1.0E-06 to 1.0E-04 with the exception of the combined child/adult resident, which was at the acceptable cancer risk range of 1.0E-04. The hazard indexes for all of the residential receptor populations evaluated were above the EPA acceptable value of 1. The hazard index for the utility worker was below the EPA acceptable value of 1. The primary site-related contaminants of concern (COCs) identified for groundwater were cis-1,2-dichloroethene, tetrachloroethene and trichloroethene (Table 1).

Table 1. Summary of hazards and risks associated with groundwater.

Receptor	Hazard Index	Cancer Risk
Future resident – adult	**19**	7.6E-05
Future resident - child	**17**	2.5E-05
Future resident – child/adult	**36**	**1.0E-04**
Future utility worker - adult	0.5	7.0E-08
The site-related COCs identified in the groundwater were cis-1,2 DEC, PCE and TCE. Bolded values exceed risk criteria.		

Surface Water

Risks and hazards were evaluated for the potential current exposure to surface water. The population of interest included adult recreators and adolescent trespassers. The cancer risks for both receptors were below or within the EPA acceptable ranges. The non-cancer hazards for both receptors were below the EPA acceptable value of 1. There were no site-related COCs identified in the surface water (Table 2).

Table 2. Summary of hazards and risks associated with surface water.

Receptor	Hazard Index	Cancer Risk
Current recreator – adult	0.006	2.7E-08
Trespasser - adolescent	0.008	8.2E-09
There were no site-related COCs identified in the surface water.		

Sediment

Risks and hazards were evaluated for the potential current exposure to sediment. The population of interest included adult recreators and adolescent trespassers. There were no site-related contaminants that exceed the conservative screening values; therefore, risks and hazards were not calculated for these receptors. There were no site-related COCs identified in the sediment (Table 3).

Table 3. Summary of hazards and risks associated with sediment.

Receptor	Hazard Index	Cancer Risk
Current recreator – adult	na	na
Current trespasser – adolescent	na	na
There were no site-related COCs identified in the sediment.		

Based on the results of the human health risk assessment, a remedial action is necessary to protect public health, welfare and the environment from actual or threatened releases of hazardous substances.

WHAT IS RISK AND HOW IS IT CALCULATED?

Human Health Risk Assessment: 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 for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at the 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 in air, water, soil, etc. identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a "reasonable 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 non-cancer health hazards, 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 non-cancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. 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 identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6}, corresponding to a one in ten thousand to a one in a million excess cancer risk. For non-cancer health effects, a "hazard index" (HI) is calculated. The key concept for a non-cancer HI is that a "threshold" (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site and are referred to as Chemicals of Concern or COCs in the final remedial decision or Record of Decision.

Ecological Risk Assessment

A SLERA was conducted to evaluate the potential for ecological risks from the presence contaminants in surface water and sediment. The SLERA focused on evaluating the potential for impacts to sensitive ecological receptors to site-related constituents of concern through exposure to surface water and sediment in the wetlands that receive groundwater discharge. Surface water and sediment concentrations were compared to ecological screening values as an indicator of the potential for adverse effects to ecological receptors. A complete summary of all exposure scenarios can be found in the SLERA.

Surface Water: There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to contaminated surface water due to groundwater discharge. The hazard indices for the site-related compounds were below an HI of 1 for both lower effect levels (LEL) and chronic values which indicates limited potential for adverse ecological effects (Table 4). Although the hazard indices were less than the acceptable value of 1, additional monitoring of the surface water is recommended to ensure that concentrations remain at acceptable values.

Table 4. Summary of ecological hazard indices associated with surface water.

Compound	Hazard Index	
	LEL	Chronic
Tetrachloroethene	0.11	0.54
Trichloroethene	0.0008	0.017
There were no site-related COCs identified in the sediment, although the pathway is complete.		

Sediment: There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to contaminated sediment due to groundwater discharge. The hazard indices for the site-related compounds were below an HI of 1 for both LEL and chronic values which indicates limited potential for adverse ecological effects (Table 5). Although the hazard indices were less than the acceptable value of 1, additional monitoring of the sediment is recommended to ensure that concentrations remain below acceptable values.

Table 5. Summary of ecological hazard indices associated with sediment.

