Cayuga County Groundwater Contamination Superfund Site
Cayuga County, New York

July 2012

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered for the contaminated groundwater at the Cayuga County Groundwater Contamination Superfund site (the 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), the lead agency for the Site, 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 contamination at the Site and the remedial alternatives summarized in this Proposed Plan are described in the final Remedial Investigation (RI) Report and the Feasibility Study (FS) Report, both issued in 2012, as well as other documents contained in the Administrative Record for this Site. EPA encourages the public to review these documents to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted.

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 remedial alternatives evaluated, including the preferred alternative. The preferred alternative involves the in-situ treatment of contaminated groundwater by biological and abiotic remediation in Area 1 and monitored natural attenuation in Areas 2 and 3. (These three areas are defined below). This proposed plan also includes, as a contingency remedy pumping and treatment of the groundwater for Area 1, and in-situ treatment of contaminated groundwater by biological and abiotic remediation for Area 2.

The remedy described in this Proposed Plan is the preferred remedy for the Site. Changes to the preferred remedy, or a change from the preferred remedy to another remedial alternative, 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 will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all of the alternatives considered in the Proposed Plan and in the detailed analysis section of the FS Report, since EPA in consultation with NYSDEC may select a remedy other than the preferred alternative.

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
July 17, 2012 – August 16, 2012
EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: August 2, 2012 at 7:00 pm
EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Union Springs High School, Union Springs, NY.

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 this end, the RI and FS Reports and this Proposed Plan have been made available to the public for a public comment period which begins on July 17, 2012 and concludes on August 16, 2012.

A public meeting will be held during the public comment period at the Union Springs High School on August 2, 2012 at 7:00 p.m. to present the conclusions of the RI/FS, to elaborate further on the reasons for recommending the preferred alternative, 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 Record of

Decision (ROD), the document which formalizes the selection of the remedy.

Written comments on the Proposed Plan should be addressed to:

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INFORMATION REPOSITORIES

Copies of the Proposed Plan and supporting documentation are available at the following information repositories:

Seymour Public Library
Auburn, New York
Telephone: (315) 252-2571
Hours of operation:
Mon. - Wed.: 10 AM to 9 PM
Thurs., Fri.: 10 AM to 6 PM
Sat.: 10 AM to 4 PM

USEPA – Region II
Superfund Records Center
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308

Hours: Monday – Friday: 9:00 AM to 5:00 PM

SCOPE AND ROLE OF ACTION

The primary objectives of this action are to remediate the groundwater contamination, to minimize the migration of contaminants, and to minimize any potential future health and environmental impacts from the groundwater contamination. This Proposed Plan addresses groundwater contamination at the Site. EPA has designated this action as the first and final operable unit for Site remediation.

The major source of the groundwater contamination at the Site is a facility formely operated by Powerex, Inc., located at 2181 West Genessee Street, in the City of Auburn, New York. This facility is being addressed under the NYSDEC Superfund program. Remedial actions at the former Powerex facility are not the focus of this decision document, although successful completion (i.e., source control or remediation) of the source area(s) at the former Powerex facility is important to the full realization of the benefits of the preferred alternative in this Proposed Plan. The source investigation and response actions for the former Powerex facility are being addressed by General Electric Company (GE) with NYSDEC oversight. EPA has identified GE as a potentially responsible party under CERCLA for the Site. The effectiveness of the remedy in this Proposed Plan requires coordination between actions to address contaminant sources at the former Powerex facility and the proposed remedy. EPA is coordinating with NYSDEC on the source area investigation at the former Powerex facility and the remedy described in this Proposed Plan. In the event that source control is not successfully implemented pursuant to New York State law, EPA may elect to evaluate additional options at the former Powerex facility pursuant to CERCLA to ensure the effectiveness of the preferred alternative.

SITE BACKGROUND

Site Description

The Site includes a groundwater plume located in Cayuga County, New York. Groundwater contaminated with volatile organic compounds (VOCs) extends from the City of Auburn to the Village of Union Springs, a distance of approximately seven miles, and includes the Towns of Aurelius, Fleming, and Springport. Cayuga County, which is located in the west central part of New York State, is an area referred to as the Finger Lakes Region. A Site location map is provided as Figure 1.

The area contains mostly residential properties intermingled with extensive farmland and patches of woodlands, as well as some commercial areas. Two public water supply systems serve residences in the immediate vicinity of the Site. The Village of Union Springs, on the east shore of Cayuga Lake, operates two water supply wells. Groundwater from these two wells is treated using an air stripper to remove VOCs. The City of Auburn provides water to the Cayuga County Water and Sewer Authority and the Town of Springport which distribute potable water to the area south and west of Auburn. The City of Auburn draws water from Owasco Lake, which has not been impacted by the Site. There are currently no restrictions on the use of private wells for potable water or agricultural use in the area.

Site History

In 1988, routine testing of the Village of Union Springs' municipal drinking water supply, conducted by the New York State Department of Health (NYSDOH), revealed low levels of cis-1,2-dichloethene (cis-1,2-DCE) and trichloroethene (TCE). In 1989, routine testing of Union Springs Academy's drinking water supply, conducted by the NYSDOH, also revealed low levels of cis-1,2-DCE and TCE. In 2000, NYSDEC conducted a potential VOC source area investigation, which included sampling residential water supplies. As a result of this investigation, 18 residential wells were found to be contaminated with VOCs. Distribution of the contamination indicated that the source(s) were located to the northeast toward the City of Auburn. In 2001, the Village of Union Springs installed an air stripper on the public water supply to remove the VOC contaminants. The Union Springs Academy well is no longer in service, and the water supply to the school is now provided by the Village of Union Springs public water supply.

In December 2000 and July 2001, EPA initiated a response action that included additional groundwater sampling and the installation of point-of-entry treatment systems (POETS) on private wells with contaminant levels above Federal Maximum Contaminant Levels (MCLs). By April 2001, over 300 residential and private water supply wells were sampled in connection with investigations by EPA, NYSDEC, NYSDOH, and Cayuga County Department of Health (CCDOH). As a result of these sampling events, EPA determined that 51 residential wells and three farm wells (54 total wells) were contaminated with VOCs, primarily TCE, cis-1,2-DCE, and vinyl chloride (VC) at concentrations above the Federal MCLs. Additional residences were found with VOC contamination above the State standards, but at concentrations less than the Federal MCLs.

Beginning in the fall of 2001, the Cayuga County Water and Sewer Authority installed public water lines to reach almost all homes in the affected area within the Town of Aurelius. In 2006, the Towns of Springport and Fleming installed public water lines to the remainder of the affected area in their towns. Residences with POETS installed previously by EPA have been connected to the public water supply. EPA continues to maintain treatment systems on four impacted wells: three dual-use (agricultural/residential) wells, and one residential well. There are a limited number of residences with VOC contamination levels less than the Federal and State MCLs that had POETS installed by the CCDOH with funding from the State of New York. These units are currently maintained by the homeowners. In addition, other residences that declined to have POETS installed were found with VOC contaminants above the State groundwater standard, but at levels below the Federal MCLs.

From January 2001 through the present, several hydrological investigations and groundwater sampling events have been conducted by EPA, NYSDEC and NYSDOH, United States Geological Survey (USGS), and CCDOH. These investigations involved the installation, hydraulic and geophysical testing, and sampling of groundwater monitoring wells and private residential wells. EPA has also reviewed studies and sampling conducted by GE pursuant to State orders at the former Powerex facility. The results of these investigations indicated that the former Powerex facility, located north of West Genesee Street in the City of Auburn, is the primary source of the groundwater contamination.

On September 13, 2001, EPA proposed the Site for inclusion on the National Priorities List (NPL) and on September 5, 2002, EPA placed the Site on the NPL.

