New Cassel/Hicksville Groundwater Contamination Superfund Site Operable Unit 3 Nassau County, New York

July 2023

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered to address contaminated groundwater at a portion of the New Cassel/Hicksville Groundwater Contamination Superfund Site (Site), herein identified as Operable Unit 3 (OU3), and identifies the preferred remedial alternative with the rationale for this preference. OU3 is generally located east of Merrick Avenue, north of Hempstead Turnpike, west of Carman Avenue, and south of Old Country Road and OU1, as depicted in Figure 1. OU3 is the area referenced in the 2013 Record of Decision for a separate OU, *i.e.*, OU1 (OU1 ROD), as the far-field area.

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), the support agency. EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, also known as Superfund), 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 contamination at OU3 of the Site and the remedial alternatives summarized in this Proposed Plan are more fully described in the Remedial Investigation (RI) Report, dated July 2023, and the Feasibility Study (FS) Report, dated July 2023, as well as other documents in the Administrative Record file for this decision. EPA encourages the public to review these documents to gain a more comprehensive understanding of the Site, the Superfund activities that have been conducted, the remedial alternatives that have been considered, and the remedial alternative that is being proposed.

The purpose of this Proposed Plan is to inform the public of EPA's preferred alternative and to solicit public comments pertaining to all of the remedial alternatives evaluated, including the preferred alternative.

The preferred alternative includes the extraction and on-Site treatment of contaminated groundwater. The treated groundwater effluent would be discharged to a recharge basin, underground infiltration galleries, reinjected to groundwater, to surface water, and/or to the sanitary sewer. The preferred alternative also includes long-term performance monitoring and institutional controls.

The remedy described in this Proposed Plan is the preferred alternative for OU3 of the Site. Changes to the preferred alternative, or a change from the preferred alternative to another remedial alternative described in this Proposed Plan, 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 selection of a remedy will be made after EPA has taken into consideration all public comments. For this reason, EPA is soliciting public comments on all of the alternatives considered in the Proposed Plan and on the detailed analysis section of the FS Report because EPA may select an alternative other than the preferred alternative.

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:

July 24th, 2023 to August 23rd, 2023
EPA will accept written comments on the Proposed Plan during the public comment period.

IN PERSON PUBLIC MEETING:

August 10th, 2023 at 6:30 p.m.

East Meadow Public Library, 1886 Front St, East Meadow, New York 11554

COMMUNITY ROLE IN SELECTION PROCESS

EPA relies on public input to ensure the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan has been made available to the public for a public comment period which begins on July 24th, 2023 and concludes on August 23rd, 2023.

A public meeting will be held on August 10th, 2023 at the East Meadow Public Library at 1886 Front St, East Meadow, New York at 6:30 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 received during the public comment period, will be documented in a Responsiveness Summary that will be a portion of a Record of Decision (OU3 ROD), the document that will memorialize the selection of a remedy for this OU3.

Written comments on the Proposed Plan should be addressed to:

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SCOPE AND ROLE OF ACTION

This Proposed Plan addresses groundwater contamination in OU3, referred to as the far-field area in EPA's 2013 OU1 ROD at the Site. A Site location map is provided as Figure 1.

As indicated above, site remediation activities are sometimes separated into different phases, or Operable Units (OUs), so that remediation of different, discrete environmental media or geographic areas of a site can proceed separately, whether sequentially or concurrently, resulting in a more efficient and expeditious cleanup of the entire site. To date, EPA has designated three OUs for the New Cassel/Hicksville Groundwater Contamination Superfund Site. EPA recognizes that there may be additional OUs for the Site, and subsequent Proposed Plans and RODs would address any such OUs.

PUBLIC INFORMATION REPOSITORIES

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

Westbury Public Library
Reference Section
445 Jefferson Street
Westbury, New York 11590
(516) 333-0176
Hours: Monday: 10AM – 8PM
Tuesday – Thursday: 9AM – 8PM
Friday – Saturday: 9AM – 5PM
Sunday: 1PM – 5PM

USEPA – Region II
Superfund Records Center
290 Broadway, 18th Floor
New York, New York 10007
(212) 637-4308
Hours: Monday – Friday: 9AM – 5PM

EPA's website for the New Cassel/Hicksville Groundwater Contamination Superfund Site
www.epa.gov/superfund/new-cassel-hicksville

On September 30, 2013, EPA signed the OU1 ROD, which addressed groundwater contamination in the area downgradient of Old Country Road, Grand Boulevard, and the New Cassel Industrial Area (NCIA).

OU2 includes the groundwater contamination at and downgradient of the General Instruments facility located at 600 West John Street, Hicksville, New York (referred to as the "GI Facility") and other properties, including 70, 100, and 140 Cantiague Rock Road, Hicksville, New York (referred to as the "Sylvania Properties").

OU3 addresses volatile organic contaminants (VOCs) in groundwater generally located east of Merrick Avenue, north of Hempstead Turnpike, west of Carman Avenue, and south of Old Country Road and OU1, as depicted in Figure 1. OU3 is the area referenced in the OU1 ROD as the far-field area downgradient of OU1 and the western portions of OU2.

SITE BACKGROUND

Site Description

The Site comprises an area of widespread groundwater contamination within the Towns of Hempstead, North Hempstead, and Oyster Bay in Nassau County, New York. The Site is currently estimated to include approximately 6.5 square miles, characterized by contaminated groundwater that has impacted several public supply wells, including four Town of Hempstead wells (Bowling Green wells 1 and 2, Roosevelt Field well 10, and Levittown well 2A), six Hamlet of Hicksville wells (4-2, 5-2, 5-3, 8-1, 7-3, and 9-3), and one Village of Westbury well (11).

Public supply water districts monitor water quality regularly and have previously installed treatment systems to remove VOCs from groundwater prior to distribution. Residents of the Hempstead, Hicksville, and Westbury areas receive drinking water from public water supplies that have treatment systems installed so that the drinking water meets federal and State standards.

Past industrial and commercial activities in the area have contributed to the groundwater contamination at the Site, a source of drinking water. Contaminants detected at the Site include, but are not limited to, tetrachloroethylene (PCE), trichloroethylene (TCE), their breakdown components such as cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethene (1,1-DCE), and 1,4-dioxane.

The area encompassing OU3 consists primarily of residential properties, some light commercial use, and parkland such as Eisenhower Park and Eisenhower Golf Course. It is expected that the future land use in this area will remain the same. According to EPA's EJScreen tool, there are no demographic indicators for the New Cassel/Hicksville OU3 that would indicate a community with environmental justice concerns. Within OU3, the community is in the 51st percentile for hazardous waste proximity, and the 71st percentile for Ozone EJ index. The proposed remedy is not anticipated to result in adverse impacts to environmental resources that would affect low income or minority populations living within the vicinity of OU3.

Site Geology & Hydrogeology

The aquifer at OU3 of the Site is classified as Class GA (6 NYCRR 701.18), meaning that it is designated as a potable water supply. The principal hydrogeologic units underlying the Site are the glacial outwash and morainal deposits known as the Upper Glacial Aquifer (UGA) and the underlying Magothy Formation and Matawan Group (Magothy). Beneath these two units are the clay member and the Lloyd Sand member of the Raritan Formation.

The UGA is estimated to be 40 to 65 feet thick and consists predominantly of coarse-grained sands and gravels. Unconfined groundwater is generally found at the Site between 40 and 65 feet below ground surface (bgs), which is near the estimated boundary between the UGA and Magothy aquifer. The underlying Magothy Formation sediments are characterized by sand and silty sand with discontinuous clay and silt layers. The Magothy is approximately 500 feet thick at the Site. Geologic studies in the area have indicated that sediments tend to become finer in size fraction the deeper that they are located in the Magothy Formation, except within the basal portion where coarse-grained sands and gravels are prevalent. The Lloyd aquifer is a confined aquifer, separated from the Magothy aquifer by the clay member of the Raritan Formation. The top of the clay member of the Raritan Formation is encountered at a depth of approximately 600 feet bgs.

Site History

Operable Unit 1

The NCIA was developed for industrial use during the 1950s through the 1970s and remains densely occupied with industrial and commercial properties. As discussed in further detail in EPA's OU1 ROD, in 1986, Nassau County Department of Health identified extensive groundwater contamination throughout the NCIA.

Numerous investigations conducted by NYSDEC since 1986 indicated that groundwater contamination from the upgradient NCIA properties impacted the Bowling Green water supply wells, and the area south of Old Country Road and Grand Boulevard, identified as EPA's OU1. Groundwater sampling data indicated that the contaminants of concern (COCs) are PCE, TCE, trichloroethane (TCA), and other minor constituents and breakdown products. NYSDEC identified three groundwater plumes (eastern, central, and western) emanating from the NCIA. NYSDEC, under its state hazardous waste cleanup program, initiated and continues to oversee response actions at individual properties within the NCIA that have been determined to be impacting groundwater, including extraction wells installed north of Old Country Road that have been operated since 2018 to remove contaminated groundwater along the eastern portion of the NCIA.

