Peninsula Boulevard Groundwater Plume Superfund Site
Operable Unit 2—Source Delineation
Nassau County, New York

June 2017

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered to address the sources of groundwater contamination at the Peninsula Boulevard Groundwater Plume Superfund Site (Site), referred to herein as Operable Unit 2 (OU2), and it identifies the preferred remedial alternative and provides 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 of 1980, as amended, 42 U.S.C. §117(a) (CERCLA) (also known as Superfund), 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 OU2 at the Site and the remedial alternatives summarized in this Proposed Plan are described in EPA's Remedial Investigation (RI) Report, dated May 2017; EPA's Feasibility Study (FS) Report, dated March 2017; as well as other documents that are contained in the Administrative Record of this action.

The purpose of this Proposed Plan is to inform the public of EPA's preferred remedy and to solicit public comments pertaining to all of the remedial alternatives evaluated, including the preferred remedy. Based on the results of EPA's investigation, EPA has identified two dry cleaners that are sources of the groundwater contamination. The preferred remedy to address one source area (AOC 1) consists of in-situ bioremediation with heat enhanced plume attenuation, long-term monitoring, and institutional controls. The preferred remedy to address the second source area (AOC 2) consists of in-situ bioremediation, long-term monitoring, and institutional controls. (These two areas are defined below).

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
June 15, 2017 – July 17, 2017
EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: June 22, 2017 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 Hewlett Fire House, located at 25 Franklin Avenue, Hewlett, NY.

COMMUNITY ROLE IN SELECTION PROCESS

EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan is available to the public for a public comment period that begins on June 15, 2017 and concludes on July 17, 2017.

A public meeting will be held during the public comment period at the Hewlett Fire House in Hewlett on June 22, 2017 at 7 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 the Responsiveness Summary section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

Written comments on the Proposed Plan should be addressed to:

Gloria M. Sosa
Remedial Project Manager
Western New York Remediation Section
U.S. Environmental Protection Agency
290 Broadway, 20th Floor
New York, New York 10007-1866
telephone: (212) 637-4283
e-mail: sosa.gloria@epa.gov

INFORMATION REPOSITORIES

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

Hewlett-Woodmere Public Library
1125 Broadway
Hewlett, New York 11557-0903
Telephone: (516) 374-1967
Hours of operation:
Mon-Thurs 9 am – 9 pm
Fri 9-6, Sat 9 am – 5 pm, Sun 12:30 pm – 5 pm

USEPA – Region II
Superfund Records Center
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308
Hours: Monday – Friday: 9 am to 5 pm

EPA's website for the Peninsula Boulevard Groundwater Plume Site:
https://www.epa.gov/superfund/peninsula-groundwater

SCOPE AND ROLE OF ACTION

Site remediation activities are sometimes segregated 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. EPA has designated two OUs for the Peninsula Boulevard Groundwater Plume Site. OU1 addresses the cleanup of contaminated groundwater; a remedy for OU1 was selected in 2011. This Proposed Plan concerns OU2, the final planned phase of response activities at the Site, and addresses the sources of the contamination found in the groundwater.

The primary objectives of this action are to remediate the groundwater and soil contamination associated with the sources of the volatile organic contamination (VOC) groundwater plume at the Site, and to minimize the migration of these contaminants.

SITE BACKGROUND

Site Description

The Site consists of the area within and around a groundwater plume located in the Village of Hewlett, Town of Hempstead, Nassau County, New York. John F. Kennedy International Airport is located approximately three miles to the west of the Site. A Site location map is provided as Figure 1.

The area consists of a mix of commercial and residential properties, with the majority of the commercial properties being located along Mill Road, Peninsula Boulevard, Broadway, and West Broadway. Woodmere Middle School is located along the western Site boundary. Portions of Motts Creek, Doxey Brook Drain, and an unnamed tributary leading to Motts Creek are located within the Site.

The residences in the area of the Site are serviced by the New York American Water Company (NYAWC). The NYAWC operates a well field approximately 1,000 feet north of the Site. The water delivered to these residences is a blend of water from several well fields, including the well field north of the Site. Since 1991, NYAWC has been treating groundwater pumped from this well field with an air stripper prior to distribution. Based on a review of water supply well records in the area, private wells are not utilized for drinking water in the area.