Site Hydrogeology and Conceptual Model

Groundwater investigations at the Site have documented the presence of four hydrogeologic units consisting of the overburden, shallow bedrock (identified as units S1 through S3), intermediate bedrock (identified as units I1 and I2), and deep bedrock (identified as units D1 through D6). The conceptual model regarding groundwater contamination at the Site indicates that contaminants entered the overburden at the Powerex facility, moved downward from the shallow zone, through the intermediate zone via vertical fractures or karst features and into the deep zone, and then moved laterally from the facility and downgradient via groundwater flow, primarily in the D3 unit. This unit is approximately 200 feet below ground surface, is 15 to 20 feet thick, and is highly transmissive due to the development of karst solutions features.

The overburden hydrogeologic unit consists of glaciolacustrine deposits of clay, silt, fine sand, and glacial till. Where present, groundwater in the overburden flows towards local surface water bodies or provides recharge to underlying bedrock units. The shallow bedrock hydrogeologic units are composed of the Upper Onondaga/Marcellus Formation (S1), the Middle Onondaga (S2), and the Lower Onondaga (S3). The Marcellus is present in the southern area of the Site and is typically 50 feet thick. The nominal thickness of the Onondaga formation at the Site is 75 feet. Data collected in the shallow bedrock shows that groundwater flow is, generally, northward from the residential area south of the former Powerex facility towards the Owasco Outlet where the shallow groundwater system discharges. The shallow zones can become de-watered locally, suggesting that in some places, vertical fracturing extends through the underlying intermediate zone, allowing water to drain into the deep zone. Near Overbrook Drive and Pinckney Road, the water levels from residential wells suggest that vertical fractures and low angle faults connect the shallow, intermediate and deep bedrock zones.

The intermediate bedrock zone consists of the Manlius Formation, which is typically divided into Upper Manlius (I1) and Lower Manlius (I2). At the Site, the Manlius often functions as an aquitard separating the shallow and deep aquifer units, unless it has been breached by vertical fractures. The nominal thickness of the Manlius formation at the Site is 36 feet.

The deep bedrock is divided into six zones. The Rondout comprises the D1 unit. The Cobleskill comprises the D2 unit. The Bertie formation is divided into three units: the D3 zone, which encompasses the gypsiferous unit at the top of the Forge Hollow Unit, the D4 unit, which is the middle of the Bertie Formation, and the D5 unit at the bottom of the Bertie Formation. The D6 unit is the Camillus Shale, which is the base unit in the hydrostratigraphic system investigated in the RI. The deep bedrock aquifer receives groundwater recharge through fractures or karst features connecting the shallow and deep bedrock units. As a result, water levels in the deep bedrock can rise rapidly in response to precipitation events. The rapid rise in hydraulic head in the D3 zone can cause upward flow along vertical fractures, faults, and/or dissolutions voids, resulting in vertical mixing of the deep and intermediate zones. The combined nominal thickness of the five deep bedrock zones above the Camillus at the Site is about 200 feet, with some variations throughout the Site.

RESULTS OF THE REMEDIAL INVESTIGATION

The results of the RI indicate that groundwater south of West Genesee Street in Auburn is contaminated in the deep bedrock units (D1 through D6 zones) with VOC contamination, primarily cis-1,2-DCE, TCE, trans-1,2-DCE and VC.

<u>Groundwater</u>

A total of 23 multiport groundwater monitoring wells were installed by EPA at the Site as part of the RI. In addition, as part of the investigation of the former Powerex facility, GE installed 32 individual screened monitoring wells in the area south of West Genesee Street. Comprehensive groundwater sampling events were conducted by EPA using all available EPA wells in July 2006, July 2007, and June 2010. The June 2010 sampling event included groundwater samples from the GE wells. During the course of the RI, a total of 603 groundwater samples were collected from the 23 EPA monitoring wells, a total of 82 samples were collected from wells installed by GE, and 12 samples were collected from residential wells. Analytical results for these samples were compared to EPA and NYSDOH promulgated health-based MCLs, which are enforceable standards for various drinking water contaminants.

Groundwater contamination exceeding applicable drinking water standards has been shown to exist within the Site, at highly elevated concentrations in some areas. VOCs**,** primarily cis-1,2-DCE, TCE, trans-1,2-DCE and VC, were identified as the Site-related contaminants of concern for the deep bedrock units (D1 through D6 zones). Specifically, cis-1,2-DCE was detected at levels up to 89,200 micrograms per liter (µg/l), trans-1,2-DCE was detected at levels up to 1,260 µg/l, TCE was detected at levels up to 679 µg/l, and vinyl chloride at concentrations up to 5,500 µg/l.

The results of the RI indicate that the potential for natural attenuation of chlorinated compounds varies across the Site. Evaluation of monitored natural attenuation (MNA) parameters suggests that conditions near the former Powerex facility are conducive to reductive dechlorination of VOCs, based on the elevated concentrations of cis-1,2-DCE and vinyl chloride found closer to the source. However, the amenability of natural attenuation processes that reduce contaminant concentrations in groundwater by destructive mechanisms such as biodegradation and chemical reactions with other subsurface constituents may be localized at or immediately downgradient of the former Powerex facility. Nondestructive mechanisms such as dilution, dispersion, and diffusion appear to be the dominant natural attenuation mechanisms further downgradient of the former Powerex facility.

Groundwater contamination occurs primarily in deep zones of the bedrock aquifer system, and is most concentrated in the gypsiferous upper portion of the Forge Hollow Unit (D3), which has a greater ability to transmit water. Groundwater contamination with VOCs extends from wells on the former Powerex facility south to Pinckney Road and then southwest to the Village of Union Springs, a distance of approximately seven miles. As described in the Site History section above, the Village of Union Springs public water supply wells have been affected by VOCs associated with the Site. The highest concentrations of VOCs were consistently detected in monitoring wells located directly south of West Genesee Street and the former Powerex facility.

In the area between West Genesee Street and Pinckney

Road, VOC contamination occurs in a relatively narrow area. The contaminant distribution observed in these wells is consistent with groundwater flow to the southwest in the deep bedrock. Historically, groundwater samples collected from monitoring wells near the former Powerex facility consistently had high VOC concentrations. Further south of the former Powerex facility, along Pinckney Road, the VOC plume appears to widen, extending to the east and west along Pinckney Road and Overbrook Drive. In the Pinckney Road area, faulting has caused extensive fracturing of the bedrock. The extensive fracturing provides a pathway for groundwater to flow between the shallow, intermediate, and deep bedrock zones.

South of Pinckney Road, groundwater flow in the deep bedrock is toward the southwest, in the direction of Cayuga Lake, which is the low point in the regional groundwater flow system. VOCs detected in wells in this area occur in the deep bedrock units. The overall distribution of VOCs in the southern area is consistent with groundwater flow to the southwest. VOC sample results from groundwater discharge areas (springs) and the Village of Union Springs public supply wells indicate that groundwater contamination extends to the Village of Union Springs.

The shallow and intermediate bedrock units appear less transmissive than the D3 unit, and wells set in shallow units south of the former Powerex facility frequently have dry intervals.

Matrix diffusion is a natural process which attenuates plume migration. Matrix diffusion occurs when contaminants diffuse from groundwater into the rock matrix. Back diffusion of these contaminants from the rock matrix to groundwater can serve to extend the time required to remediate groundwater contamination. A modeling analysis using existing data collected by EPA and GE was performed to assess the extent of contaminants within the pore spaces of the rock. For planning and estimating purposes, the results of this analysis support the use of a 30-year time frame to remediate groundwater.

Surface Water and Sediments

The RI included sampling of surface water from Owasco Outlet, Crane Brook, and Union Springs. Sediment samples were collected from springs, seeps, and streams in the Village of Union Springs. Concentrations of cis-1,2-DCE were detected at concentrations exceeding its site-specific surface water screening criterion in a spring and associated stream in the Village of Union Springs. VOCs detected in the surface water samples were similar to the VOCs that exceeded site-specific screening criteria in groundwater samples. The VOCs observed in the spring and stream in Village of Union Springs suggest discharge of contaminated groundwater to the surface water bodies. No VOCs were detected in the surface water samples collected from Crane Brook and Owasco Outlet at the northern end of the Site.