Compound	Hazard Index	
	LEL	Chronic
Tetrachloroethene	0.008	0.001
Trichloroethene	0.006	0.00025
There were no site-related COCs identified in the sediment, although the pathway is complete.		

Based on the results of the ecological risk assessment, which indicated a completed pathway for surface water and sediments due to groundwater discharge with limited potential for any adverse effects, an active remedial action is not necessary to protect the environment from actual or threatened releases of hazardous substances. As noted above, additional surface water/sediment monitoring in the HJ-54 area would be performed as part of the preferred remedy to ensure that concentrations remain at acceptable values.

Remedial Action Objectives

Remedial Action Objectives (RAOs) are based on available information and standards, such as applicable relevant and appropriate requirements (ARARs) and risk-based levels established in the SLERA and the BHHRA. The specific RAOs identified for the Site are listed below:

- To reduce and to control, to the extent practicable, the residual DNAPL source in fractured granitic bedrock beneath the Facility and to prevent migration to the groundwater.

- To reduce VOC concentrations in the source area until the data demonstrates that continued pumping will no longer have an appreciable benefit in achieving MCLs within the groundwater plume.

- Prevent ingestion/direct contact of residential human receptors with groundwater having a concentration of PCE, TCE or cis-1,2 DCE or their degradation products which exceed NYSDOH Drinking Water Standards (10 NYCRR, Part 5, Subpart 5-1) of 5 µg/L for principal organic contaminants.

- Restore groundwater in the plume area beyond the Facility to the NYS Groundwater Quality Class GA Standards (6 NYCRR Part 703) of 5 µg/L for PCE, TCE and cis-1,2 DCE.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. §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 §121(d), 42 U.S.C. §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 §121(d)(4), 42 U.S.C. §9621(d)(4).

Common Elements

All of the alternatives include certain common components. All alternatives: Alternative #1 – No Further Action, Alternative #2 - Monitored Natural Attenuation (MNA) for Entire Groundwater Plume with Source Extraction and Treatment and Alternative #3 - Extraction and Treatment of Bedrock Aquifer, MNA for Glacial Aquifer and Source Extraction and Treatment include the continuation of the source extraction and treatment system which consists of four groundwater extraction wells and two GAC adsorption vessels piped in series to treat the contaminated groundwater. The treated groundwater is discharged to the designated storm water conveyance under a NYSDEC permit.

Alternatives #2 and #3 also include 1) the long-term monitoring of the groundwater and of the surface water and sediments in the affected areas of HJ-54 and 2) institutional controls, including existing governmental controls consisting of local laws that limit exposure to contaminated groundwater by restricting the drilling of private residential wells and their use as a domestic supply within established public water districts, as well as proprietary institutional controls in the form of environmental easements and/or covenants placed on the Facility property to ensure that no construction or other invasive activities are conducted on the property which would interfere with existing remedial components, including the source extraction and treatment system.

Also, because these alternatives may result in contaminants remaining on-site above health-based levels until MCLs are achieved, CERCLA requires that the Site be reviewed every five years. Also, provisions will be made for periodic reviews of the institutional and engineering controls. If justified by these reviews, additional remedial actions may be implemented at the Site.

The source extraction and treatment system that is already in place and operating was designed to control the groundwater chemical flux from the source area at the Facility, namely VOCs, and to diminish the DNAPL source in bedrock to levels that no longer require such control. Since the soil contaminated with levels of PCE typical of a DNAPL source was removed, the remaining DNAPL zone in the bedrock

beneath the Facility constitutes the only remaining primary source of continued contamination to the groundwater. This system is expected to operate for 15 years.

Current data from the operation of the source extraction and treatment system show that PCE concentrations in SRMW-18RA are being reduced. The reduction in PCE concentrations in this well indicates that pumping this well is drawing groundwater with lower PCE concentrations than existed prior to pumping. This is a positive sign that the hydraulic influence of this well extends to areas of the Facility with cleaner groundwater and drawing cleaner groundwater through the DNAPL source zone would enhance 1) dissolution of DNAPL in fractures and 2) back diffusion of dissolved PCE from the rock matrix. The operating data indicates that mass is being removed from the source area at a rate of approximately 50 pounds per year.

All alternatives include ongoing groundwater monitoring to ensure the continued effectiveness of the source extraction and treatment system. The four extraction wells are sampled monthly for operation and maintenance purposes and for compliance with discharge permitting requirements. Alternatives #2 and #3 include the expanded monitoring of the groundwater plume to determine effectiveness of MNA, as well as surface water/sediment sampling.