Site History

Under NYSDEC oversight, a series of investigations were conducted from 1991 to 1999 at the former Grove Cleaners, located at 1274 Peninsula Boulevard. The investigations revealed an extensive groundwater contaminant plume extending both to the north and south of Peninsula Boulevard, primarily consisting of tetrachloroethylene (PCE) and its breakdown products, including trichloroethylene (TCE). The results of the investigation suggested source areas other than the former Grove Cleaners property were contributing to the groundwater contaminant plume. Following the implementation of interim remedial measures, which consisted of the removal of impacted soils related to solvent discharges to a dry well, a No Further Action remedy was selected by NYSDEC in March 2003, under state authorities, for the former Grove Cleaners facility, and NYSDEC requested that EPA address the area-wide groundwater plume.

On March 7, 2004, EPA proposed the Site for inclusion on the National Priorities List (NPL), and on July 22, 2004, EPA included the Site on the NPL.

As mentioned earlier, the Site is being addressed by EPA in two separate OUs. EPA conducted an RI/FS for OU1 at the Site from 2005 through 2010. The RI identified groundwater contaminated with PCE, PCE breakdown products, and low levels of other VOCs. The source of the PCE groundwater contamination was not able to be identified during the OU1 RI.

EPA issued a ROD for OU1 in September 2011 which called for the extraction and treatment of contaminated groundwater, in-situ chemical treatment in targeted areas, and institutional controls. EPA completed the remedial design for the OU1 remedy in September 2016. Construction of the OU1 remedy has not yet begun.

EPA initiated the RI for OU2 in 2012 with the purpose of identifying the source(s) of the groundwater contamination. The results of the RI are discussed below.

Site Hydrogeology

The Upper Glacial Aquifer (UGA) underlies the Site. Groundwater flow in the UGA is dominated by a groundwater divide located approximately 2,000 feet south of Peninsula Boulevard, along a low ridge trending southwest to northeast. North of the divide, groundwater flow is both north and west, depending upon depth. South of the divide, groundwater flow within the UGA is southward toward Macy Channel.

North of the Site, the UGA overlies the Jameco Aquifer. In this area of Long Island, the Jameco Aquifer is limited in extent, but is an important water-bearing zone because of its high hydraulic conductivity on the order of 200 feet per day. The NYAWC Plant #5 well field adjacent to the Site utilizes the Jameco Aquifer as its source for water production and does not utilize the UGA. Given the similar hydraulic properties of the UGA and Jameco Aquifer, there is the potential for significant hydraulic connection between the two units. However, data obtained as a result of the RI activities indicate that the Gardiners Clay (which separates the UGA from the Jameco Aquifer) acts as a confining unit in the area of the Site.

The inter-bedded nature of sediments in the UGA suggests significant vertical and horizontal variability in hydraulic conductivity values. The “20-foot clay” is a discontinuous, semi-confining layer within the UGA that separates the UGA into an upper and lower zone in some areas of the Site.

The depth to groundwater within the unconfined portion of the UGA ranges from approximately 3 to 15 feet below grade surface (bgs), while ranging from 6 to 17 feet bgs in the semi-confined portion of aquifer. Saturated thickness of the unconfined UGA above the “20-foot clay” layer ranges from 10 to 30 feet. Saturated thickness of the deeper portion of the UGA below the “20-foot clay,” including the pressure head component caused by the semi-confined conditions, is approximately 55 to 65 feet.

RESULTS OF THE REMEDIAL INVESTIGATION

The RI Report, dated May 2017, provides the analytical results of surface soil, subsurface soil, soil gas, and groundwater samples collected from 2012 to 2016 at Cedarwood Cleaners, Mill Road Cleaners, Piermont Cleaners, the former Vogue French Cleaners, and a former vacant lot located at 1255 West Broadway (former Vacant Lot), including adjacent parcels. Sampling was not conducted at the former Grove Cleaners property because previous investigations failed to provide sufficient evidence to conclude it was a source of the groundwater plume.