Vapor Intrusion

EPA investigated the soil vapor intrusion pathway at the Site. VOC vapors released from contaminated groundwater and/or soil have the potential to move through the soil and seep through cracks in basements, foundations, sewer lines, and other openings and affect the indoor air quality of overlying buildings.

EPA conducted vapor intrusion sampling at 54 residences and one school at the Site. EPA drilled through the basements floors and installed ports in order to sample the soil vapor (air) under these residences. Sampling devices called Summa canisters were attached to these ports to collect air from below building slabs at a slow flow rate over a 24-hour period. In addition to collecting indoor air samples, summa canisters were also used to collect outdoor air samples to determine if there were any outdoor sources that may impact indoor air quality. The Summa canisters were then collected and sent to a laboratory for analyses.

The results of the analyses indicated that the residences and school did not have concentrations of VOCs at or above EPA Region 2 screening levels in sub-slab and indoor air.

Source Investigation

Based on the hydrostratigraphic data, groundwater flow data, contaminant distribution data collected during the RI, and previous investigations including groundwater investigations and sampling conducted by GE, the former Powerex facility is the primary source of the VOC contamination observed in groundwater at the Site. No other sources of VOCs which can be linked to the groundwater contamination were identified during the RI.

The former Powerex facility consists of 55.4 acres of land located on West Genesee Street on the boundary of the Town of Aurelius and the City of Auburn in Cayuga County, New York. GE purchased the property in 1951 and operated a manufacturing plant where electric components, including radar equipment, printed circuit boards, and high-voltage semi-conductors were manufactured. The property was acquired by Powerex, Inc. in January 1986, a joint venture of Westinghouse Electric Corporation, Mitsubishi Electric America, Inc. and GE. Powerex continued to manufacture high voltage semi-conductors until May 1990, when the plant was closed. No manufacturing operations are currently conducted at the Site. GE repurchased the property in 1990.

On March 31, 1993, NYSDEC and GE entered into an Order on Consent to perform an RI/FS under state law for the former Powerex facility, which is listed on the State registry of inactive hazardous waste sites. The RI/FS is currently in progress. Three Interim Remedial Measures (IRMs) have also been taken under the Order on Consent. The first IRM, conducted in February 1994, included the excavation and removal of two laboratory waste solvent tanks and their contents. The second IRM involved the installation of additional fencing and gates to restrict access at the Site. This work was completed in December 1994. The third IRM focused on addressing surface water and groundwater in the shallow bedrock source areas, including pre-design investigation activities and a pilot test for the use of a dual-phase extraction technology. Pursuant to an Interim Action ROD issued by NYSDEC in March 1996 under state law and an Amended Order on Consent executed on May 12, 1997, GE constructed the groundwater extraction and treatment system at the former Powerex facility. Operation of that system commenced on May 15, 2001. The system consists of 12 extraction wells in and near the source areas and one off-facility extraction well.

To date, the system has treated over 60 million gallons of groundwater and removed over 100,000 pounds of VOCs from the former Powerex facility. The system serves to contain contaminants at the former Powerex facility in the shallow bedrock and prevent off-site migration. However, concentrations of contaminants in the extraction area still remain high.

In 2011, GE performed a bench-scale microcosm study to investigate abiotic degradation of TCE in groundwater by iron sulfides at the former Powerex facility. The study was performed to assess whether abiotic degradation of TCE is occurring within the aquifer. The study results suggest that abiotic degradation is occurring in the aquifer and is contributing to the natural attenuation of TCE and cis-1,2-DCE observed in groundwater. The study further revealed that a large amount of natural attenuation was found to be due to biotic degradation.

RISK SUMMARY

As part of the RI, EPA conducted a baseline risk assessment to estimate the current and future effects of contaminants on human health and the environment. A baseline risk assessment is 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, groundwater, surface water, and sediment uses. The baseline risk assessment includes a Human-Health Risk Assessment (HHRA) and an ecological risk assessment.

The cancer risk and non-cancer health hazard estimates in the HHRA are based on reasonable maximum exposure scenarios and were developed by taking into account various health protective estimates about the frequency and duration of an individual's exposure to chemicals selected as chemicals of potential concern (COPCs), as well as the toxicity of the contaminants. Cancer risks and non-cancer health hazard indices (HIs) are summarized below. Please see the text box on page 8 for an explanation of these terms.

The Site currently includes residential neighborhoods intermingled with extensive farmland and parcels of woodlands, as well as commercial/industrial land. Future land use is expected to remain the same, with the potential for additional future residential development. In the surrounding area, private and public supply wells meet domestic and agricultural water supply needs and septic systems are used for sanitary disposal. In 2006, the City of Auburn public water supply system was extended to the Towns of Aurelius, Fleming, and Springport.

The baseline risk assessment began by selecting COPCs in the various media that would be representative of Site risks. The media evaluated as part of the HHRA included groundwater, surface water and sediment. Groundwater at the Site is designated by NYSDEC as a potable water supply. The COPCs for the Site groundwater are cis-1,2-DCE, trans-1,2-DCE, TCE, and VC. No COPCs were identified for sediment or surface water.

The baseline risk assessment evaluated health effects that could result from exposure to contaminated media through ingestion, use of groundwater for potable purposes, including ingestion of and dermal contact with groundwater, inhalation of vapors in the bathroom after showering, and wading in Site waterways. Based on the current zoning and anticipated future use, the risk assessment focused on a variety of possible receptors, including current and future recreational users, future residents, and future commercial workers. However, consistent with the anticipated future use of the Site, the receptors most likely to be in contact with media impacted by site-related contamination, e.g., groundwater, were primarily considered when weighing possible remedies for the Site.

These potential receptors include the future residents, future commercial workers, and future construction workers. A complete discussion of the exposure pathways and estimates of risk can be found in the *Human Health Risk Assessment* for the Site in the information repository.

A screening-level ecological risk assessment (SLERA) was conducted to evaluate the potential for ecological effects from exposure to surface water and sediment. 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 the methodology utilized can be found in the *Screening Level Ecological Risk Assessment* for the Site in the information repository.

The results of the RI indicated that sediments were not contaminated with site-related contaminants. Therefore, no risks were calculated for exposure to Site sediments. Exposure to surface waters did not pose an unacceptable cancer risk or non-cancer hazard.

A vapor intrusion screening evaluation indicated potential for VOCs in groundwater to migrate into buildings in the areas along and south of West Genesee Street, in the vicinity of Pinckney Road, and at potential groundwater discharge areas in Union Springs. In 2009, EPA conducted an investigation of vapor intrusion into structures within the area by collecting subslab and indoor air data. EPA evaluated the vapor intrusion data collected in 2009 and determined that there was no unacceptable risk from vapor intrusion into homes and school that were tested. EPA determined that additional vapor intrusion investigations were not necessary as there was no unacceptable risk in the homes and school that were tested.

Human Health Risk Assessment

EPA's statistical analysis of groundwater sampling data found that the average concentration of cis-1,2-DCE, trans-1,2-DCE, TCE, and VC in the groundwater were 1,459 µg/l, 26 µg/l, 11 µg/l, and 71 µg/l, respectively. All were detected in the groundwater in excess of EPA's Safe Drinking Water Act MCLs of 70 µg/l, 100 µg/l, 5 µg/l, and 2 µg/l, respectively. These concentrations also exceed the NYSDOH MCLs, which are 5 µg/l for cis-1,2-DCE, trans-1,2-DCE, and TCE, and 2 µg/l for VC. These concentrations are associated with an excess lifetime cancer risk of 2×10^{-4} for the future Site worker, 5×10^{-4} for the future adult resident, and 4×10^{-3} for the future child resident. The calculated non-carcinogenic hazard quotients (HQs) are: future Site worker HQ=7, future adult resident HQ=21, and future child resident HQ=51.

These cancer risks and non-cancer health hazards indicate that there is significant potential risk to potentially exposed populations from direct exposure to groundwater. For these receptors, exposure to groundwater results in either an excess lifetime cancer risk that exceeds EPA's target risk range of 10^{-4} to 10^{-6} or an HI above the acceptable level of 1, or both. The chemical in groundwater that contributes most significantly to the cancer risk and non-cancer hazard is VC.