The construction time for each alternative reflects only the time required to construct or to implement the remedy and does not include the time required to design the remedy, to negotiate the performance of the remedy with any PRPs or to procure contracts for design and construction.

The various costs for the remedial alternatives are discussed below. All costs are addressed as operation, maintenance and monitoring (OM&M).

Detailed descriptions of the remedial alternatives for addressing the Site contamination can be found in the FS report. The three remedial alternatives are as follows:

Alternative #1: No Further Action

Capital Cost	N/A
Present Worth (PW) (15 years)	$1,897,296
Representative Annual OM&M	$143,787
Construction Time	N/A

The NCP requires that a “No Action” alternative be developed as a baseline for comparing other remedial alternatives. Alternative #1 satisfies the EPA requirement in that no actions beyond the existing source extraction and treatment system would be taken to address Site risks.

Since the ongoing source extraction and treatment system is included within all the remedial alternatives, its implementation is designed to control groundwater chemical flux from the source area and to reduce the DNAPL source in bedrock to levels that no longer require such control. It is estimated that the system will operate over the next 15 years.

Groundwater monitoring is also included as part of the system’s operation to determine the effectiveness of this action.

Alternative #2: Monitored Natural Attenuation (MNA) for Entire Groundwater Plume with Source Extraction and Treatment

Capital Cost	N/A
Present Worth	$3,985,721
Representative Annual OM&M	$205,837
Construction Time	N/A

Alternative #2 relies on MNA to address the groundwater contamination. Natural attenuation is the process by which groundwater contaminant concentrations are reduced by various naturally occurring physical, chemical and biological processes. These processes include biodegradation, dispersion, dilution, sorption, volatilization and chemical or biological stabilization, transformation or destruction of contaminants. The processes occur naturally (in-situ) and act to decrease the mass or concentration of contaminants in the subsurface. The principal causes of these reductions were dilution and dispersion of dissolved mass after a component of the source was removed. Adsorption on organic carbon in aquifer solids also accounts for some of the attenuation observed. These attenuation mechanisms are responsible for the observed patterns in the reduction of PCE levels within the groundwater plume chemistry.

Trends in groundwater concentrations over time in former residential wells have indicated declining concentrations of PCE since the original soil removal action in 2002.

Based on projections of the groundwater monitoring data and modeling, reductions in the concentrations of PCE to acceptable levels in the glacial groundwater would take place over a longer period of time than in the bedrock groundwater.

Alternative #2 includes 1) the continued operation of the existing source extraction and treatment system and 2) the groundwater and surface water/sediment monitoring program to measure the effectiveness of

the MNA remedy for both the bedrock and glacial aquifers, as well as institutional controls. MNA would rely on dispersion, dilution and sorption within the groundwater plume.

Sixty monitoring wells/intervals are proposed in the monitoring plan. For the first five years, it is expected that 27 wells/intervals would be sampled quarterly, 18 sampled semiannually and 15 annually.

Similarly, five groundwater seep and surface water/sediment sampling locations would be sampled quarterly, semiannually and annually to provide a sufficient number of results to permit more accurate projections and modeling of cleanup times, *i.e.*, reduction in VOCs in the groundwater plume.

For years six to 15, it is anticipated that the sampling frequency for monitoring wells initially sampled quarterly would be reduced to semiannual, and those sampled semiannually would be reduced to annual. The initial annual wells would all still be sampled on that frequency to provide a full snapshot of concentrations throughout the plume each year.

At the end of the 15th year, it is anticipated that the source extraction system would be shut down and post-termination sampling would be performed. Therefore, for years 16-18, it is assumed that the frequency of sampling would be returned to quarterly for those wells identified for years one through five. Sampling frequencies for years six to 15 at all other wells would continue. For years 19 to 30, all that remains to be monitored are the glacial ice-contact deposits and the groundwater seeps and surface water. Frequency of that monitoring is assumed to be semiannual.