Sampling activities during this RI were conducted at the Site in phases. In 2012, EPA installed and sampled exterior and sub-slab soil gas monitoring wells and temporary groundwater monitoring wells at Cedarwood Cleaners, Mill Road Cleaners, Piermont Cleaners, and the former Vogue French Cleaners. Based on these findings, in 2013, EPA utilized a Membrane Interface Probe with Hydraulic Profiling Tool (MiHPT) to characterize subsurface geologic/hydrogeologic conditions and survey for the presence of VOCs at Cedarwood Cleaners, Piermont Cleaners, and the former Vogue French Cleaners.

In 2014, EPA conducted soil sampling and groundwater profiling at the Cedarwood Cleaners, Piermont Cleaners, and the former Vogue French Cleaners. Based on the 2014 results, in early 2015, EPA conducted additional soil sampling and groundwater profiling at Cedarwood Cleaners and Piermont Cleaners. In addition, the sampling program was expanded to conduct soil sampling and groundwater profiling at the former Vacant Lot, including adjacent parcels and public right-of-ways in the immediate area.

Using this data, in late 2015 and early 2016, EPA installed permanent groundwater monitoring wells in the area and conducted further soil sampling and two rounds of groundwater sampling from the permanent groundwater monitoring wells.

In June and July of 2016, EPA conducted a transducer study involving certain monitoring wells at Cedarwood Cleaners, Piermont Cleaners, the former Vacant Lot, and a stilling well in the Macy Channel, a nearby inlet of the Great South Bay. A transducer study involves measuring water levels to obtain a better understanding of the direction of groundwater flow.

Data collected by EPA during this period, in addition to aerial imagery and a digital elevation model from the United States Geographical Survey, were used to develop localized, three-dimensional models of the PCE plumes in soil and groundwater at OU2 of the Site. The model also resulted in an estimate of the PCE mass in soil and groundwater for each stratigraphic layer sampled during drilling, profiling, or monitoring activities.

Soil Sampling Results

PCE and TCE were the only VOCs detected in soil at concentrations exceeding the NYSDEC Subpart 375-6 Protection of Groundwater Soil Cleanup Objectives

(SCOs). SCOs for PCE and TCE are 1.3 and .470 milligrams per kilogram (mg/kg), respectively.

Cedarwood Cleaners

Soil sampling revealed subsurface soil contamination at depths up to approximately 80 feet bgs. Maximum concentrations of PCE and TCE were detected in subsurface soil at 1,350 mg/kg and 1.8 mg/kg at depths of 33 feet bgs and 67.5 feet bgs, respectively. In addition, testing revealed the presence of dense non-aqueous phase liquid (DNAPL)[1] in the southern portion of the property at a depth of approximately 35 feet bgs. OIL IN SOIL™ test results and visual observations indicated that DNAPL was present at depths between 33 and 35.5 feet bgs and light non-aqueous phase liquid (LNAPL)[2] was present at depths between 17 and 18 feet bgs.

Former Vacant Lot at 1255 West Broadway, 1245 West Broadway, and Long Island Rail Road Substation (LIRR) Right-of-Way (ROW)

At the former Vacant Lot, soil sampling revealed PCE contamination at a maximum concentration of 118 mg/kg at a depth of 60 feet bgs. At 1245 West Broadway, soil sampling revealed PCE contamination at a maximum concentration of 11,100 mg/kg at a depth of 41.5 feet bgs. Generally, concentrations of TCE at these two properties were detected below 1 mg/kg.

At the LIRR Substation ROW, soil sampling did not reveal significant concentrations of PCE or TCE.

Piermont Cleaners

Soil sampling revealed PCE at a maximum concentration of 2.7 mg/kg at a depth of 35.5 feet bgs. TCE was generally not detected in soil samples from the Piermont Cleaners property.

Former Vogue French Cleaners

PCE and TCE were not detected in soil samples collected at this property.

Mill Road Cleaners

PCE and TCE were not detected in soil samples collected at this property.

Groundwater Sampling Results

Cedarwood Cleaners

Groundwater samples collected from the shallow UGA, “20-foot clay,” and deep UGA between depths of 22 and 71 feet bgs revealed PCE and TCE at concentrations up to 65,000 micrograms per liter (µg/L) and 5,000 µg/L, respectively. Other VOCs detected included: 1,1,2-trichloro-1,2,2-trifluoroethane (150 µg/L); 1,2,3-trichlorobenzene (18 µg/L); benzene (570 µg/L); methylene chloride (2,500 µg/L); and *cis*-1,2-dichloroethene (*cis*-1,2-DCE) (42 µg/L).