In 2003, NYSDEC selected a remedy under its State authorities to address groundwater contamination downgradient of the NCIA. While NYSDEC conducted pre-design investigation activities, the State-selected remedy was never constructed. Thereafter, NYSDEC requested that EPA list the Site on the National Priorities List (NPL). On September 16, 2011, EPA listed the Site on the NPL and this area south (downgradient) of the NCIA was identified by EPA as OU1. As outlined above, the listing of the Site on the NPL does not alter the oversight of the individual response actions undertaken under State authority.

On September 30, 2013, EPA selected a remedy for OU1 which addressed groundwater contamination in the area downgradient of Old Country Road, Grand Boulevard, and the NCIA. Three groundwater plumes exist at OU1 (the eastern, central, and western plumes). The OU1 remedy included in-situ treatment of groundwater via in-well vapor stripping, extraction of groundwater via pumping and ex-situ treatment, and/or in-situ chemical treatment to target high concentration areas, as appropriate. The OU1 remedy also includes the implementation of long-term monitoring and institutional controls to limit exposure to contaminated groundwater.

The design of the OU1 remedy is underway. As part of the remedy design, from 2020 to 2022, EPA installed additional vertical profile borings (VPBs) and groundwater monitoring wells in the western plume, and additional VPBs and monitoring wells were installed in the eastern and central plume by potentially responsible parties (PRPs) under EPA's direction. Maximum concentrations of PCE and TCE detected in each of the plumes during drilling of the VPBs is provided in Table 1.

Table 1: Maximum OU1 Remedial Design VPB Groundwater Sample Results (2020 to 2022)

	PCE	TCE
Eastern Plume	10,300	1,090
Central Plume	176	714
Western Plume	1,700	810

Note: Concentrations are reported in micrograms per liter (µg/L).

Following the installation of the permanent monitoring wells, a comprehensive round of sampling of the OU1 permanent monitoring wells was conducted in Spring 2023. The sampling results will be provided in a technical memorandum that EPA expects to release this summer, and the data will be used in the development of the remedial design and technical specifications for the OU1 cleanup.

Operable Unit 2

OU2 includes the groundwater contamination at and downgradient of the GI Facility and Sylvania Properties, among others. The Sylvania Properties are located immediately north of the GI Facility in Hicksville, New York. Below is a summary of the investigations and response actions conducted at OU2.

The Sylvania Properties were used for industrial and manufacturing operations from as early as 1942. From 1952 to 1966 the facilities were involved in the research, development, and fabrication of nuclear elements. Beginning in 1992, investigations and removal activities were conducted to determine the nature and extent of contamination at the Sylvania Properties. Investigations revealed concentrations of PCE in soils up to 40,000 milligrams per kilogram (mg/kg) at a depth of 16 feet bgs. Cleanup activities conducted at the Sylvania Properties by certain responsible parties associated with the Sylvania Properties under a voluntary cleanup agreement with NYSDEC included the excavation of soils and the removal of underground storage tanks (USTs).

In September 2021, the U.S. Army Corps of Engineers (USACE) published an RI report for the Sylvania Properties, performed under the federal Formerly Utilized Sites Remedial Action Program (FUSRAP), and it detailed the contaminants associated with the early atomic energy program, including certain VOCs that are contaminants of potential concern (COPCs) at the Site. The RI report indicates that historical operations at the Sylvania Properties resulted in releases of wastes to the ground surface, leach pools, drywells, and recharge basins/sumps, resulting in primarily PCE, uranium, and nickel impacts to soils and groundwater.

The USACE RI report provides detailed information regarding the extent of contamination, including PCE plumes emanating from multiple, on-property features, extending up to 8,500 feet south of the Sylvania Properties. Concentrations of PCE in groundwater were generally highest immediately downgradient of the eastern portion of the Sylvania Properties (at concentrations between 8,000 to 16,000 µg/L) at a depth of 80 feet bgs. Nickel and uranium plumes were also identified, however, these plumes were found to be limited in extent to beneath the former Sylvania Properties. Additional information regarding the findings of the RI can be found in the USACE RI report, dated September 2021.

In 2022, the USACE performed a pilot study on the eastern portion of the Sylvania Properties to evaluate the effectiveness of air sparging/soil vapor extraction to remediate soils and shallow groundwater contaminated with VOCs. EPA anticipates receiving a report summarizing the results of the pilot study soon.

The former GI Facility, located on West John Street and adjacent to the Sylvania Properties to the south, was constructed in 1960 for the manufacture of electric components including semiconductor products and circuits. Operations continued at the property until 1993.

Investigations at the GI Facility began in 1971 and identified PCE, TCE, 1,2-dichlorobenzene (1,2-DCB), toluene, ethylbenzene, and xylene as the primary contaminants resulting from releases at two areas in the vicinity of USTs. Beginning in 1980, cleanup activities under the authority of NYSDEC at the GI Facility included the removal of USTs and the excavation of approximately 25 cubic yards of soil. Soil samples indicated concentrations of total VOCs greater than 20,000 mg/kg. In 1994, an SVE system was installed as an interim remedial measure under the authority of the NYSDEC, however, the system was shut down in 1995 because of mechanical problems.

In March 1997, NYSDEC selected a remedy under its State authorities to address the on-property soil contamination that included an expansion of the SVE system at three areas. The SVE system operated to address on-property soil contamination before being discontinued in two areas in 2003, and completely shut-down in 2012. For more information regarding the SVE system, refer to *Operable Unit 1, SVE System Closure Sampling in Area A*, dated 2013.

In 2003, under NYSDEC oversight, Vishay GSI, Inc. (Vishay), the successor corporate entity to General Instruments Corporation, installed an in well air stripping system to treat VOC-contaminated groundwater attributable to the GI Facility. Through 2009, the system treated approximately 224 million gallons of groundwater and removed approximately 2,559 pounds of VOCs. An evaluation of five years of system performance since its inception resulted in Vishay shutting down the system in 2009. For more information regarding the operation of this system, refer to *Operable Unit 2 – Groundwater IRM Final Progress Report*, dated 2009.

EPA is currently overseeing the preparation of a supplemental RI report by Vishay to determine the nature and extent of contamination at OU2 of the Site related to the GI Facility.

<u>Operable Unit 3</u>

In 2015, EPA began an RI/FS of the groundwater contamination at OU3, the subject of this Proposed Plan. The investigation, conducted in two phases, included drilling vertical profile borings, installing permanent monitoring wells, and groundwater sampling. As part of the OU3 RI, a total of 12 permanent groundwater monitoring wells were installed and sampled.

RESULTS OF THE OU3 REMEDIAL INVESTIGATION

Phase I

The first phase of work began in 2016. Six VPBs were drilled during Phase I: NCOU3-B01 through NCOU3-B06 (refer to Figure 2). As part of the drilling process, groundwater samples were collected at 20 to 30-foot intervals as the boreholes were advanced. The method employed ensured that a representative groundwater sample was collected from each interval. The samples collected as part of the VPB effort are referred to as groundwater screening profile samples. At each borehole, sample collection began at the water table, and then from either 147 to 197 feet bgs, depending on the borehole location, to the borehole termination depth at the top of the Raritan Formation, around 600 feet bgs.

During Phase I, 103 VPB groundwater screening profile samples were collected and analyzed for VOCs. The VPB results indicated a 'clean' lens of groundwater to a depth of approximately 200 feet bgs. Generally, the highest levels of contamination were observed in the eastern portion of OU3 between depths of 350 to 500 feet bgs, with levels of contamination decreasing with increased depth from that interval. The highest detection of total VOCs in VPB groundwater screening profile samples during Phase I was observed in NCOU3-B03 (8,667 µg/L) at a depth of 382 feet bgs.

Nine monitoring wells were subsequently installed and developed in the completed VPB boreholes during Phase I (NCOU3-MW-01S/D, NCOU3-MW-02S/D, NCOU3-MW-03S/D, NCOU3-MW-04, NCOU3-MW-05, and NCOU3-MW-6) (Figure 2). Monitoring well screen depths were selected based on groundwater profile screening sampling results and other observed conditions, such as lithology.

Following the installation of the monitoring wells, a round of synoptic water level measurements were collected in January 2019 to gain a better understanding of groundwater flow conditions in the OU3 study area. The groundwater flow direction was determined to be consistent with previous studies at the Site and confirmed a flow generally oriented in a south-southwest direction.