Ecological Risk Assessment

The SLERA focused on identifying potential environmental risks associated with aquatic environments present at the Site. The SLERA focused on impacts of contaminants in surface water and sediment from three water bodies: Owasco Outlet, Crane Brook, and ponds and streams in Union Springs.

The primary risk scenarios for aquatic organisms considered were from direct contact with, and ingestion of, contaminated surface water and sediment. A comparison of maximum concentrations of contaminants detected in Site surface water and sediment to published ecological screening levels (ESLs) indicate no risks to ecological receptors. Thus, no COPCs were identified for surface water or sediment. Consequently, the potential risk for ecological receptors was considered insignificant.

Based on the results of the SLERA, concentrations of contaminants detected in surface water and sediment at the Site are unlikely to pose any unacceptable risks to aquatic or terrestrial ecological receptors at the Site.

Summary of Human Health and Ecological Risks

The results of the HHRA indicate that the contaminated groundwater presents an unacceptable human health exposure risk. The SLERA indicated that the Site does not pose any unacceptable risks to aquatic or terrestrial ecological receptors.

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.

Based upon the results of the RI and the risk assessment, EPA has determined that actual or threatened releases of hazardous substances from the Site, if not addressed by the preferred remedy or one of the other active measures considered, may present a current or potential threat to human health or welfare or the environment. EPA has determined that the Preferred Alternative identified in the Proposed Plan is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are 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 site-specific risk-based levels.

The following RAOs for contaminated groundwater will address the human health risks and environmental concerns:

- Reduce or eliminate exposure (via ingestion and dermal contact) to VOCs in groundwater at concentrations in excess of federal and State MCLs;
- Restore the impacted aquifer to its most beneficial use as a source of drinking water by reducing contaminant levels to the federal and State MCLs; and,
- Reduce or eliminate the potential for migration of contaminants towards the Village of Union Springs public water supply wells.

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).

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the Site can be found in the FS Report. The FS Report presents four groundwater alternatives, including a no action alternative.

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

Common Elements

All of the alternatives, with the exception of the no action alternative, include common components. Alternatives 2 through 4 require the connection of residences currently using POETS to the public water supply system for their future potable water needs. This action includes any current or new residences that are impacted by contaminated groundwater at the Site and will provide the physical connection from the house to the water main. POETS will be maintained, as part of this action, until the connection to the public water supply is conducted. Currently, EPA maintains a POET at one residence. These alternatives also require the treatment of extracted groundwater at impacted agricultural or dairy farms through air stripping or carbon treatment. Existing systems will be maintained, as necessary. Currently, EPA maintains treatment systems at three dairy farms. Each of these alternatives requires the long-term monitoring of the groundwater, long-term monitoring of surface water in Union Springs and institutional controls for groundwater use restrictions.

Institutional controls are anticipated to include existing governmental controls, such as well permit requirements, and informational devices, such as publishing advisories in local newspapers and issuing advisory letters to local governmental agencies, regarding groundwater use in the impacted area.

Remediation Areas

As mentioned previously, the Site extends from the City of Auburn to the Village of Union Springs, a distance of approximately seven miles. Since the concentration of contaminants in groundwater significantly decreases with distance from the former Powerex facility towards the Village of Union Springs, the remedial alternatives developed in the FS are categorized by Site areas and are based on the level of impacts and the type of process options that may be used to address a given area of the Site. For remedial planning and cost estimating purposes, the Site has been divided into three approximate areas (refer to Figure 2).

Area 1 consists of the impacted area immediately south of the former Powerex facility and extends approximately 700 to 900 feet south of West Genesee Street. In Area 1, cis-1,2-DCE was detected at a maximum concentration of 89,200 µg/l, TCE was detected at a maximum concentration of 679 µg/l, trans-1,2-DCE was detected at a maximum concentration of was 1,260 µg/l, and the maximum detected concentration of VC was 5,500 µg/l.

Area 2 consists of the impacted area immediately south-southwest of Area 1, and extends to the southwest to the Town of Aurelius. In Area 2, concentrations of cis-1,2-DCE in residential wells were generally less than 500 µg/l, concentrations of TCE were generally less than 70 µg/l, concentrations of trans-1,2-DCE were less than 20 µg/l, and VC was not detected. In general, the highest concentrations of contaminants detected in Area 2 groundwater are approximately 100 times less than the highest groundwater concentrations detected in Area 1.

Area 3 consists of the impacted area immediately south and southwest of Area 2 extending to and including Union Springs. Historical concentrations of cis-1,2-DCE in residential wells were generally less than 500 µg/l, concentrations of TCE were generally less than 70 µg/l, concentrations of trans-1,2-DCE were generally less than 10 µg/l, and concentrations of VC were generally less than 40 µg/l. Sampling of the three permanent groundwater monitoring wells in Area 3, installed by EPA as part of the RI, revealed VOC concentrations below federal and State MCLs. In addition, recent sampling of the influent water at the two Village of Union Springs' municipal drinking water supply wells detected cis-1,2-DCE and TCE below federal and State MCLs. Nevertheless, certain private wells continue to exceed State or Federal MCLs in Area 3.

The screening process conducted as part of the FS evaluated a wide range of technologies to remediate the contaminated groundwater at the Site. As part of this process, EPA determined that, in addition to no action, groundwater pump and treat and enhanced in-situ biological and abiotic remediation would be evaluated to remediate Area 1. No action, enhanced in-situ biological and abiotic remediation and monitored natural attenuation would be evaluated to address Area 2. No action and monitored natural attenuation would be evaluated to address Area 3.

MNA was not evaluated to remediate Area 1 since groundwater contamination concentrations are considered too high to be able to achieve the RAOs with MNA alone. Groundwater pump and treat was not evaluated to remediate Area 2 since pumping in Area 2 would have the potential to enhance plume migration from the source areas.

The development of remedial action alternatives for evaluation in Area 3 considered the generally lower concentration of contaminants in the area and the expected reduced contamination migration to Area 3 from remediation in Area 1 and Area 2. As a result, only MNA and no action were considered for Area 3, and the alternatives of pump and treat and enhanced in-situ biological and abiotic remediation were screened out for this area.

As detailed in the FS Report, the development of the alternatives for evaluation in each area assumed that source areas within the former Powerex facility with high contaminant concentrations would be effectively controlled by remedial activities undertaken with NYSDEC oversight within the facility.

Alternative 1: No Action (Considered for Areas 1 -3)

The NCP requires that a "No Action" alternative be developed as a baseline for comparing other remedial alternatives. Under this alternative, there would be no remedial actions conducted at the Site to control or remove groundwater contaminants. This alternative does not include monitoring or informational institutional controls. Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, additional response actions may be implemented.

Capital Cost:	$0
Annual Operations & Maintenance (O&M) Costs:	$0
Present-Worth Cost:	$0
Construction Time:	Not Applicable

Alternative 2: Groundwater Pump and Treat (Considered for Area 1 only)

This remedial alternative consists of the extraction of groundwater via pumping wells and treatment prior to disposal. Groundwater is pumped to remove contaminant mass from areas of the aquifer with elevated concentrations of contaminants. For this conceptual design, it is estimated that groundwater extraction wells would be installed in the D3 unit of the aquifer. A treatment plant with a capacity of approximately 400 gallons per minute (gpm) would be constructed within or near the Site to achieve the mass removal objectives. Extracted groundwater with VOC contamination would be treated by air stripping. Air stripper effluent may be treated with a thermal oxidizer system, in accordance with federal and State regulations prior to being discharged into the atmosphere, if necessary. Due to the variation in hydraulic and hydrogeologic properties, as well as the contaminant concentrations, during the remedial design, pilot studies and performance tests will be conducted to determine the number and location of extraction wells needed to ensure that the required mass removal is achieved. During the remedial design, a determination will also be made either to discharge treated extracted groundwater to surface water or to reinject it to groundwater.