Alternative #3: Extraction and Treatment of Bedrock Aquifer, MNA in Glacial Aquifer and Source Extraction and Treatment

Capital Cost	$3,823,160
Present Worth	$9,789,848
Representative Annual OM&M	$395,466
Construction Time	10-12 months

Alternative #3 includes 1) the continued operation of the source extraction and treatment system, 2) the associated groundwater and surface water/sediment monitoring program, 3) bedrock groundwater extraction from four (4) vertical wells installed at a depth of approximately 300 feet with treatment to remove suspended solids by filtration and to remove VOCs by adsorption on aqueous phase granular activated carbon (GAC) and 4) institutional controls, as described above. Discharge of treated groundwater from the bedrock system would be to surface water. The extraction wells and associated piping would be connected to a new groundwater treatment facility.

The groundwater treatment facility would include instrumentation to monitor, control and record flow rates and water levels in the extraction wells, as well as GAC vessels to treat the extracted bedrock groundwater.

This alternative would require acquisition of an easement on private property in order to locate and construct the treatment facility. Following design, approvals, bidding and permitting, the construction period is expected to be 10-12 months.

Since this remedial alternative is anticipated to reduce the time required for plume restoration in the bedrock from 15 years to 10 years, post-termination monitoring for this component of the remedy would occur in years 11 to 13. This would be in addition to the post-termination monitoring for the source extraction and treatment system which would occur in years 16 to 30.

COMPARATIVE ANALYSIS OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria: overall protection of human health and the environment, compliance with ARARs, long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short-term effectiveness, implementability, cost and state and community acceptance.

- 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 ARARs addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes, regulations and other requirements or provide grounds for invoking a waiver.
- 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 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 through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, 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 costs, operation and maintenance costs and net present worth costs.
- State acceptance indicates if, based on its review of the RI/FS and Proposed Plan, the State concurs with the preferred remedy.
- 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.

Overall Protection of Human Health and the Environment

Alternative #2 and Alternative #3 would be protective of overall human health and the environment. Alternative #1 would not be as protective, since it does not address the remediation of the groundwater plume. Alternative #3 would achieve ARARs in the bedrock aquifer five years sooner than Alternative #2 and thus is somewhat more protective than Alternative #2.

Compliance with ARARs

Location-specific ARARs would be achieved for all alternatives. Action-specific and chemical-specific ARARs would also be achieved for groundwater by Alternative #2 and Alternative #3. Since the period of time necessary to attain ARARs in the groundwater with the glacial aquifer is determined by the anticipated future effects of secondary sourcing, the time to attain groundwater standards in this aquifer cannot be accelerated by any technology that could be applied to this aquifer in this setting. Therefore, the only alternative that provides better performance in achieving chemical-specific ARARs is Alternative #3, because it accelerates the attainment of groundwater standards in the bedrock aquifer from 15 years to 10 years.

Long-Term Effectiveness and Permanence

Alternative #1 does not provide for establishment of an environmental easement on the Facility. The two other alternatives are rated as high and achieve this criterion. Alternative #2 and Alternative #3 rely on a more robust and reliable set of institutional controls to prevent potential future exposure to groundwater for drinking water purposes and restrict interference with remedial components at the Facility than does Alternative #1. The operations identified in Alternative #3 would have long-term impacts to the northern wetlands, since the discharge would be into the wetlands.

Reduction of Toxicity, Mobility or Volume Through Treatment

As discussed above, all of the alternatives include the source extraction and treatment system as a component of the remedial action. This system would produce the greatest amount of mass removal from the environment of any activity included in all of the alternatives. The alternatives are mostly equivalent in terms of the reduction of toxicity and volume of the source and the reduction of contaminant migration into the groundwater. Alternative #3 would further reduce the mobility of the PCE in the bedrock aquifer. Alternative #3 does the most to reduce mobility. The other two alternatives, which include only source extraction and treatment as an active remedial measure, do not achieve this additional reduction.

Short-term Effectiveness

Since Alternative #1 does not rely on new construction or activities in public areas other than the current source extraction and treatment, there are no short-term impacts. Alternative #2 adds additional groundwater and surface water/sediment sampling but no added short-term impacts. As a result of the magnitude of construction to be performed under Alternative #3, there would be short-term impacts to workers and the community, as well as the surface water in the wetlands. Safety techniques would be used to minimize exposure risks and reduce the short-term impacts.