In addition, groundwater samples were collected in January 2019 from each of the Phase I monitoring wells in OU3, as well as 13 existing monitoring wells located within OU1 and Eisenhower Park. The parameters for this sampling event were expanded to include additional compounds, such as metals and semi-volatile organic compounds

(SVOCs). The highest concentrations of PCE (6,500 µg/L) and TCE (530 µg/L) in OU3 were detected in NCOU3-MW-03S at a depth of 380 feet bgs. Other frequently detected VOCs included 1,1,1-trichloroethane (1,1,1-TCA), 1,1-DCE, and cis-1,2-DCE, at maximum concentrations of 17 µg/L, 120 µg/L, and 610 µg/L, respectively. These maximum concentrations were detected in monitoring wells MW-4, MW-3, and MW-MW-17D, respectively, located within OU1. Other compounds detected included iron, sodium, and 1,4-dioxane at maximum concentrations of 52,900 µg/L, 169,000 µg/L, and 22 µg/L, respectively. These maximum concentrations were all detected in monitoring well NCOU3-MW-06, located in OU3.

In addition, in November 2018, a sample collected by EPA personnel from one of the OU3 monitoring wells and analyzed by a laboratory under contract with NYSDEC as part of a State-wide screening for emergent contaminants at Superfund sites revealed the presence of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) at a concentration of 2.18 ng/L and 0.92 ng/L, respectively.

Phase II

The second phase of investigative RI work began in 2021 and was an expansion of the work conducted in Phase I, targeting areas further downgradient. Using the same drilling and sampling methods as Phase I, seven VPBs were drilled, and groundwater screening profile samples were collected and analyzed for VOCs. During Phase II, 125 VPB groundwater screening profile samples were collected and analyzed for VOCs. VPB groundwater screening profile samples from Phase II revealed generally lower concentrations of VOCs than during Phase I. Generally, the highest levels of contamination during the drilling of VPBs in Phase II were observed at depths of approximately 400 to 570 feet bgs, indicating that contamination tends to move with groundwater flow, migrating vertically and horizontally through the subsurface. During Phase II, the highest detection of total VOCs in VPB groundwater screening profile samples was observed in NCOU3-B08 (6,877 µg/L) at a depth of 444 feet bgs.

Several other compounds were detected in the VPB groundwater screening profile samples collected during Phases I and II, with acetone and benzene being the most frequently detected non-chlorinated VOCs, with maximum concentrations of 3,300 µg/L and 290 µg/L, respectively.

Following the drilling of the VPBs, in 2021, three monitoring wells were installed and developed (NCOU3-MW-07, NCOU3-MW-08, and NCOU3-MW-09) to further define the nature and extent of groundwater contamination. The location of each of the VPBs and monitoring wells installed during Phases I and II are shown in Figure 2. The furthest downgradient (south) monitoring well, NCOU3-MW-09, was installed approximately one mile north of the East Meadow water district. The water district supply wells are located south (downgradient) of the Site and Hempstead Turnpike.

Between January and April 2022, EPA conducted two groundwater sampling events, collecting groundwater samples from 26 monitoring wells in OU3 and the surrounding area. The results from these two sampling events were consistent with the previously analyzed groundwater screening profile sampling results. The highest concentrations of PCE, TCE and cis-1,2-DCE detected from the permanent monitoring wells installed as part of the OU3 RI were generally observed in the eastern portion of OU3. The maximum groundwater contaminant concentrations from permanent monitoring wells installed as part of the OU3 RI are included in Table 3 below.

As indicated above, as part of the OU3 RI, the 2022 groundwater sampling events included the collection of samples from select monitoring wells located within OU1. The results indicated the highest concentrations of PCE (5,300 µg/L) and TCE (750 µg/L) were detected in OU1 monitoring well MW-17D at a depth of 280 feet bgs. This monitoring well is located in the eastern plume, upgradient of NCOU3-MW-03S (PCE 3,400 µg/L and TCE 11 µg/L). Therefore, while contaminant concentrations generally reveal a decreasing trend in concentrations with increasing distance from OU1, instances of higher concentrations have been revealed.

During Phase II, other frequently detected VOCs in the OU3 groundwater monitoring wells included 1,1,1-TCA, 1,1-DCE, and cis-1,2-DCE, at maximum concentrations of 8.1 µg/L, 23 µg/L, and 190 µg/L, respectively. These maximum concentrations were detected in NCOU3-MW-08, NCOU3-MW-08, and NCOU3-MW-04, respectively. 1,4-dioxane, a SVOC, was detected during OU3 sampling at a maximum concentration of 28 µg/L in monitoring well NCOU3-MW-06. Additional contaminants considered to be Site-related based on historical OU1 information were detected, and the maximum concentrations for these contaminants are included in Table 3 below. Metals such as sodium, iron, and arsenic were detected in OU3 during Phase II at maximum concentrations of 128,000 µg/L, 109,000 µg/L, and 40.1 µg/L, respectively. These maximum concentrations were all detected in monitoring well NCOU3-MW-06, located in OU3. However, metals are not considered to be Site-related. Some of the metals detected are naturally occuring in the Magothy Formation, while others may have resulted from urban runoff and stormwater recharge to the aquifer system unrelated to releases at the Site.

For more detailed information regarding the results of the remedial investigation, including a comprehensive analysis of vertical profile boring and groundwater monitoring well samples, please refer to Section 4 of the OU3 RI Report, dated July 2023.

In April and May 2022, EPA collected two additional rounds of synoptic water level measurements. To provide a better understanding of groundwater flow directions at the Site, groundwater elevations were collected from a total of 127 monitoring, municipal, and irrigation wells located in the general area. The data confirmed that groundwater within the UGA and Magothy aquifer in OU3 generally flows in a south-southwest direction with local variations to the southwest and may be impacted by the pumping of active municipal and industrial supply wells and the functioning of stormwater retention basins. The supply wells in the study area range in depth from 200 feet bgs to more than 600 feet bgs. The wells operate for a range of purposes, from municipal water supply and irrigation wells to private industrial wells used for cooling equipment. Water levels were generally between one and three feet higher in 2022 compared to 2019. The difference in groundwater levels may be the result of a combination of seasonal and annual variations in precipitation and/or fluctuations caused by pumping at nearby water supply wells.

An evaluation of natural attenuation conditions was conducted as part of the RI to characterize conditions that may support or inhibit microbial degradation of chlorinated solvents through the process of reductive dechlorination.

Reductive dechlorination is a natural attenuation process that can degrade chlorinated VOCs (CVOCs) by transforming chlorinated compounds such as TCE to other compounds. Other natural attenuation processes can include degradation, dispersion, dilution, sorption, and volatilization. The primary process of attenuation at a site can change through time if subsurface chemical conditions are altered. To assess degradation processes on Site-related contamination, laboratory analyses were performed in 2022 for a series of geochemical parameters to provide information on geochemical conditions, which can impact natural attenuation processes. The following is a summary of the conclusions of the analysis.

- Reductive dechlorination only occurs in anaerobic conditions (less than 0.5 mg/L of dissolved oxygen (DO). DO levels measured in the OU3 study area indicated a broad range of conditions in the aquifer ranging from oxygen depleted to oxygenated approaching saturation. In general, wells with depths greater than 400 feet bgs showed anaerobic conditions (oxygen depleted). The analyses indicated that anaerobic conditions necessary for reductive dechlorination are not widespread throughout the OU3 study area.
- Iron and manganese play a role in both biotic (biological) and abiotic (physical or chemical) degradation of CVOCs, and increased concentrations can be indicative of their reduction to more soluble forms as a result of microbial degradation. Elevated levels of iron and manganese were observed in select monitoring wells.
- For reductive dechlorination to occur, sulfate in the groundwater must be less than 20 mg/L. Analytical results indicate that sulfate levels were below this value throughout the OU3 study area, indicating the potential for natural attenuation to occur.
- Chloride is produced during reductive dechlorination and can be an indicator of biological activity. Chloride was detected in each sample collected as part of the RI, indicating the potential for natural attenuation to occur. Chloride in groundwater could also be naturally occuring or related to urban run-off impacting groundwater.

Geochemical characteristics indicate that anaerobic conditions favorable for microbial degradation are present in isolated areas but are not widespread throughout OU3. The presence of PCE and TCE metabolites indicate that CVOC degradation is occuring to some degree, but the lack of vinyl chloride indicates that reductive dechlorination is not moving beyond 1,2-DCE on a wide scale. Anaerobic conditions favorable for microbial degradation of CVOCs may be present in isolated areas within silts and clays at greater depths in the aquifer. The presence of 1,1-DCE indicates that abiotic degradation of TCA may also be occuring. Some degree of dilution and dispersion are also expected to occur as contamination migrates downgradient.

The OU3 RI Report contains additional details for all sampling results, including an in-depth analysis of the fate and transport and nature and extent of contamination in the study area. The OU3 RI Report, Feasibility Study, and other Site-related documents are included in the Administrative Record file for this action, which is available at the Public Information Repositories and online. 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.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 CFR § 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. Source material includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. Principal threat wastes are source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Contaminated groundwater is generally not considered to be source material. As such, there are no principal threat wastes in OU3. Please refer to the text box, "What is a Principal Threat", for more information on the principal threat concept.