Former Vacant Lot at 1255 West Broadway, 1245 West Broadway, and LIRR Substation ROW

Groundwater samples collected from the shallow UGA, 20-foot clay, and deep UGA revealed PCE and TCE concentrations up to 800,000 µg/L and 2,000 µg/L, respectively. Other VOCs detected included: 2- butanone (50 µg/L); benzene (100 µg/L); 1,1-dichloroethene (15 µg/L); *cis*-1,2-DCE (520 µg/L); methyl tert-butyl ether (140 µg/L); and, vinyl chloride (12 µg/L).

Piermont Cleaners

Groundwater samples collected from the shallow UGA, “20-foot clay," and deep UGA revealed PCE and TCE concentrations up to 1,200 µg/L and 21J µg/L, respectively. Other VOCs detected from included: benzene (3.5 µg/L); *cis*-1,2-DCE (51 µg/L); methylene chloride (4,900 µg/L); and vinyl chloride (12 µg/L).

Former Vogue French Cleaners

PCE and TCE were not detected in any of the groundwater samples collected at the former Vogue French Cleaners property. Benzene, ranging from 1.2 µg/L to 3.5 µg/L, was detected in samples collected immediately downgradient of the property.

[1] A dense non-aqueous phase liquid or DNAPL is a liquid that is both denser than water and is immiscible or has low solubility in water.

[2] LNAPL is a groundwater contaminant that is not soluble in water and has lower density than water, in contrast to a DNAPL which has higher density than water. Once a LNAPL infiltrates the ground, it will stop at the height of the water table because the LNAPL is less dense than water.

Jameco Aquifer

As part of the remedial design for OU1, EPA installed three groundwater monitoring wells in the Jameco Aquifer, the aquifer underlying the UGA, to determine whether Site-related contaminants have impacted the Jameco Aquifer. As part of this effort, one well was installed upgradient of the Site, one downgradient of the source areas, and one within the Site. Based on the sampling results, no Site-related VOCs (e.g., PCE and TCE) were detected in the groundwater samples collected from these wells, indicating that the contaminants have not migrated through the Gardiners Clay and into the Jameco Aquifer.

Soil-Gas Sampling Results

Cedarwood Cleaners

PCE was detected in outdoor, or exterior, soil gas samples at Cedarwood Cleaners at concentrations ranging from 22 micrograms per cubic meter ($\mu g/m^3$) to 59,000 $\mu g/m^3$, and TCE was detected at concentrations ranging from undetected, or "non-detect," to a level of 4,500 $\mu g/m^3$. Soil gas samples were also collected from beneath the concrete floor slab of the building. In those sub-slab soil gas samples, PCE was detected at concentrations ranging from 6,820 $\mu g/m^3$ to 5,500,000 $\mu g/m^3$, and TCE was detected at concentrations ranging from 50 $\mu g/m^3$ to 36,000 $\mu g/m^3$. Indoor-air samples were not collected because of the indoor use of PCE at the dry cleaner.

Piermont Cleaners

PCE was detected in exterior soil gas samples at Piermont Cleaners at concentrations of approximately 1,017 $\mu g/m^3$, and TCE was detected at concentrations of approximately 1 $\mu g/m^3$. In the sub-slab soil gas samples, PCE was detected at concentrations ranging from 1 $\mu g/m^3$ to 21 $\mu g/m^3$, and TCE was detected at concentrations up to 2.6 $\mu g/m^3$. Indoor-air samples were not collected because of the indoor use of PCE at the dry cleaner.

Vapor Intrusion

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. As part of the OU1 RI, EPA conducted vapor intrusion sampling at fifteen residences. The results of the analyses indicated that one residence had concentrations of VOCs at or above EPA Region 2 acceptable screening levels for sub slab and indoor air. In 2009, EPA installed a sub-slab depressurization system at this residence, and subsequent sampling has indicated that VOCs were no longer detected in indoor air.

WHAT IS A "PRINCIPAL THREAT?"