Implementability

All of the alternatives are implementable. Alternative #1 and Alternative #2 are the easiest to implement, since no further construction is required. Alternatives #2 and #3 would require the acquisition of an easement at the Facility to restrict activities which would interfere with existing remedial components, including the source extraction and treatment system. Alternative #3 involves myriad technical and administrative issues associated with performing construction work in public rights-of-way and on private property. As described above, this alternative would also require property access and the potential for property purchase and additional easements in order to construct the treatment facility.

Cost

The following table identifies the various cost estimates for the three alternatives.

Alternatives	Capital Cost	Representative Annual OM&M Costs	Total Present Worth Cost
1	$0	$143,787	$1,897,296
2	$0	$205,837	$3,985,721
3	$3,823,160	$395,466	$9,789,848

As shown above, the alternatives rank from most costly to least costly as follows: Alternative #3, Alternative #2 and Alternative #1. Alternative #1 has the lowest present worth at $1,897,296. Alternative #3 has the highest present worth at $9,789,848.

PROPOSED REMEDY

Based on an evaluation of the three remedial alternatives, EPA and NYSDEC recommend Alternative #2: Monitored Natural Attenuation (MNA) for Entire Groundwater Plume and Source Extraction and Treatment.

This preference is based on the proven reliability, effectiveness and efficiency of the ongoing source extraction and treatment system and MNA.

The preferred remedy can be implemented in an expeditious manner and has all the necessary discharge permits and access agreements in place to continue the source extraction and treatment system. The preferred remedy would have no impact on the community.

Other than the No Further Action Alternative, the preferred remedy represents the lowest capital costs, O&M costs and present worth cost.

EPA believes that the assessment of the three alternatives has produced a preferred remedy that would provide the best balance of trade-offs in assessing the evaluating criteria. EPA and NYSDEC believe that the preferred remedy would be protective of human health and the environment, comply with ARARs, be cost effective and utilize permanent solutions and treatment technologies to the maximum extent practicable.

Because this alternative may result in contaminants remaining on-site above health-based levels until MCLs are achieved, CERCLA requires that the Site be reviewed every five years. Also, provisions will be made for periodic reviews of the institutional and engineering controls. If justified by these reviews, additional remedial actions may be implemented at the Site.

Basis for the Remedy Preference

Alternative #2 would rely primarily on the natural attenuation processes of dispersion, dilution and sorption in the groundwater plume to reduce COC concentrations to below MCLs. Although these are not specific degradation or destruction processes, historical Site data from former residential wells show that these processes have successfully reduced concentrations of COCs in the groundwater plume and prevent unacceptable impacts to the environment.

Alternative #2 is capable of achieving the Site's remediation objectives within a timeframe that is reasonable. EPA expects that Alternative #2 would achieve MCLs in the groundwater in the glacial aquifer in approximately 30 years.

The soil removal action demonstrated that groundwater can be effectively remediated by Alternative #2 following source remediation and control. Overall, the majority of the groundwater data to date shows that the boundary of the groundwater plume appears to be stable or reducing.

Public water has replaced residential wells as the source of drinking water. The PWS is drawn from resources outside the limits of the Site so there would be no further demand for the groundwater resources within the STWD. The eight homeowners within the STWD who still use their private wells would continue to have the opportunity to connect to the PWS at any time, now or in the future.

Although the estimated time required to achieve groundwater standards in the bedrock aquifer in Alternative #3 is estimated to be 5 years less than Alternative #2 (10 years vs. 15 years), there are substantial capital costs, higher O&M costs and increased short-term impacts to the community associated with this alternative. In addition, for the glacial aquifer, more aggressive action would only intercept contaminant flux to surface water and would not hasten the attainment of groundwater standards in this aquifer any faster than Alternative #2. The MNA timeframe for achieving groundwater standards in the glacial aquifer for both alternatives is expected to be 30 years.

Alternative #2 is not expected to increase the risk of generating higher concentrations of more toxic or mobile transformation products beyond that which already occurs. As the PCE concentrations are reduced so are the transformation product concentrations.