RISK SUMMARY

As part of the RI/FS, a baseline human health risk assessment (HHRA) was conducted for OU3 to estimate the risks and hazards associated with the current and future effects of contaminants on human health and the environment. A baseline HHRA is an analysis of the potential adverse human health effects of releases of hazardous substances from a site in the absence of any actions or controls to mitigate these exposures under current and future site uses. A screening level ecological risk assessment was not conducted because the purpose of such an assessment is to assess the risk posed to ecological receptors, and because the OU3 contaminated groundwater does not discharge to any surface water bodies within the OU3 study area, exposure pathways are not complete, and ecological receptors are not exposed to contaminants from OU3 of the Site.

In the HHRA, the cancer risk and noncancer health hazard estimates are based on current reasonable maximum exposure scenarios and were developed by taking into account various health protective estimates about the concentrations, frequency and duration of an individual's exposure to chemicals selected as COPCs, as well as the toxicity of these contaminants.

WHAT IS A "PRINCIPAL THREAT"?

The National Oil and Hazardous Substances Pollution Contingency Plan establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, non-aqueous phase liquids in ground water may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

Human Health Risk Assessment

A four-step human health risk assessment process was used for assessing Site-related cancer risks and noncancer health hazards in the absence of any remedial action. The four-step process is comprised of: Hazard Identification, Exposure Assessment, Toxicity Assessment, and Risk Characterization (see text box on page 10, "What is Risk and How is it Calculated") for more details on the risk assessment process.

The HHRA began with selecting COPCs in groundwater that could potentially cause adverse health effects in exposed populations. COPCs are selected by comparing the maximum detected concentrations of each chemical identified with state and federal risk-based screening values.

The COPC screening conducted in the HHRA identified 27 COPCs, including 13 VOCs and 1,4-dioxane. All identified COPCs can be found in Table 3-3 of the HHRA, and the identified COPCs were evaluated further in the risk assessment. COPCs at concentrations similar to background or not considered to be Site-related are carried through the quantitative portion of the HHRA but not identified as primary COPCs for OU3 of the Site.

The exposure assessment identified potential human receptors based on a review of current and reasonably foreseeable future land use at the Site. The area encompassing OU3 consists primarily of residential properties, some light commercial use, and Eisenhower Park and Eisenhower Golf Course. It is expected that the future land and groundwater use in this area will remain the same. Based on the current zoning and land use, the HHRA evaluated residential and commercial uses at OU3 of the Site.

Under the current land use scenario, there are no current exposures, however, exposures were considered under the future land use scenario as follows:

- Resident (child/adult): ingestion of and dermal contact with groundwater and inhalation of vapors during bathing/showering activities
- Commercial/Industrial Worker (adult): ingestion of and dermal contact with groundwater

In this assessment, exposure point concentrations (EPCs) were estimated using either the maximum detected concentration of a contaminant or the 95% upper confidence limit of the average concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably anticipated to occur at OU3 of the Site. The RME is intended to estimate a conservative exposure scenario that is still within the range of possible exposures. A complete summary of all exposure scenarios can be found in the baseline human health risk assessment section of the RI, which can be found in the Administrative Record for OU3 of the Site.

In the risk assessment, two types of toxic health effects were evaluated for COPCs, cancer risk and noncancer hazard. Calculated cancer risk estimates for each receptor were compared to EPA's target risk range of $1x10^{-6}$ (a one-in-one million excess cancer risk) to $1x10^{-4}$ (one-in-ten thousand excess cancer risk). The calculated noncancer hazard index (HI) estimates were compared to EPA's target threshold value of 1. The following section provides an overview of the cancer risks and noncancer hazard estimates associated with exposure to groundwater at the Site.

Cancer risks and noncancer hazards were evaluated for future exposure representative of sitewide groundwater. The populations of interest evaluated were child/adult residents and adult workers. As shown in Table 2, the estimated cancer risk for the child/adult resident of $2x10^{-3}$ exceeded the upper bound of EPA's threshold criteria of $1x10^{-6}$ to $1x10^{-4}$, and the hazard index (169) for the child/adult resident also exceeded the threshold of 1. The COPCs that primarily contributed to elevated noncancer hazards and cancer risks for the child/adult residents were 1,1,2-trichloroethane (1,1,2-TCA), 1,2,3-trichloropropane (1,2,3-TCP), cis-1,2-DCE, PCE and TCE.

Although several metals including arsenic, aluminum, and cobalt also contributed to elevated noncancer hazards and cancer risks for the child/adult resident, these metals are not Site-related.

For adult workers, the estimated cancer risk of $2x10^{-4}$ exceeded the upper bound of EPA's threshold criteria of $1x10^{-6}$ to $1x10^{-4}$, and the hazard index (11) for the worker also exceeded the threshold of 1. COPCs primarily contributing to the elevated risks for future workers were PCE and TCE. In addition, although 1,1,1-TCA, trans-1,2-DCE, 1,1-DCE, 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), benzene, vinyl chloride, and 1,4-dioxane were not associated with elevated risk, these chemicals are considered Site-related and exceeded federal and state drinking water and/or groundwater quality standards.

Table 2: Summary of Hazards and Risks Associated with Groundwater

Receptor	Hazard Index	Cancer Risk
Resident - Child (<6 years)	**169**	**2 x 10^{-3}**
Resident - Adult	**169**	
Worker - Adult	**11**	**2 x 10^{-4}**

Note: **Bold** indicates value above the acceptable risk range

Vapor Intrusion

A vapor intrusion screening assessment was conducted by reviewing the vertical distribution of contaminants in the OU3 VPB data collected for the RI. The results demonstrated that the upper glacial (0-85 feet bgs) and upper Magothy (85-185 feet bgs) aquifer zones are mostly not contaminated with CVOCs, and the shallowest screening criteria exceedance of any individual compound was at a depth of 147 feet bgs in the OU3 study area. The depth to contaminated groundwater exceeded 100 feet in all VPB sampling conducted. As 'clean' lenses of shallow groundwater have been demonstrated to exist over the deeper OU3 contaminated zones, vapor intrusion in OU3 was not further analyzed.[1]

Summary of Human Health Risks

In summary, the HHRA indicated that future potable use of groundwater at OU3 of the Site would result in elevated noncancer hazards and cancer risks that exceed EPA's

[1] In accordance with the EPA 2015 *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air.*

target threshold values for child/adult residents and workers. Based on the results of the RI and the risk assessment, EPA has determined that the actual or threatened releases of hazardous substances that are present at OU3 of the Site, if not addressed by the preferred alternative, may present a threat to human health or welfare or the environment. It is EPA's current judgement that the preferred remedial alternative identified in this 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 have been established for OU3:

- Prevent or minimize the potential future human exposure (via dermal, ingestion and inhalation) to Site-related contaminants in groundwater at concentrations in excess of federal maximum contaminant levels (MCLs) and State standards;
- Minimize the potential for further migration of groundwater with Site-related contaminant concentrations in excess of federal MCLs and State standards; and
- Restore the impacted aquifer to its most beneficial use as a source of drinking water by reducing contaminant levels to the more stringent of federal MCLs or New York State standards.

The groundwater preliminary remediation goals (PRGs) established for OU3 are identified in Table 3.

WHAT IS HUMAN HEALTH 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 releases under current- and anticipated future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure (RME) scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at the site in various media (*i.e.*, soil, fish, 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. that were 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 fish. 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" RME scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other noncancer health 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 risks and noncancer 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 noncancer 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 noncancer health effects, a "hazard index" (HI) is calculated. The key concept for a noncancer HI is that a "threshold" (measured as an HI of less than or equal to 1) exists below which noncancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a noncancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at a site and are referred to as chemicals of concern, or COCs, in the final remedial decision document or the Record of Decision.

Table 3: Preliminary Remediation Goals (PRGs) and Maximum OU3 Groundwater Contaminant Concentrations

Contaminants of Potential Concern (COPCs)[1]	NYSDEC Ground Water Quality Standards (µg/L)	NYSDOH Drinking Water Quality Standards (µg/L)	National Primary Drinking Water Standards (µg/L)	Permanent Monitoring Well Sample Maximum Concentration (µg/L)	Monitoring Well ID	Sample Depth (bgs)
1,1,1-TCA	5	5	200	13 J*	NCOU3-MW-03S	380
1,1,2-TCA	1	5	5	1.1	NCOU3-MW-03D	470
1,1-DCE	5	5	7	23	NCOU3-MW-08	385
1,1-DCA	5	5	NS	11	NCOU3-MW-01S/ NCOU3-MW-07	385/ 425
1,2,3-TCP	0.04	5	NS	0.26 J	NCOU3-MW-05	380
1,2-DCA	0.6	5	5	2.4	NCOU3-MW-04	404
Cis-1,2-DCE	5	5	70	390	NCOU3-MW-03S	380
PCE	5	5	5	6,500	NCOU3-MW-03S	380
Trans-1,2-DCE	5	5	100	9.9	NCOU3-MW-06	440
TCE	5	5	5	530	NCOU3-MW-03S	380
Vinyl Chloride	2	2	2	0.46 J	NCOU3-MW-02D	512
Benzene	1	5	5	0.96	NCOU3-MW-02D	512
1,4-Dioxane	NS**	1	1	28	NCOU3-MW-06	440

*J value indicates estimated concentration.