Capital Cost:	$20.05 Million
Annual O&M Costs:	$2.81 Million
Present-Worth Cost:	$53.8 Million
Construction Time:	24 months

Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation (Considered for Area 1 and Area 2)

Enhanced in-situ biological and abiotic remediation involves the injection of an electron donor, nutrients, dechlorinating microorganisms (i.e., bioaugmentation), and/or other chemicals into the groundwater at the impacted depths using an extraction-reinjection well network. Once delivered, these chemicals promote reductive dechlorination, a process used to describe the degradation of VOCs.

There are several different in-situ treatment process options that are potentially applicable under this alternative, including Enhanced Anaerobic Bioremediation (EAB) and Biogeochemical Transformation (BT). EAB is the process of adding a carbon source as an electron donor, which would promote the biological reductive dechlorination of VOCs by microorganisms in the subsurface. Lactate, emulsified vegetable oil (EVO), and whey are examples of carbon sources used to promote the biodegradation of chlorinated solvents by naturally occurring microorganisms called Dehalococcoides.

Biogeochemical transformation degrades chlorinated solvents though a combination of biological and abiotic (i.e., not dependent on microorganisms) processes. This process involves the addition of a carbon source (such as lactate, EVO, or others) along with a source of iron and/or sulfate to promote both biotic and abiotic reductive dechlorination processes.

The FS evaluated each of these four process options. The cost information provided below is for the BT process option which a bench-scale study suggests would be effective. Detailed cost information for each process option is included in the FS. The estimated cost of this alternative is contingent upon numerous factors, such as the injection material, dosage requirements and number of subsequent injections. Further evaluation during the remedial design would be required to determine the specific process option (i.e. carbon source) or combination of process options to be implemented. Pilot studies would be required to assess treatment effectiveness. During the remedial design, further evaluation would be conducted to determine the effective number and location of the injection well network in delivering the agents into the subsurface. It is anticipated that repeated injections may be necessary.

<u>Area 1</u>

Capital Cost:	$16.29 Million
Annual O&M Costs:	$163,300
Present-Worth Costs:	$18.32 Million
Construction Time:	24 months

<u>Area 2</u>

Capital Cost:	$ 10.36 Million
Annual O&M Costs:	$ 163,300
Present-Worth Costs:	$ 12.39 Million
Construction Time:	24 months

Alternative 4: Monitored Natural Attenuation (MNA) (Considered for Area 2 and Area 3)

This remedial alternative relies on monitored natural attenuation to address the groundwater contamination. Natural attenuation is the process by which contaminant concentrations are reduced by various naturally occurring physical, chemical, and biological processes. The main processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants. These processes occur naturally, in-situ, and act to decrease the mass or concentration of contaminants in the subsurface. Only non-augmented natural processes are relied upon under this alternative. Augmentation through addition of electron acceptors or nutrients is considered an in-situ technology. Since this alternative does not involve active remediation, the effectiveness of this alternative in Areas 2 and 3 depends on the effectiveness of the alternative implemented in Area 1 in preventing downgradient migration of contamination. Implementation of this alternative includes the installation of additional monitoring wells, periodic sample collection and analysis, data evaluation, and contaminant concentration trend analysis.

<u>Area 2</u>

Capital Cost:	$246,000
Annual O&M Costs:	$134,000
Present-Worth Cost:	$1.91 Million
Construction Time:	2 months

<u>Area 3</u>

Capital Cost:	$771,650
Annual O&M Costs:	$274,900
Present-Worth Cost:	$4.18 Million
Construction Time:	3 months

EVALUATION OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria, namely 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.

Refer to the table on the next page for a description of the evaluation criteria.

This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how each compares to the other options under consideration. A detailed analysis of alternatives can be found in the FS Report.

<u>Overall Protection of Human Health and the Environment</u>

Each of the alternatives evaluated for Areas 1, 2, and 3, except Alternative 1: No Action, would provide protection of human health and the environment. Alternatives 2 and 3 are active remedies that address groundwater contamination. Alternative 4 relies on certain natural processes to achieve the cleanup levels. Alternatives 2 and 3 in Area 1, Alternatives 3 and 4 in Area 2, and Alternative 4 in Area 3 would restore groundwater quality over the long term. As to each Area, each of the alternatives evaluated for that Area would achieve overall protectiveness.

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES

Overall Protectiveness of Human Health and the Environment evaluates whether and how an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, the community, and the environment during implementation.

Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Alternatives 2, 3, and 4 when combined would achieve protectiveness through a combination of reducing contaminant concentrations in groundwater and limiting exposure to residual contaminants through the implementation of governmental and informational institutional controls. Informational institutional controls would help limit exposure by restricting the use of, and access to, contaminated groundwater. Alternatives 2, 3, and 4 also assume the control of contaminant migration from the former Powerex facility.

Alternative 2 would be protective in Area 1 through reducing contaminant concentrations via extraction and treatment of groundwater. Protectiveness under Alternative 3 is achieved in Areas 1 and 2 through reducing contaminant concentrations in-situ via the injection of materials to facilitate the degradation of contaminants, and protectiveness under Alternative 4 is achieved in Areas 2 and 3 through reducing contaminant concentrations via naturally occurring processes.

A long-term monitoring program for groundwater would monitor the migration and fate of the contaminants and ensure that human health is protected. Combined with long-term monitoring and institutional controls, Alternatives 2, 3, and 4 would meet the RAOs. Alternative 1 would not meet the RAOs in each of the areas which they were evaluated.

Because Alternative 1: No Action is not protective of human health and environment, it was eliminated from consideration under the remaining evaluation criteria.

Compliance with Applicable or relevant and Appropriate Requirements (ARARs)

EPA and NYSDOH have promulgated health-based protective MCLs (40 CFR Part 141, and 10 NYCRR § 5-1.51 Chapter 1), which are enforceable standards for various drinking water contaminants (chemical-specific ARARs). If more than one such requirement applies to a contaminant, compliance with the more stringent ARAR is required.

The aquifer is classified as Class GA (6 NYCRR 701.18), meaning that it is designated as a potable water supply. Because area groundwater is a source of drinking water, achieving MCLs in the groundwater is an applicable or relevant and appropriate standard.

In Area 1, Alternative 3 will potentially reach ARARs sooner than Alternative 2. However, pilot studies would be undertaken for Alternatives 2 and 3 to assess specific remediation timeframes. Similarly, in Area 2, Alternative 3 will potentially reach ARARs sooner than Alternative 4. In Area 3, chemical-specific ARARs are expected to be attained through certain natural processes (dilution and dispersion). Due to the uncertainty in the mass diffused in the bedrock matrix, the remediation timeframes are estimated. However, results of modeling of the matrix diffusion process support a 30-year remediation time frame.

Each of the alternatives would comply with location- and action-specific ARARs.

Long-Term Effectiveness and Permanence

Groundwater extraction and treatment under Alternative 2 is considered an effective technology for treatment of contaminated groundwater, if designed and constructed properly. As discussed previously, the former Powerex facility is the primary source of groundwater contamination. The design of an extraction system to remediate the groundwater contamination in the D3 unit would need to ensure that the potential for increased drawdown of contamination to the deeper bedrock intervals from the source areas is addressed. Enhanced in-situ biological and abiotic remediation under Alternative 3 has been demonstrated to be effective and reliable at numerous sites for groundwater treatment for VOCs in contaminated areas. At the former Powerex facility, a bench-scale pilot study was conducted in 2011 that demonstrated the potential effectiveness of the biogeochemical transformation technology. However, groundwater concentrations may rebound if there is continued migration of VOCs from the former Powerex facility. Active remediation may be required over the long term to address continued migration of contaminants from source areas into groundwater. In that event, the effectiveness of remedial measures at the former Powerex facility would need to be evaluated by EPA.