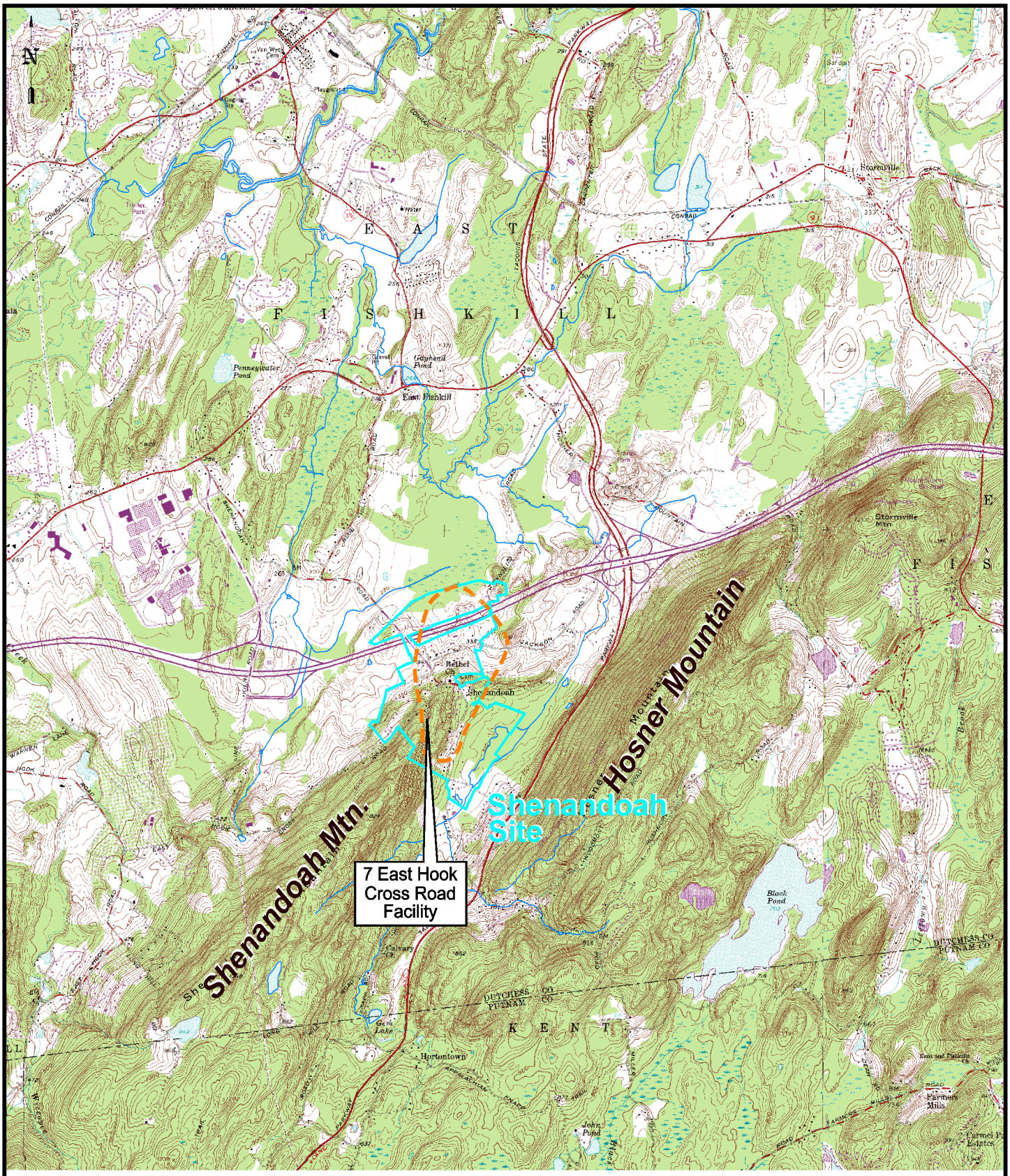
Under Alternative #2, there are both town and county institutional controls in place to protect against the installation of drinking water wells within the STWD and to restrict groundwater use. The DNAPL source material underlying the Facility is the only Site location at which COC concentrations above groundwater standards are expected to persist in the long-term. In addition, the O&M of the four existing vapor mitigation systems would continue as would the vapor intrusion monitoring program. Although not expected, additional mitigation systems would be installed if monitoring results demonstrate they are warranted.

Alternative #2 includes the establishment of environmental easements and/or covenants placed on the Facility property to ensure that no construction or other invasive activities are conducted on the property which would interfere with existing remedial components, including the source extraction and treatment system.

The continued operation of the source extraction and treatment system and the existing and proposed institutional controls of the preferred remedy enhance the effectiveness of the MNA remedy.