**NS indicates there is no currently available standard; however, 0.35 µg/L is the NYSDEC ambient water quality guidance value for 1,4-dioxane for discharges to drinking water sources. Treated effluent would meet the New York State 1,4-dioxane effluent limitation of 0.35 µg/L for discharged water.

Note: As indicated above, the PRGs for each COPC is identified based on the more stringent of federal MCL or New York State standard.

Note: Table 3 provides the maximum contaminant concentrations for permanent monitoring wells installed in OU3 as part of the RI/FS.

SUMMARY OF REMEDIAL ALTERNATIVES

Section 121(b)(1) of CERCLA, 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be 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 that employ, as a principal element, treatment to reduce permanently and significantly the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants at a site. Section 121(d) further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants that at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to Section 121(d)(4) of CERCLA, 42 U.S.C. § 9621(d)(4).

Detailed descriptions of the remedial alternatives for addressing the contamination associated with OU3 of the Site can be found in the FS Report, dated July 2023.

The FS Report presents four groundwater alternatives, including a required "no action" alternative.

The duration 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, if possible, or procure contracts for design and construction.

Common Elements

Alternatives 2 through 4 target discrete areas near the northern portion of OU3 where total groundwater contaminant concentrations are greater than 1,000 µg/L. During the remedial design for each of these alternatives, additional groundwater monitoring wells would be installed, and sampling would be performed to refine the areas with contaminant concentrations greater than 1,000 µg/L. Sampling for emerging contaminants, such as PFOA and PFOS, would be performed during the remedial design. Each of these alternatives, however, provide a different method of groundwater treatment in the northern portion of OU3 and are discussed in further detail below.

[1] The COPCs listed in Table 3 include all site-related contaminants that exceed the federal MCL or New York State groundwater quality standard.

Alternatives 2 through 4 also rely on the hydraulic control of groundwater in the southern portion of OU3 via a network of extraction (pumping) wells near the portion of the plume containing total groundwater contaminant concentrations of approximately 100 μg/L (referred to in the FS as the downgradient edge of contamination). During the remedial design, additional groundwater monitoring wells would be installed, and sampling would be performed to refine the areas with contaminant concentrations greater than 100 μg/L. Sampling for emergent contaminants, such as PFOA and PFOS, would be performed during the remedial design. It is estimated that, for each alternative, extraction wells would target a depth range from approximately 200 to 500 feet bgs for extraction. The extracted groundwater from the pumping wells would be conveyed to a groundwater treatment plant for treatment prior to discharge.

For Alternatives 2 through 4, a combination of air stripping, granular activated carbon (GAC), as well as advanced oxidation processes would be used to treat the extracted groundwater at a groundwater treatment plant. Based on the results of the pre-design investigation, the conceptual design for the treatment of the extracted groundwater may be refined to meet discharge requirements.

Treated groundwater would be discharged to one or more of the following: (1) a newly constructed or existing recharge basin; (2) underground infiltration galleries; (3) the sanitary sewer; (4) to surface water; and/or (5) reinjection to groundwater. The specific location for the various components of the groundwater extraction and treatment system have not been determined. For cost-estimating and planning purposes, it was assumed in developing the FS that a centralized groundwater treatment plant would be sited in or in the vicinity of Eisenhower Park. The assumption included that the treatment plant and discharge of treated effluent would require a total area of approximately 2.5 acres. Given the amount of space required and the limited availability of open space in the area, there are limited options for siting the equipment.

While EPA made certain assumptions in the FS for cost-estimating and planning purposes, as part of the remedial design, further evaluation would be conducted to identify potential locations to site the various system components comprising the preferred alternative. If it is determined that parkland, such as Eisenhower Park, is needed to construct and/or operate a portion of the system, EPA would coordinate this effort with Nassau County and endeavor to obtain any necessary approvals (e.g., from the New York State legislature) for the use of parkland for this purpose. As part of this effort, an evaluation would be conducted to determine whether a portion of the treated effluent could be used by the County on a seasonal basis for irrigation purposes at the park.

For these reasons, alternatives to a centralized treatment plant, such as multiple smaller treatment plants, may be considered during the remedial design. In addition, if sufficient capacity were to exist, consideration could be given to treat a portion of the extracted groundwater at a treatment plant intended for a response action at another operable unit of the Site, such as OU1. As indicated previously, the development of the design specifications for the OU1 selected remedy are underway.

Alternatives 2 through 4 also include long-term monitoring to ensure that groundwater quality improves following implementation of these alternatives until clean up levels are achieved, including areas outside of the area of hydraulic control within OU3 through naturally occurring attenuation processes. Under Alternatives 3 and 4, the sampling program would also include monitoring geochemical conditions and degradation byproducts generated by the treatment processes. For each of the active alternatives, the long-term monitoring program would include the installation and sampling of an early-warning monitoring well for the East Meadow water supply well located south of Hempstead Turnpike. During the remedial design, the location of the early-warning monitoring well would be determined to ensure sufficient time for the installation of wellhead treatment to address Site-related contamination, if that is determined to be needed.

Alternatives 2 through 4 also include institutional controls that will rely on current groundwater use restrictions in the form of state and local laws. Specifically, Article IV of the Nassau County Public Health Ordinance prohibits the use of private wells where public water systems are available. The Site and surrounding area is serviced by public water systems. In addition, New York State Environmental Conservation Law Section 15-1527 prohibits the installation and use of public drinking water wells in Nassau County without a State permit. To ensure the remedy remains protective, the above State and County well restrictions will be relied upon. It is intended that a Site management plan (SMP) would be developed to provide for the proper operation and maintenance (O&M) of the OU3 remedy post-construction, and as such it would include long-term groundwater monitoring, confirming institutional controls, periodic reviews, and certifications as applicable.

For Alternatives 2 through 4, an estimated remediation time frame of 30 years is used for developing costs associated with annual O&M activities. In order to refine the amount of time required for the active remedial alternatives to achieve RAOs, during remedy implementation additional information regarding groundwater pumping rates and naturally occuring attenuation processes, such as dilution and dispersion, would be used to refine remediation time frames. Active remediation would be employed in the area of hydraulic control until the PRGs for each of the COPCs are attained within the targeted treatment area.

Additionally, because it will take longer than five years to achieve cleanup levels under any of the active alternatives, CERCLA requires that a review of conditions at the Site be conducted no less often than every five years until such time as cleanup levels are achieved. These reviews are not considered part of the remedy; they are an independent requirement required by the Superfund law.

Alternative 1: No Action

Capital Cost:	$0
Total O&M Costs:	$0
Total Present-Worth Cost:	$0
Construction Time:	Not Applicable

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 action conducted at the Site for OU3. This alternative does not include monitoring.

Alternative 2: Groundwater Extraction and Ex-Situ Treatment (Pump & Treat)

Capital Cost:	$51,685,000
Total O&M Costs:	$47,455,000
Total Present-Worth Cost:	$99,140,000
Construction Time:	36 months

This remedial alternative consists of the extraction (pumping) of groundwater from extraction wells and its treatment prior to discharge. Groundwater would be treated to remove contaminant mass from areas of the aquifer with elevated contaminant concentrations, as discussed below.

For the conceptual design, it is estimated that four extraction wells with a combined pumping rate of approximately 450 gallons per minute (gpm) would be installed in the northern portion of OU3, targeting areas of total groundwater contaminant concentrations greater than 1,000 μg/L. In addition, a transect of an estimated five extraction wells with a combined pumping rate of approximately 900 gpm would be installed near the portion of the plume containing total groundwater contaminant concentrations of approximately 100 μg/L to establish hydraulic control and reduce the downgradient migration of contamination. The extracted groundwater from the pumping wells would be conveyed to a groundwater treatment plant for treatment prior to discharge. During the remedial design, pumping tests would be performed to determine capture zones and the exact location and number of extraction wells, pumping rates, and screen locations.

The conceptual design is depicted in Figure 3 of this Proposed Plan and Figure 8-2 in the FS Report. The conceptual design would be refined during the remedial design phase if this alternative is selected.

Alternative 3: Enhanced In-Situ Bioremediation and Pump & Treat

Capital Cost:	$151,582,000
Total O&M Costs:	$51,003,000
Total Present-Worth Cost:	$202,585,000
Construction Time:	54 months

This remedial alternative involves the injection of microorganisms and/or nutrients into the subsurface to create conditions to accelerate the biodegradation of contaminants in groundwater. The end products to this destruction process include carbon dioxide, water, and microbial cell mass. For the conceptual design, it is estimated that approximately 452 permanent injection wells screened at depths ranging from 200 to 500 feet bgs would be installed perpendicular to groundwater flow in the northern portion of OU3 where total groundwater contaminant concentrations are greater than 1,000 μg/L.