Indigenous bacteria capable of complete reductive dechlorination of the contaminants may be localized at or immediately downgradient of the former Powerex facility. In Areas 2 and 3, daughter products such as vinyl chloride, ethane and ethane are observed sporadically. Dispersion, diffusion, and dilution appear to be the dominant natural attenuation mechanisms identified for this Site. Therefore, MNA would be a permanent solution and achieve long-term effectiveness.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives 2 and 3 reduce the toxicity and volume of contaminants at the Site through treatment of contaminated groundwater. Alternative 2 removes contaminated groundwater and treats it via air stripping. Alternative 3 uses biological and abiotic processes to degrade contaminants in groundwater to less harmful compounds. Alternative 4 relies on natural processes to degrade contaminants and, hence, the reduction in toxicity, mobility, and volume may vary with location. In Area 1, Alternative 2 would be the most effective at reducing the mobility of the groundwater contamination by extracting the contaminated groundwater. In Area 2, Alternative 3 would be most effective, if it can be implemented properly since Alternative 4 relies on dilution, dispersion, and diffusion to reduce the toxicity and volume of contaminants. During the EAB under Alternative 3, and monitored natural attenuation biological degradation processes, TCE and cis-1,2-DCE could be transformed into the more toxic VC under anaerobic conditions in the subsurface, prior to degradation to the less toxic ethane. This transformation would need to be monitored and managed to prevent exposure via drinking contaminated water.

Short-Term Effectiveness

Alternatives 2 and 3 may have short-term impacts to remediation workers, the public, and the environment during implementation. The short-term impacts due to Alternative 4 are minimal as it does not involve active remediation. Alternative 2 is expected to have higher short-term impacts compared to Alternative 3. Remedy-related construction (e.g., well installation and trench excavation) under Alternative 2 would require disruptions in traffic. In addition, Alternative 2 has aboveground treatment components and infrastructure that may create a minor noise nuisance and inconvenience for local residents during construction. Exposure of workers, the surrounding community and the local environment to contaminants during implementation of the three alternatives is minimal. No difficulties are foreseen with managing the required quantity of the injection material needed in Alternative 3, as it is non-hazardous. Drilling activities, including the installation of monitoring, injection, and extraction wells for Alternatives 2 and 3 could produce contaminated liquids that present some risk to remediation workers at the Site. The potential for remediation workers to have direct contact with contaminants in groundwater could also occur when groundwater remediation systems are operating under Alternative 2. Alternative 2 could increase the risks of exposure, ingestion, and inhalation of contaminants by workers and the community because contaminated groundwater would be extracted to the surface for treatment. However, measures would be implemented to mitigate exposure risks through the use of personnel protective equipment (PPE) and standard health and safety practices. All three alternatives include monitoring that would provide the data needed for proper management of the remedial processes and measures to address any potential impacts to the community, remediation workers, and the environment. Groundwater monitoring and discharge of treated groundwater will have minimal impact on workers responsible for periodic sampling. The time frame to meet groundwater RAOs in each of the three areas is difficult to predict, but is expected to exceed 30 years.

Implementability

All technologies under Alternatives 2, 3, and 4 are established technologies with commercially available equipment and are implementable. However, the implementation of Alternatives 2 and 3 may be challenging due to the nature of the subsurface materials and the depths of the contaminants. In Area 1, Alternative 3 would be easier to implement than Alternative 2 since it involves the installation of fewer wells and a lesser amount of long-term operations. The additional wells, well vaults, and underground piping and electrical lines that would need to be constructed under Alternative 2 would potentially cause higher disruption than Alternative 3 in the residential area. The bedrock nature of the impacted unit and the large depths of impacts (approximately 200 feet deep) may present technical difficulties under Alternative 2 and Alternative 3. Under Alternative 2, potential issues such as sinkhole collapse induced by pumping would require the development of preventative measures. Under Alternative 3, some limitations may be encountered with in-situ injections, including implementation issues due to delivery of injected materials into bedrock at depth, and high levels of sulfate in the formation, which could compete with microbial processes that degrade VOCs. Alternative 4 is the easiest alternative to implement since no active remediation would be performed.

Each of these three alternatives would require routine groundwater quality, performance, and administrative monitoring, including CERCLA five-year reviews. Alternatives 2, 3 and 4 require periodic operation and maintenance (O&M) for the life of the remedy.

Cost

The estimated capital costs, O&M and present worth costs are discussed in detail in the FS Report. The cost estimates are based on the best available information. Alternative 1: No Action has no cost because no activities are implemented. The estimated capital, operation and maintenance (O&M) and present worth cost for each of the alternatives are presented below. The highest present worth cost alternative is Alternative 2 in Area 1, at $53.8 million.

Table 1: Summary of Alternatives Cost

Alternative	Capital Cost	Annual O&M Cost	Present Worth
Area 1: Alternative 2	$20.05 M	$2.81 M	$53.8 M
Area 1: Alternative 3	$16.29 M	$163,300	$18.32 M
Area 2: Alternative 3	$10.36 M	$163,300	$12.39 M
Area 2: Alternative 4	$246,000	$134,000	$1.91 M
Area 3: Alternative 4	$771,650	$274,900	$4.18 M

State/Support Agency Acceptance

NYSDEC concurs with the preferred alternative.

Community Acceptance

Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the ROD for this Site. The ROD is the document that formalizes the selection of the remedy for a site.

PREFERRED REMEDY

The Preferred Alternative represents a combination of technologies comprising the remedial alternatives developed and evaluated in the FS. It was constructed to provide a comprehensive cost-effective remedy for the Site recognizing the different characteristics of the three areas. EPA, in consultation with NYSDEC, recommends the combination of Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation for Area 1, and Alternative 4: Monitored Natural Attenuation for Areas 2 and 3, as the Preferred Alternative. The estimated present worth cost of EPA’s Preferred Alternative is $24.41 million. The total estimated present worth cost of Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation for Area 1 is $18.32 million, and the present worth cost of Alternative 4: Monitored Natural Attenuation for Areas 2 and 3 is $1.91 million and $4.18 million, respectively.

Alternative 3 has the following key components: the in-situ treatment of contaminated water to promote reductive dechlorination of chlorinated solvents in the D3 zone in Area 1 and long-term monitoring in conjunction with implementation of institutional controls. Under this alternative, both biological and abiotic processes are enabled during the in-situ biogeochemical transformation process to promote reductive dechlorination of chlorinated solvents. This alternative is a flexible approach that could include a combination of one or more process options to produce equivalent or better overall treatment effectiveness. Potential process options include the addition of a carbon source that enhances the biological reductive dechlorination of the contaminants by the microorganisms in the subsurface. Carbon is delivered with lactate or other injectants, such as EVO or whey. The amendments to be injected, injection dosages, duration of injections, and frequency of supplemental injections will be determined during the remedial design. The extraction and injection well network will be designed with the placement of extraction wells at high yield locations and the injection well locations would likely be biased closer to flow paths. Figure 3 provides the conceptual extraction and injection well locations.

Alternative 4 in Area 2 and Area 3 involves monitoring of naturally occurring, in-situ processes, to decrease the mass or concentration of contaminants in groundwater. Under this alternative, additional monitoring wells as shown in Figure 2 would be installed and included as part of the monitoring well network. The monitoring program would consist of quarterly monitoring for parameters such as VOCs, geochemical indicators and hydrogeologic parameters in the monitoring well network. Additional modeling to evaluate the attenuation processes would be performed and institutional controls would be relied upon to limit exposure to contaminated groundwater.

Impacted residences would be connected to municipal water for their future potable water needs. Existing groundwater treatment systems at three dairy farms would be maintained, as necessary, or connected to the public water supply system. This action includes any current or new residences that are impacted by contaminated groundwater at the Site. POETS will be provided, as necessary, and maintained, as part of this action, until the connection to the public water supply is completed.

The environmental benefits of the preferred remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy.[1] This will include consideration of green remediation technologies and practices.

A long-term groundwater and surface water monitoring program would be implemented to track and monitor changes in the groundwater contamination and surface water in Union Springs and ensure the RAOs are attained. The results from the long-term monitoring program will be used to evaluate the migration and changes in the VOC contaminants over time.