Alternative #2 is the preferred remedy that includes a fully operating source control action, MNA in the lower concentration portions of the groundwater plume and institutional controls in the form of town and county laws and easements to prevent invasive activities on the Facility property.

In combination, these actions would achieve groundwater restoration in a reasonable timeframe while utilizing active engineering controls and natural attenuation processes to protect human health and the environment.



- Extent of Individual Site COPCs Detected Above 5 µg/L in Groundwater

Figure 1

Study Area Setting

Shenandoah Road Groundwater Contamination Superfund Site

Scale

0 2000' 4000'

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21003-007-C9 / 08-10-12

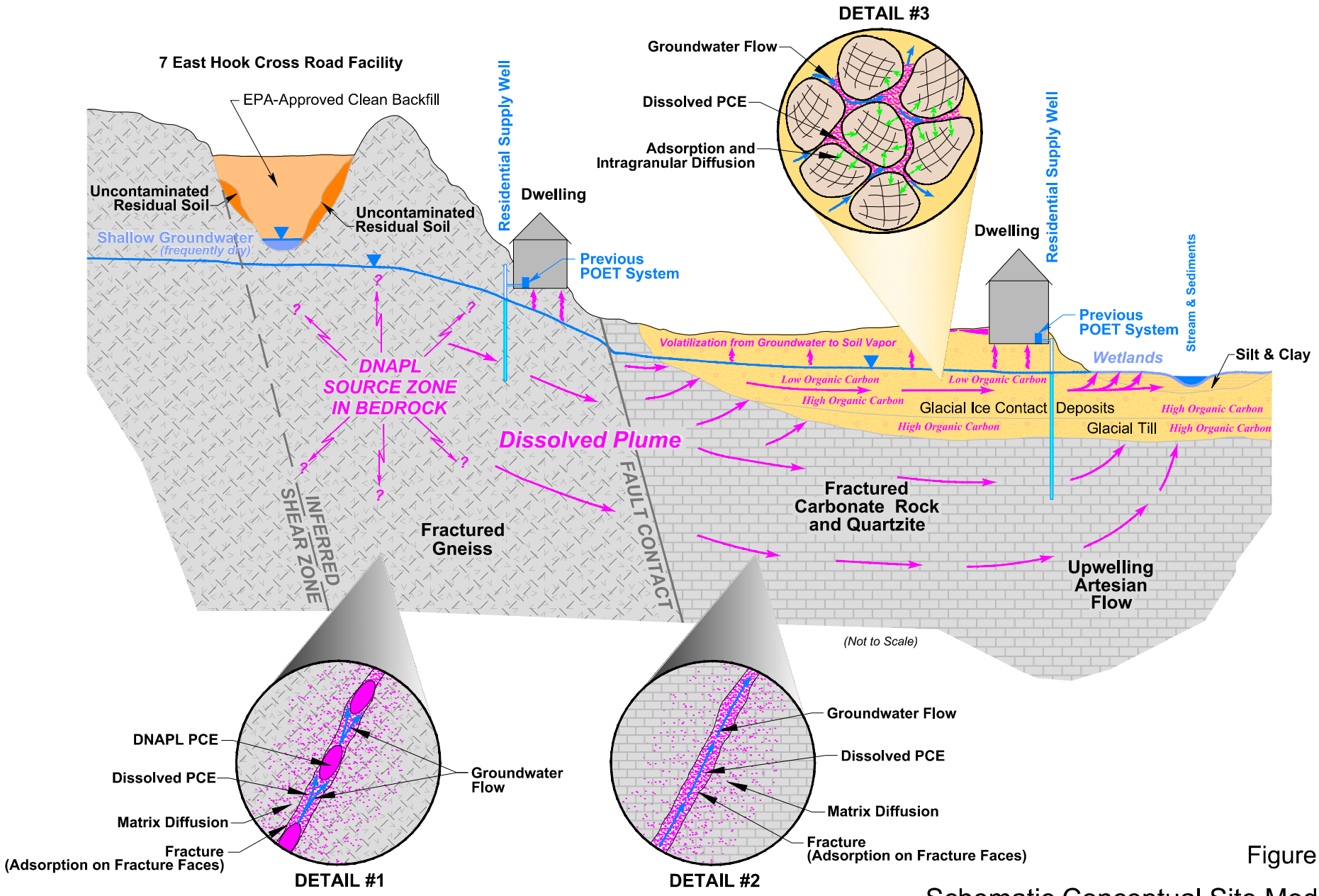

Figure 2

Schematic Conceptual Site Model
Shenandoah Road Groundwater Contamination Superfund Site