The NCP 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) of the NCP). 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 (NAPLs) in groundwater 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.

EPA anticipates conducting vapor intrusion sampling near the two source areas identified during the OU2 RI, pending obtaining permission for access. As indicated in the OU1 ROD, EPA intends to address existing or potential future exposure through inhalation of vapors migrating from contaminated groundwater into buildings at the Site, as determined necessary.

PRINCIPAL THREAT WASTE

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. They include liquids and other highly mobile materials (e.g., solvents) or materials having high concentrations of toxic compounds. No threshold level of toxicity/risk has been established to equate to "principal threat" A detailed explanation of principle threat wastes can be found in the box, "What is a "Principle Threat?'"

EPA's findings to date indicate the presence of principal threat wastes. Results from the investigation showed maximum concentrations of PCE of 1,350 mg/kg in subsurface soil at Cedarwood Cleaners and 11,100 mg/kg at 1245 West Broadway. In addition, the DNAPL at the Cedarwood Cleaners is considered a principal threat waste.

Human Health Risk Assessment

EPA conducted a four-step, baseline human health risk assessment (HHRA) as part of OU1 to assess Site-related cancer risks and noncancer health hazards. The four-step process is comprised of the following: Hazard Identification, Exposure Assessment, Toxicity Assessment, and Risk Characterization (see box on page 7, "What is Risk and How is it Calculated?"). As a result, PCE, TCE, *cis*-1,2-DCE, and vinyl chloride were identified as the primary, Site-related contaminants of concern contributing most significantly to elevated cancer risk and noncancer hazard based on the potential for direct contact exposure to groundwater.

A risk screening evaluation, serving as a streamlined HHRA, was conducted for OU2 to assess the potential for these Site-related contaminants to pose current or future risks to human health and the environment in the absence of any remedial action. Therefore, the chemicals of potential concern (COPCs) evaluated included PCE, TCE, *cis*-1,2-DCE, and vinyl chloride.

For the purposes of conducting the OU2 risk screening, the two source areas were evaluated separately. The area comprised of Cedarwood Cleaners, the former Vacant Lot, 1245 West Broadway, the LIRR Substation, and sections of West Broadway and Hewlett Parkway adjacent to Cedarwood Cleaners is referred to as Area of Concern 1 (AOC 1). Piermont Cleaners is referred to as AOC 2. The current and future land use scenarios assessed within the risk screening evaluation included the following populations and exposure pathways:

- Resident (child and adult): ingestion, dermal contact, and inhalation of soil particles and vapors from surface soils (0-2 feet) and ingestion, dermal contact, and inhalation of tap water (under a future-use scenario where groundwater is an untreated source of tap water);
- Site Worker (adult): ingestion, dermal contact, and inhalation of soil particles and vapors from surface soils; and
- Construction Worker (adult): ingestion, dermal contact and inhalation of soil particles and vapors from both surface and subsurface soil (0-10 feet).

The OU2 risk screening used exposure point concentrations (EPCs) and available risk-based screening levels, i.e., USEPA May 2016 Regional Screening Levels (RSLs) at a target risk of 1 x 10^{-6} and target hazard quotient (HQ) of 1 to calculate facility-specific cancer risks and noncancer HQs. The RSLs incorporate assumptions on potential exposure scenarios and human receptors, along with contaminant-specific toxicological information. The EPCs were estimated using either the maximum detected concentration of a contaminant or the 95% upper-confidence limit (UCL) of the average concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably anticipated to occur at the Site. The RME is intended to estimate a conservative exposure scenario that is still within the range of possible exposures. A more detailed discussion of the exposure pathways can be found in the risk assessment screening of the Site in the information repository.

Summary of the Human Health Risk Assessment

Soil

Risks and hazards were evaluated for current and future exposure to surface and subsurface soil. The populations of interest included adult and child residents and adult Site workers for surface soil and adult construction workers for surface and subsurface soil. The cancer risks for all of the receptor populations evaluated within each AOC were below the acceptable EPA risk range of 1 x 10^{-6} to 1 x 10^{-4} for exposure to OU2 soils. The HI for each receptor population was below the EPA acceptable value of 1, as well.

Table A. Summary of risks and hazards associated with soil.