While this alternative will ultimately result in reduction of contaminant levels in groundwater to levels that would allow for unlimited use and unrestricted exposure, it will take longer than five years to achieve these levels. As a result, in accordance with EPA policy, the Site is to be reviewed at least once every five years.

The Preferred Alternative includes a contingency remedy. The contingency remedy for Area 1 would be implemented if it is determined that Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation in Area 1 and/or Alternative 4: Monitored Natural Attenuation in Area 2 is not achieving MCLs in a reasonable timeframe and thus is not protective of human health and the environment. The contingency remedy for Area 1 will include Alternative 2: Groundwater Pump and Treat. The contingency remedy for Area 2 will include Enhanced In-Situ Biological and Abiotic Remediation. There is no contingency remedy for Area 3.

The former Powerex facility continues to be a source of VOC contamination to groundwater at this Site. As mentioned previously, the source investigation and response actions for the former Powerex facility are being addressed by GE with NYSDEC oversight. Remedial actions for the former Powerex facility are not the focus of this decision document, although successful completion (i.e., source control or remediation) of the source area(s) at the former Powerex facility is important to the full realization of the benefits of the Preferred Alternative in this Proposed Plan. In the event that source control is not successfully implemented pursuant to New York State law, EPA may elect to evaluate additional options at the former Powerex facility pursuant to CERCLA to ensure the effectiveness of the Preferred Alternative.

Basis for the Remedy Preference

While Alternative 2: Groundwater Pump and Treat and Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation both use proven technologies to actively treat VOC-contaminated groundwater in Area 1, Alternative 2 would be significantly more expensive to construct and implement than Alternative 3. In Area 2, Alternative 3 would be significantly more expensive to construct and implement than Alternative 4: Monitored Natural Attenuation. Alternative 4 in Area 2 and Area 3 relies on reduced contaminant migration from upgradient areas and natural processes to achieve MCLs in the groundwater.

Although the precise timeframe to achieve MCLs in the groundwater is somewhat uncertain due to the continuing source to groundwater contamination at the former Powerex facility and given the impact of the mass diffused in the bedrock matrix, long-term groundwater monitoring would ensure that RAOs are achieved at the Site. Mitigation in the form of POETS or public water supply had been offered by the CCDOH to residents whose drinking water wells are contaminated, and these residents will be offered another opportunity to obtain POETS or to connect to public water supply. Therefore,

[1] See http://epa.gov/region2/superfund/green_remediation.

EPA and NYSDEC believe that Alternative 3: Enhanced In-Situ Biological and Abiotic Remediation in Area 1, and Alternative 4: Monitored Natural Attenuation in Areas 2 and 3 would be protective of human health and the environment by effectively reducing the toxicity and volume of contaminated groundwater at the Site through treatment, while providing the best balance of tradeoffs among the alternatives with respect to the evaluation criteria.

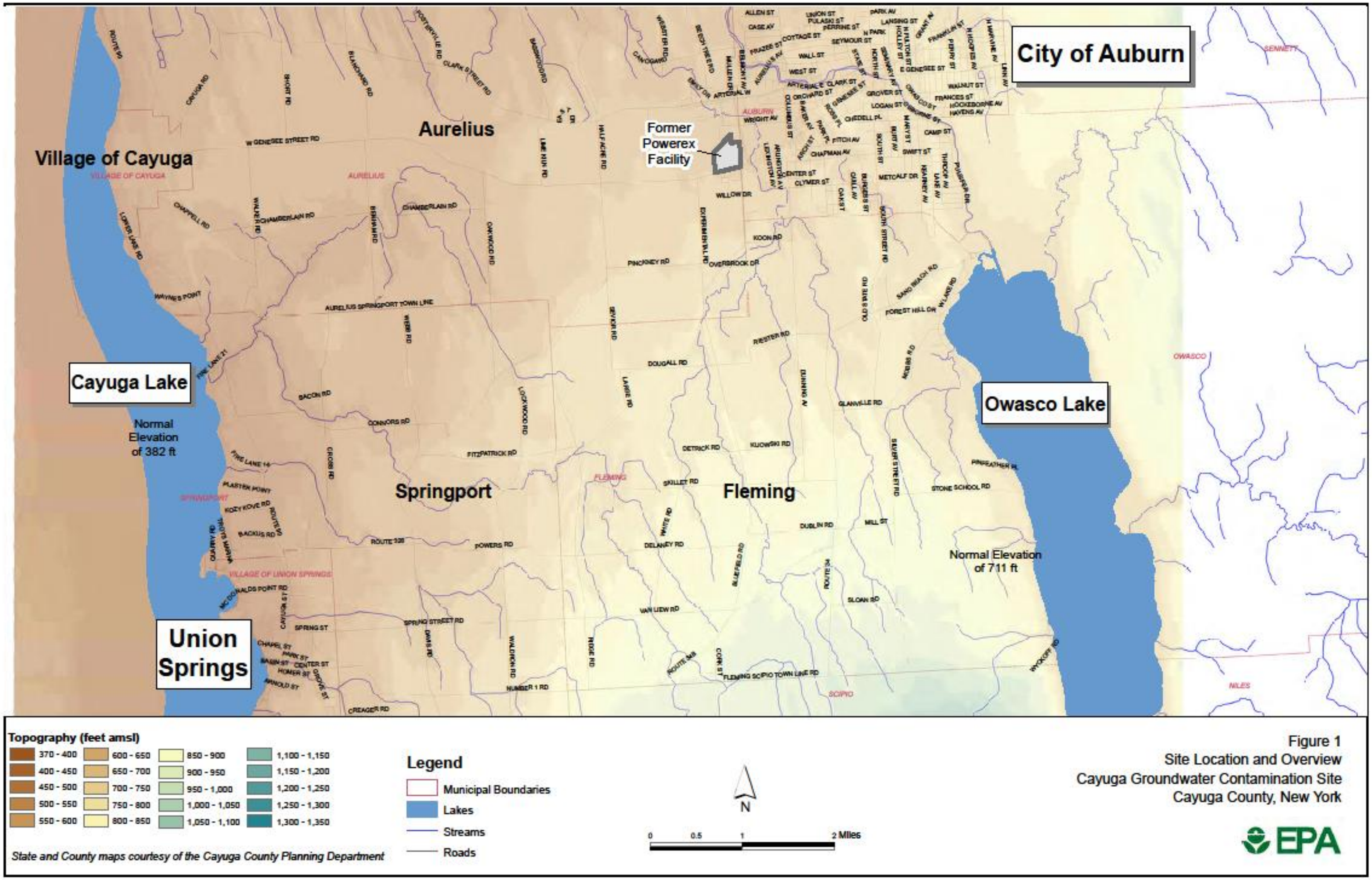
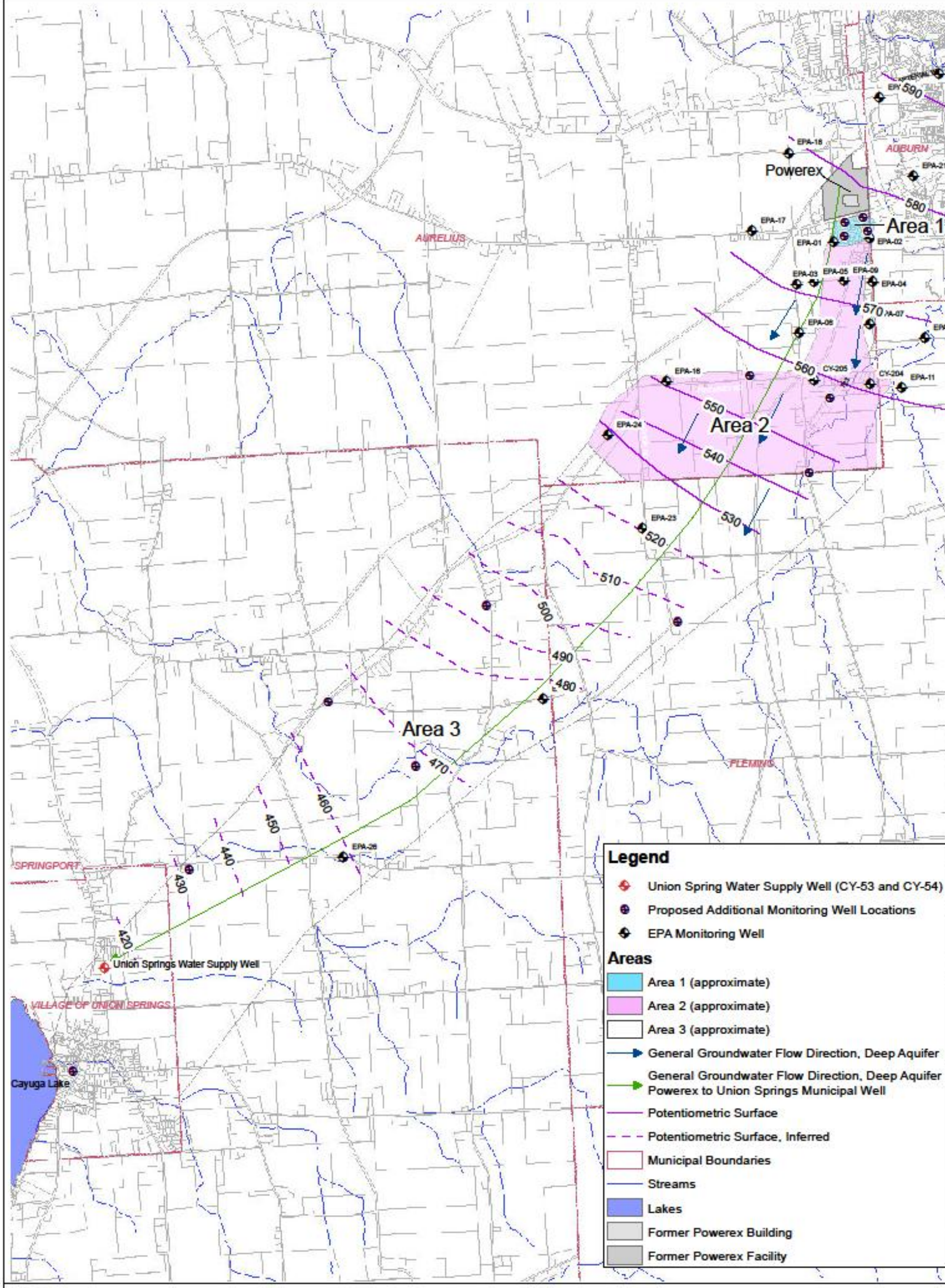