During the remedial design, pilot testing and treatability studies would be performed to determine the radius of influence, location, and arrangement of injection wells, the optimal injection material, volumes and composition, and the frequency of injection events.

In addition, a transect of an estimated six extraction wells with a combined pumping rate of approximately 900 gpm would be installed near the portion of the plume containing total groundwater contaminant concentrations of approximately 100 μg/L to establish hydraulic control and reduce the downgradient migration of contamination. The extracted groundwater from the pumping wells would be conveyed to a groundwater treatment plant for treatment prior to discharge.

During the remedial design, pump tests would be performed to estimate capture zones and the exact location and number of extraction wells, pumping rates, and screen intervals.

The conceptual design is depicted in Figure 8-3 in the FS Report. The conceptual design would be refined during the remedial design phase if this alternative is selected.

Alternative 4: In-Situ Chemical Reduction and Pump & Treat

Capital Cost:	$158,113,000
Total O&M Costs:	$39,893,000
Total Present-Worth Cost:	$198,006,000
Construction Time:	54 months

This remedial alternative involves the injection of a solution of oxidizing or reducing agents (usually zero-valent iron (ZVI)) suspended in a microemulsion to chemically convert contaminants in groundwater into less toxic compounds that are more stable, less mobile, and/or inert. The ZVI donates electrons, acting as the reductant in a reaction that removes chlorine atoms from contaminants. For the conceptual design, it is estimated that approximately 452 permanent injection wells screened at depths ranging from 200 to 500 feet bgs would be installed perpendicular to groundwater flow in the northern portion of OU3 where total groundwater contaminant concentrations are greater than 1,000 µg/L.

During the remedial design, pilot testing and treatability studies would be performed to determine the radius of influence, location, and arrangement of injection wells, the optimal injection material and amendments, volumes, and the frequency of injection events.

In addition, a transect of an estimated six extraction wells with a combined pumping rate of approximately 900 gpm would be installed near the portion of the plume containing total groundwater contaminant concentrations of approximately 100 µg/L to establish hydraulic control and reduce the downgradient migration of contamination. The extracted groundwater from the pumping wells would be conveyed to a groundwater treatment plant for treatment prior to discharge.

During the remedial design, pump tests would be performed to estimate capture zones and the exact location and number of extraction wells, pumping rates, and screen intervals. The conceptual design is depicted in Figure 8-4 in the FS Report. The conceptual design would be refined during the remedial design phase if this alternative is selected.

EVALUATION OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria set forth in the NCP, namely, overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements, 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 text box, "Evaluation Criteria for Superfund Remedial Alternatives" 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 more detailed analysis of alternatives can be found in the FS Report.

Overall Protection of Human Health and the Environment

A threshold requirement of CERCLA is that the selected remedial action be protective of human health and the environment. An alternative is protective if it reduces current and potential future risk associated with each exposure pathway at a site to acceptable levels.

Alternative 1 (No Action) does not provide for adequate protection of human health because it does not mitigate potential future risk posed by contaminated groundwater within OU3. Alternatives 2 through 4 include active remedial components that would address groundwater contamination and are intended to restore groundwater quality over the long-term, and therefore Alternatives 2 through 4 are protective of human health and the environment. In the northern portion of OU3 where total groundwater contaminant concentrations are greater than 1,000 µg/L, Alternative 2 relies on the extraction and ex-situ treatment of groundwater to reduce groundwater contaminant concentrations, while Alternatives 3 and 4 rely on biological and chemical processes, respectively, to reduce groundwater contaminant concentrations. In the southern portion of OU3, Alternatives 2 through 4 would rely on the extraction and ex-situ treatment of groundwater near the portion of the plume containing total groundwater contaminant concentrations of approximately 100 µg/L and would also rely on certain natural processes to achieve the cleanup levels for areas outside the area of hydraulic control.

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 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.

Finally, Alternatives 2 through 4 limit exposure to residual contaminants until PRGs are achieved through existing institutional controls, as noted above.

Alternatives 2, 3, and 4 would achieve the RAOs. Alternative 1 (No Action) would not achieve RAOs. Because Alternative 1 is not protective, and this criteria is a threshold criteria, it is eliminated from consideration in this evaluation of the nine criteria.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

EPA and New York State have promulgated MCLs (at 40 CFR Part 141, and 10 NYCRR, Chapter 1, respectively), which are enforceable standards for various drinking water contaminants (chemical-specific ARARs). Chemical-, location-, and action-specific ARARs were identified in the July 2023 FS Report.

The aquifer at OU3 of the Site is classified as Class GA (6 NYCRR 701.18), meaning that it is designated as a potable water supply and is a sole source aquifer. Because area groundwater is a source of drinking water, the MCLs are applicable or relevant and appropriate requirements. The federal MCLs and State standards for OU3 groundwater are identified in Table 3, above. If the standards are not equivalent, compliance with the more stringent standard is required.

Alternative 2 would comply with all chemical-specific ARARs, while Alternatives 3 and 4 may not treat 1,4-dioxane in the northern portion of OU3 where total groundwater contaminant concentrations are greater than 1,000 µg/L. Alternatives 3 and 4 would treat 1,4-dioxane in groundwater near the portion of the plume containing total groundwater contaminant concentrations of approximately 100 µg/L through extraction and ex-situ treatment.

Under all the active treatment alternatives, naturally-occuring attenuation processes would be relied upon to achieve PRGs in areas outside of hydraulic control. Table 3 provides the PRGs for each of the COPCs in groundwater at OU3. Refer to Table 4-1A in the FS Report for information regarding chemical-specific ARARs.

Alternatives 2 through 4 would comply with location-specific ARARs, TBCs or other guidance, such as Federal Emergency Management Agency Executive Order 11988 and NYSDEC Floodplain Management Criteria, in the event any construction activities were to take place within floodplains. Alternatives 2 through 4 would comply with action-specific ARARs, TBCs or other guidance, such as the Clean Water Act and the NYSDEC State Pollution Discharge Elimination System regulations governing discharges of treated water from the treatment plant. Refer to Table 4-1B and Table 4-1C in the FS Report for details.

Long-Term Effectiveness and Permanence

Groundwater extraction and ex-situ treatment under Alternatives 2 through 4 is considered an effective method for addressing groundwater contaminated with the COPCs at this OU. Alternative 2 would provide long-term effectiveness and permanence via the pumping and treatment of contaminated groundwater. Alternatives 3 and 4 would include in-situ treatment processes to treat areas of total groundwater contaminant concentrations greater than 1,000 μg/L, while contaminants not treated in-situ would be extracted for treatment via a pump and treat system near the portion of the plume containing total groundwater contaminant concentrations of approximately 100 μg/L. Alternatives 2 through 4 would provide hydraulic control to minimize migration of the contamination.

All three of the active alternatives rely on a combination of one or more of treatment, naturally-occuring attenuation processes for areas outside of treatment, and institutional controls.

Alternatives 2, 3 and 4 would require routine groundwater quality, performance, and administrative monitoring, and while required independently from the alternatives, CERCLA five-year reviews would also occur. As such, each of these alternatives provides a similar level of long-term effectiveness and permanence.

Potential site impacts from climate change have been assessed, and the future performance of these alternatives are currently not at risk as a result of the effects of climate change in the region and near the Site.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 2 through 4 would reduce the toxicity, mobility, and volume of contaminants at OU3 through treatment of contaminated groundwater. Alternative 2 would provide the greatest reduction in mobility, toxicity, and volume of contaminants through the extraction and treatment of the greatest volume of groundwater of the three alternatives. Alternatives 3 and 4 would reduce the toxicity and volume of contaminants in the northern portion of OU3 via in-situ treatment, but they would rely on natural attenuation processes and ex-situ treatment of downgradient groundwater to reduce the toxicity and volume of 1,4-dioxane. Alternative 2 reduces the mobility of contaminants by creating a gradient for contamination migration towards the extraction wells in the northern as well as the southern portion of OU3. Alternatives 3 and 4 would rely on extraction and ex-situ treatment in only the southern portion of OU3 to reduce mobility of contaminants. This is not the case in the northern portion because the injection of amendments in the northern portion of OU3 does not reduce the mobility of contaminants while the degradation processes are underway.

Short-Term Effectiveness

Alternatives 2 through 4 would be effective in the short-term at controlling the migration of contaminated groundwater and removing contaminants from the aquifer. Remedy-related construction under Alternatives 2 through 4 would include drilling extraction wells, installing underground conveyance piping, constructing one or more treatment plants, and developing discharge locations. Alternatives 3 and 4 would also involve installing an estimated 452 injection wells to a depth of up to 500 feet bgs, and would present the most noise impacts, while Alternative 2 would involve the construction of expansive groundwater conveyance piping networks in residential neighborhoods, resulting in the greatest potential impacts to traffic. Alternatives 2 through 4 present short-term impacts to the local communities, however, these disruptions could be minimized through noise and traffic control plans, as well as community air monitoring during construction to minimize any potential impacts to the community, remediation workers, and the environment.