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21003-070-E9 / 07-03-12

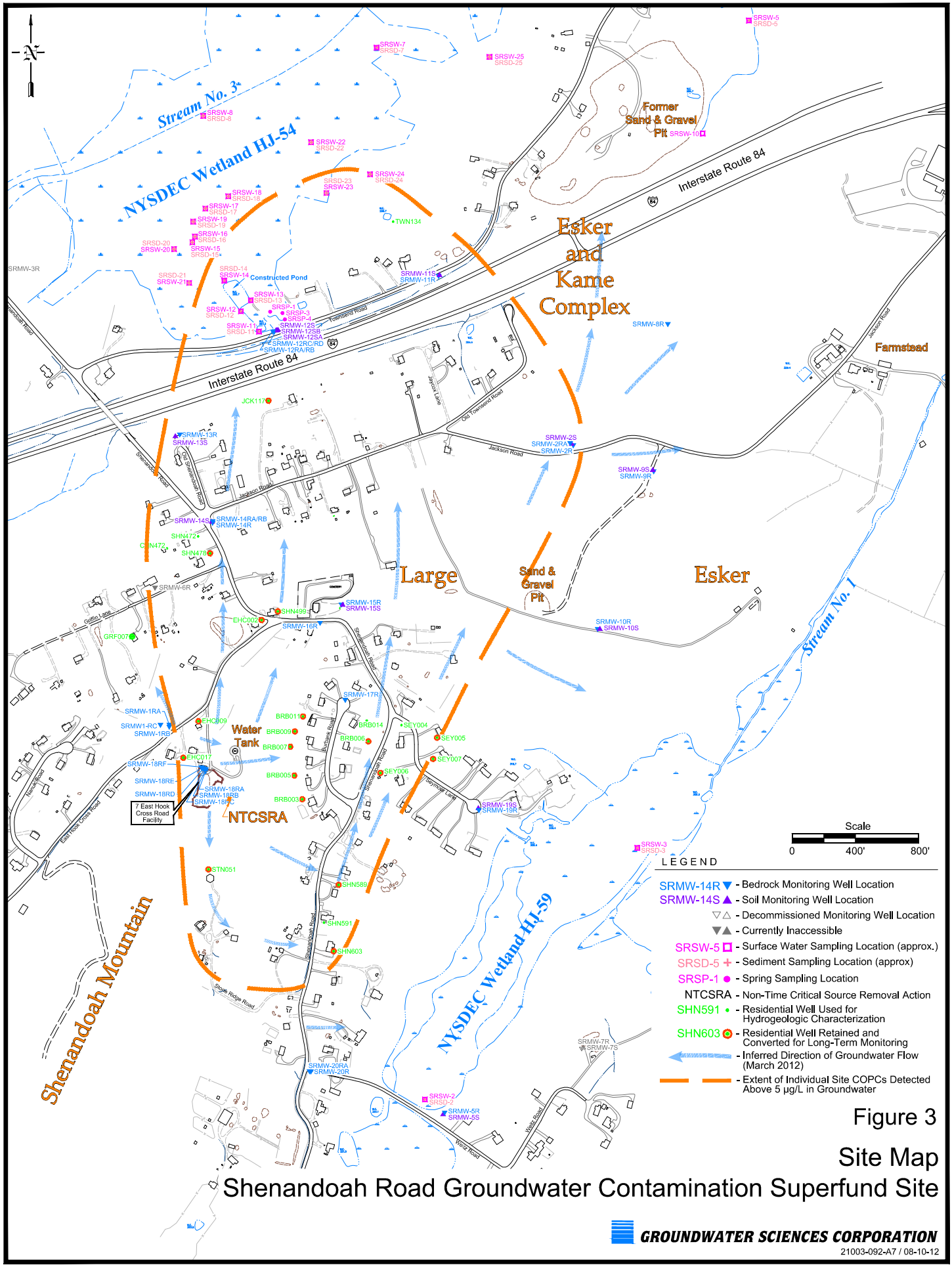

Figure 3

Site Map

Shenandoah Road Groundwater Contamination Superfund Site

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