Figure 1
Site Location and Overview
Cayuga Groundwater Contamination Site
Cayuga County, New York



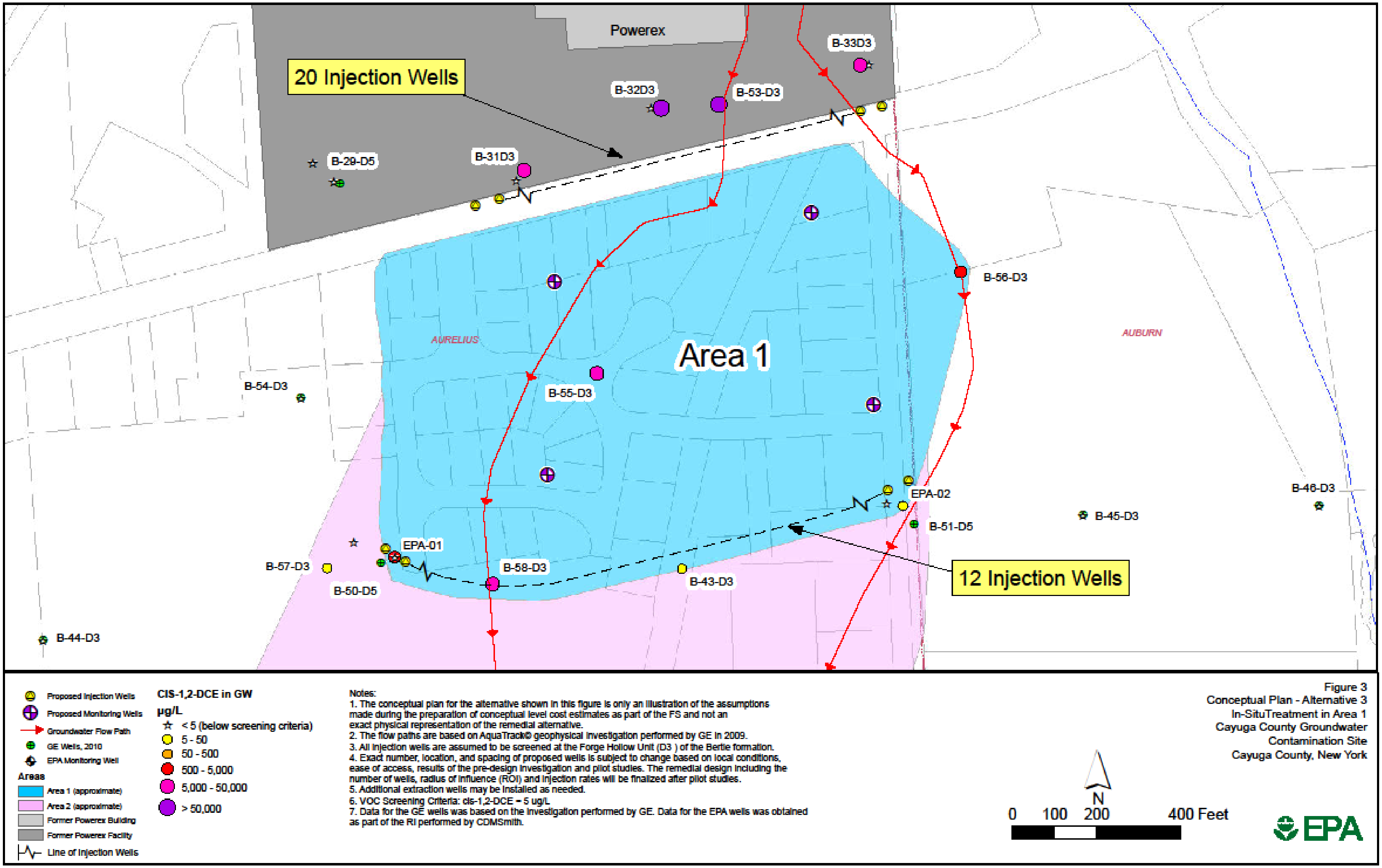
Notes:
1. Area 1 & Area 2 are as shown on the figure.
2. Area 3 consists of all areas south-southwest of Area 2 that are impacted with Site-related groundwater contamination; Area 3 extends up to Cayuga Lake, but does not include Cayuga Lake.

N

0 1,500 3,000 6,000 Feet

Figure 2
Approximate Extent of Impacts – Areas 1, 2 & 3
Cayuga County Groundwater Contamination Site
Cayuga County, New York

EPA



Notes:
1. The conceptual plan for the alternative shown in this figure is only an illustration of the assumptions made during the preparation of conceptual level cost estimates as part of the FS and not an exact physical representation of the remedial alternative.
2. The flow paths are based on AquaTrack© geophysical investigation performed by GE in 2009.
3. All injection wells are assumed to be screened at the Forge Hollow Unit (D3) of the Bertie formation.
4. Exact number, location, and spacing of proposed wells is subject to change based on local conditions, ease of access, results of the pre-design investigation and pilot studies. The remedial design including the number of wells, radius of influence (ROI) and injection rates will be finalized after pilot studies.
5. Additional extraction wells may be installed as needed.
6. VOC Screening Criteria: cis-1,2-DCE = 5 ug/L
7. Data for the GE wells was based on the investigation performed by GE. Data for the EPA wells was obtained as part of the RI performed by CDMSmith.

Figure 3
Conceptual Plan - Alternative 3
In-SituTreatment in Area 1
Cayuga County Groundwater
Contamination Site
Cayuga County, New York

EPA