The potential for remediation workers to have direct contact with the contaminants in the groundwater could also occur when groundwater remediation systems are operating under Alternatives 2 through 4 as groundwater would be extracted to the surface for treatment and could result in increased risks of exposure, ingestion, and inhalation. However, measures could be implemented to mitigate exposure risks through the use of personal protective equipment and standard health and safety practices. Alternatives 2 through 4 include monitoring that would provide the data needed for proper management of the remedial processes and a mechanism to address any potential impacts to the community, remediation workers, and the environment.

Groundwater monitoring and discharge of treated groundwater would have minimal impact on workers responsible for periodic sampling. The estimated time frame required to implement the construction of Alternative 2 is approximately three years. Alternatives 3 and 4 are estimated to take approximately four and a half years to implement (operating the treatment system for all three alternatives is estimated at 30 years).

For cost estimating and planning purposes, EPA estimated in the FS that RAOs would be achieved for the groundwater in Alternatives 2 through 4 in approximately 30 years. The time frame to meet groundwater RAOs in the areas outside of hydraulic control is difficult to predict but is expected to exceed 30 years.

Implementability

The technologies under Alternatives 2 through 4 are established technologies with commercially available equipment and are readily implementable.

Each of the active alternatives involve drilling extraction wells, installing underground piping, and constructing a treatment plant for the extracted groundwater. Given the amount of space required and the limited availability of open space in the densely populated area, limited options are available for the siting of a treatment plant and the discharge of treated effluent.

In addition to these challenges, Alternatives 3 and 4 would require the installation of an estimated 452 permanent injection wells, thereby significantly increasing the construction challenges. Alternatives 3 and 4 would also include follow-up injection events, requiring large-scale mobilizations of equipment and materials. Reconfiguration of the injection well networks because of access constraints could potentially significantly impact the effectiveness of the technology. Given the difficulty of installing hundreds of deep injection wells in a densely populated residential area, Alternatives 3 and 4 are considered less implementable than Alternative 2.

Alternatives 2 through 4 would require routine groundwater quality, performance, and administrative monitoring. Although required independently from the Alternatives, five-year reviews will be conducted. Alternatives 2 through 4 also require periodic O&M of the groundwater treatment plant for the duration of the remediation.

Cost

The estimated capital, O&M, and present worth costs assuming a 7% discount rate over a period of 30 years are presented in Table 4 below and discussed in detail in the FS Report. The cost estimates are based on the best available information. Alternative 1 has no cost because no activities are implemented. The present worth cost for the preferred alternative, Alternative 2, is $99.1 million.

Table 4: Summary of Costs

Alternative	Capital Cost	Total O&M Costs	Present Worth*
1	$0	$0	$0
2	$51,685,000	$47,455,000	$99,140,000
3	$151,582,000	$51,003,000	$202,585,000
4	$158,113,000	$39,893,000	$198,006,000

* 30-year present worth cost calculations includes a 7% discount rate.

State/Support Agency Acceptance

NYSDEC has consulted with NYSDOH and concurs with the preferred alternative.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends, and a Responsiveness Summary will be prepared to address significant comments and be included as a section of the ROD memorializing the selection of any remedy for OU3.

PREFERRED ALTERNATIVE

Based upon an evaluation of the remedial alternatives, EPA, in consultation with NYSDEC, proposes Alternative 2, Groundwater Pump and Treat, as the preferred alternative for OU3.

The preferred alternative has the following key components: (1) extraction of the groundwater via pumping; (2) ex-situ treatment of the extracted groundwater prior to discharge to a new or existing recharge basin, underground infiltration galleries, the sanitary sewer, surface water, and/or reinjection to groundwater; (3) long-term monitoring of groundwater and attenuation processes outside the area of hydraulic control; and (4) institutional controls. The location, number, and pumping rates of the extraction wells, specifications for the treatment plant, and discharge locations would be determined during the remedial design. The extraction well network would be designed with the placement of extraction wells near the northern portion of OU3 where total groundwater contaminant concentrations are greater than 1,000 µg/L. In addition, a transect of an estimated six extraction wells would be installed near the portion of the plume containing total groundwater contaminant concentrations of approximately 100 µg/L to establish hydraulic control and reduce the downgradient migration of contamination. During the remedial design, additional groundwater monitoring wells would be installed, and sampling would be performed to refine the areas with contaminant concentrations greater than 1,000 µg/L and 100 µg/L. Sampling for emergent contaminants, such as PFOA and PFOS, would be performed during the remedial design. The extracted groundwater from the pumping wells would be conveyed to a groundwater treatment plant for treatment prior to discharge. Extraction and ex-situ treatment of contaminated groundwater would continue until the cleanup levels for each of the COPCs are attained within the targeted treatment area.

The preferred alternative includes the following additional elements:

- Implementation of a long-term monitoring program to ensure that groundwater quality improves following implementation of this alternative until clean up levels are achieved, including areas outside of the area of hydraulic control through naturally occurring attenuation processes. The long-term monitoring program would include the installation and sampling of an early-warning monitoring well for the East Meadow water supply well that is located south of Hempstead Turnpike. During the remedial design, the location of the early-warning monitoring well would be determined to ensure sufficient time for the installation of wellhead treatment to address Site-related contamination, if needed.

- Institutional controls that will rely on current groundwater use restrictions in the form of state and local laws. Specifically, Article IV of the Nassau County Public Health Ordinance prohibits the use of private wells where public water systems are available. The Site is serviced by public water systems. In addition, New York State Environmental Conservation Law Section 15-1527 prohibits the installation and use of public drinking water wells in Nassau County without a State permit. To ensure the remedy remains protective, the above State and County well restrictions will be relied upon.

- It is anticipated that a SMP would be developed to provide for the proper O&M of the OU3 remedy post-construction, and it would include plans for long-term groundwater monitoring, confirming institutional controls, periodic reviews, and certifications as applicable.

As part of the remedial design, further evaluation would be conducted to identify potential locations to site the various system components. If it is determined that parkland, such as Eisenhower Park, is needed to construct and/or operate a portion of the system, EPA would coordinate this effort with Nassau County and endeavor to obtain any necessary approvals (e.g., New York State legislature) for the use of parkland for this purpose. As part of this effort, an evaluation would be conducted to evaluate whether some of the treated effluent could be used by the County on a seasonal basis for irrigation purposes at the park.

Alternatives to constructing a centralized treatment plant, such as multiple smaller treatment plants, may be considered during the remedial design. In addition, if sufficient capacity were to exist, consideration could be given to treat a portion of the extracted groundwater at a treatment plant intended for a response action at another operable unit of the Site, such as OU1.

The environmental benefits of the preferred alternative may be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with both EPA Region 2's Clean and Green Energy Policy and NYSDEC's Green Remediation Policy.[1] This would include consideration of green remediation technologies and practices, including GAC regeneration.

The total estimated present-worth cost for the preferred alternative is $99,140,000. This is an engineering cost estimate that is expected to be within the range of plus 50 percent to minus 30 percent of the actual project cost. Further detail on the cost is presented in Appendix A of the FS Report.

While the preferred alternative would ultimately result in reduction of contaminant levels in groundwater such that levels would allow for unlimited use and unrestricted exposure, it is anticipated that it would take longer than five years to achieve these levels. As a result, in accordance with CERCLA, the Site is to be reviewed at least once every five years until cleanup levels are achieved and unrestricted use is permissible.

Basis for the Remedy Preference

EPA is proposing Alternative 2 because of the difficulty in implementing Alternatives 3 and 4 in the densely populated and fully-developed residential setting of the Site. In addition to installing the common components associated with the extraction, treatment, and discharge of contaminated groundwater, Alternatives 3 and 4 would also require securing access to install hundreds of injection wells in the residential neighborhood near the northern portion of OU3. In addition, under Alternatives 3 and 4, multiple injection events are likely to be necessary over time. These activities would cause a significant disturbance to the residential neighborhood. Reconfiguration of the injection well networks because of access constraints could potentially significantly impact the effectiveness of the

[1] See http://www.epa.gov/greenercleanups/epa-region-2-clean-and-green-policy and http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf

technology. Access for the purpose of installing extraction wells and constructing and operating the necessary treatment plant(s) and recharge basin under Alternative 2, though still complicated, is more manageable.

Alternative 2 uses proven technologies that can be more readily implemented than the other alternatives. The treatment components can be optimized to improve the treatment effectiveness or decrease the remedial time frame, if required. Groundwater pump and treat has been demonstrated as an effective remedial approach for contaminant mass removal over the long term. Long-term groundwater monitoring would ensure that RAOs are achieved at OU3 of the Site. The preferred alternative is also considerably less expensive than Alternatives 3 and 4.