Receptor	Hazard Index	Cancer Risk
AOC 1		
Resident	0.015	5.0E-08
Site Worker	0.0031	1.2E-08
Construction Worker	0.0026	1.3E-09
AOC 2		
Resident	0.00019	7.8E-10
Site Worker	0.00004	1.3E-10
Construction Worker	0.00018	3.5E-11

Groundwater

Risks and hazards were evaluated for current and future exposure to groundwater for the on-Site child and adult resident only. The cancer risk and noncancer hazard both exceeded the applicable EPA thresholds described above at each AOC. PCE was the primary driver of elevated risk and hazard at AOC 1, although *cis*-1,2-DCE, TCE, and vinyl chloride contributed as well. PCE and vinyl chloride were the primary risk drivers at AOC 2, although only PCE contributed to the elevated hazard.

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

Receptor	Hazard Index	Cancer Risk
AOC 1		
Resident	4,600	1.9E-02
AOC 2		
Resident	18	1.5E-04

Ecological Risk Assessment

EPA conducted a Screening Level Ecological Risk Assessment (SLERA) as part of OU1. The SLERA was conducted to evaluate the potential for ecological effects from exposure to surface water, interstitial water, and/or sediments. In the SLERA, EPA concluded that the risk to potential receptors through either direct contact or ingestion of media containing contaminants was below EPA's acceptable hazard index of 1, indicating that there would be no adverse ecological impacts. Based on the results of the OU2 RI, concentrations of contaminants detected in soil at OU2 of the Site are at depth and, as such, unlikely to pose any unacceptable risks to aquatic or terrestrial ecological receptors.

Conclusion

The results of the risk screening indicate that the contaminated groundwater presents an unacceptable risk to human health at each of the two AOCs. Therefore, 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. It is EPA's current judgment that the preferred remedy identified in this Proposed Plan is necessary to protect human health 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 guidance, and site-specific, risk-based levels.

The following RAOs have been established for contaminated groundwater at OU2:

- Prevent or minimize current and potential future human exposure (via inhalation, ingestion, and dermal contact) to VOCs in-groundwater at

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these 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 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 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 that 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 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 Record of Decision.

concentrations in excess of federal and state standards;

- 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 and state standards; and,
- Minimize the potential for further migration of groundwater containing VOC concentrations greater than federal and State standards.

The preliminary remediation goals (PRGs) for groundwater are identified in Table 1.

Table 1: PRGs for Groundwater

Chemicals of Potential Concern (COPCs)	**NYS Groundwater Quality Standards (µg/L)**	NYS Drinking Water Quality Standards (µg/L)	National Primary Drinking Water Standards (µg/L)
cis-1,2-DCE	**5**	5	70
trans-1,2-DCE	**5**	5	10
TCE	**5**	5	5
PCE	**5**	5	5
Vinyl Chloride	**2**	2	2

Note: PRGs for groundwater are highlighted in bold.

The following RAOs have been established for contaminated soil at OU2:

- Prevent impacts to groundwater resulting from soil contamination with concentrations greater than preliminary remediation goals; and,
- Reduce or eliminate the potential for soils with VOCs exceeding preliminary remediation goals to be a continued source of contamination to the aquifer.

To satisfy these RAOs, PRGs for contaminated soil are identified in Table 2.

Table 2: PRGs for Soil

Chemicals of Potential Concern (COPCs)	**Soil PRGs*(mg/kg)**
cis- 1,2-DCE	0.25
trans-1,2-DCE	0.19
Vinyl Chloride	0.02
TCE	0.47
PCE	1.3

* NYSDEC soil cleanup objectives 6 NYCRR Subpart 375-6.5

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, 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) of CERCLA 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) of CERCLA, 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 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 presented in this Proposed Plan for addressing the contamination in soil and groundwater are provided in the FS, dated March 2017.

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

Remediation Areas

As mentioned previously, the OU2 RI identified two separate source areas, referred to as AOC 1 and AOC 2. AOC 1 consists of Cedarwood Cleaners, the former Vacant Lot, 1245 West Broadway, the LIRR Substation, and sections of West Broadway and Hewlett Parkway adjacent to Cedarwood Cleaners. AOC 2 consists of Piermont Cleaners, which is located within a commercial strip mall at the northeastern intersection of Broadway and Piermont Avenue. Refer to Figures 2 and 3.