Groundwater within the Magothy at the Site generally flows in a south-southwest direction with local variations to the southwest. OU3 is generally downgradient of OU1 and referenced as the far-field area. Individual facilities within the NCIA are considered to be among the sources of groundwater contamination for OU1. Sources of groundwater contamination for OU2 are generally located east of OU1. Response actions for OU1, OU2, and the sources of the contamination at those OUs are not part of this OU3, although the successful completion (i.e., source control or cleanup) of addressing the source area(s) at the upgradient, individual source facilities and the resulting groundwater contamination are anticipated and was assumed in evaluating the potential for attaining the objectives of the preferred alternative for this OU3 ROD.

Based on information currently available, EPA, in conjunction with NYSDEC, believes that Alternative 2, Groundwater Pump and Treat, meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the preferred alternative to satisfy the following statutory requirements of Section 121(b) of CERCLA: (1) the preferred alternative is protective of human health and the environment; (2) it complies with ARARs; (3) it is cost-effective; (4) it utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) it satisfies the preference for treatment as a principal element. With respect to the two modifying criteria of the comparative analysis, state acceptance and community acceptance, NYSDEC concurs with the preferred alternative, and community acceptance will be evaluated upon the close of the public comment period.

Figure 1: Site Location Map

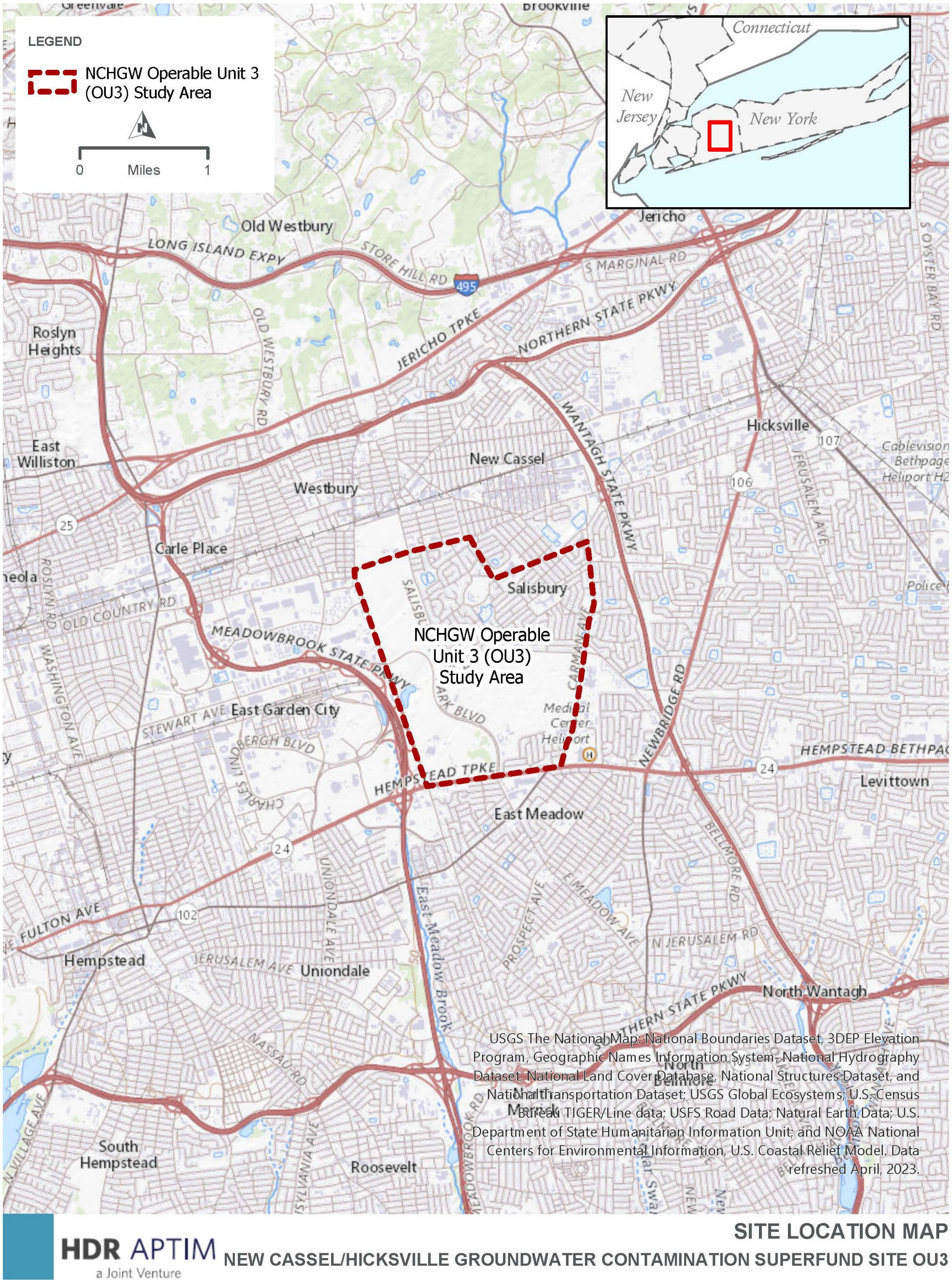

Figure 2: Location of VPBs and Monitoring Wells

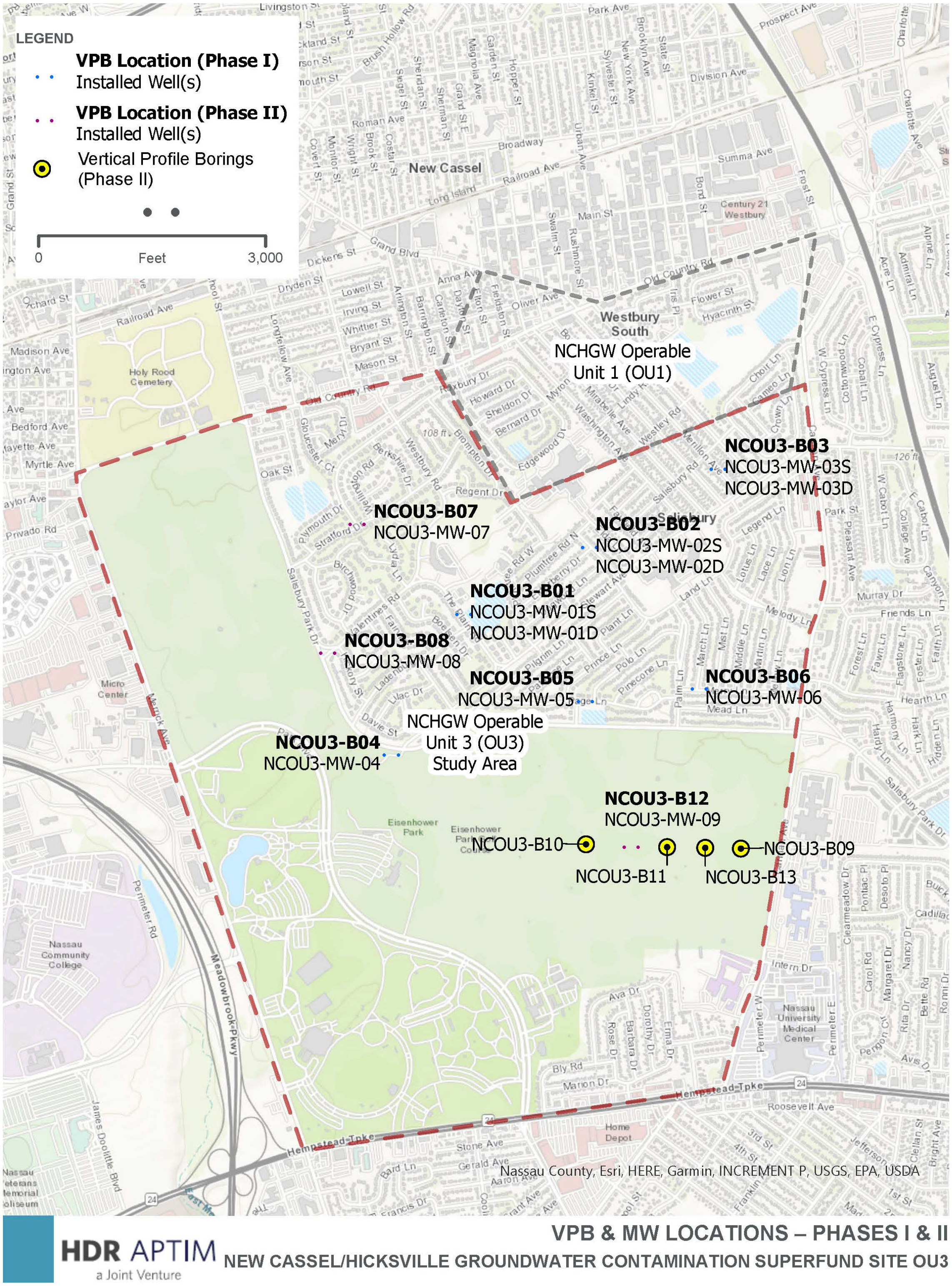

Figure 3: Conceptual Design of Preferred Alternative – Alternative 2 Groundwater Extraction and Ex-Situ Treatment (Pump & Treat)