Contaminated soil in AOC 1 and AOC 2 is present at depths below the water table, where the pores between soil particles are filled with water. This contaminated soil, often referred to as saturated soil in the OU2 RI/FS, in conjunction with contaminated groundwater is the focus of the remedial alternatives evaluated.

Common Elements

All of the alternatives, with the exception of the no action alternative, include common components. Alternatives 2, 3, 4A, and 4B include long-term monitoring to ensure that the soil and groundwater quality improves following implementation of these alternatives until cleanup levels are achieved. The groundwater sampling would also monitor groundwater quality including degradation by-products generated by the treatment processes and to address the potential migration of vapors resulting from the *in-situ* treatment of contaminants in soil and groundwater. During the remedial design, measures would be evaluated to mitigate potential impacts to nearby properties (such as the installation and operation of vapor recovery wells) from vapors which may be potentially generated by these alternatives.

Alternatives 2, 3, 4A, and 4B also all include the implementation of institutional controls for soil and groundwater use restrictions until RAOs are achieved to ensure the remedy remains protective. Institutional controls for groundwater and soil use may include, as determined to be appropriate, existing governmental controls, such as well permit requirements, and deed restrictions. EPA intends to pursue the creation of environmental easements at the Cedarwood Cleaners and Piermont Cleaners properties and to file such environmental easements in the property records of Nassau County until such time that RAOs are attained.

A site management plan (SMP) will be developed to provide for the proper management of the Site remedy post-construction, such as through the use of institutional controls until RAOs are met, and will also include long-term groundwater monitoring, periodic reviews, and certifications.

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

Alternative 1: No Action

The NCP requires that a “No Action” alternative be developed and considered as a baseline for comparing other remedial alternatives. Under this alternative, there would be no remedial action conducted at the Site. This alternative does not include any monitoring or institutional controls.

As mentioned above, because this alternative would result in contaminants remaining at the Site that are above levels that would otherwise 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
O&M Costs:	$0
Present-Worth Cost:	$0
Construction Time:	Not Applicable

Alternative 2: Air Sparging/Soil Vapor Extraction (AS/SVE); Long-Term Monitoring; Institutional Controls

AOC 1

Capital Cost:	$2,899,086
Total O&M Costs:	$7,211,883
Present-Worth Cost:	$10,492,429
Construction Time:	6 months to 1 year

AOC 2

Capital Cost:	$1,736,759
Total O&M Costs:	$4,422,318
Present-Worth Cost:	$6,399,321
Construction Time:	6 months to 1 year

Under this alternative, an AS/SVE system would be built including the installation of a network of vertical air injection or sparging wells into the saturated zone of the aquifer and a network of vapor extraction wells installed into the unsaturated zone. A stream of air under pressure would be injected into the subsurface via the sparging well, and extraction wells would be used to remove contaminants in the vapor phase. VOCs in the vapor phase would be collected from each vacuum extraction well and pumped to a treatment system that would utilize activated granular carbon.

In-well air stripping can be implemented in different system configurations. For the purposes of developing a conceptual design and cost estimate for comparison with other technologies, the FS estimated the installation of approximately 59 AS wells and 53 SVE wells to remediate groundwater and soil contamination in AOC 1. In AOC 2, the FS estimated the installation of approximately 14 AS wells and 10 SVE wells.

An asphalt cap would also be installed at the former Vacant Lot to improve the effectiveness of the AS/SVE system by minimizing short circuiting of air flow from the ground surface. The entire footprint of Cedarwood Cleaners and Piermont Cleaners are each currently covered with asphalt, concrete pavement, and a concrete slab-on-grade building. This conceptual design would require further evaluation during the remedial design if chosen to be implemented. Additional wells would have to be installed to monitor the progress of the remediation.

Alternative 3: In-Situ Thermal Remediation; Long-Term Monitoring; Institutional Controls

AOC 1

Capital Cost:	$21,632,524
Total O&M Costs:	$18,722,129
Present-Worth Cost:	$41,048,610
Construction Time:	6 months to 1 year

AOC 2	
Capital Cost:	$7,256,345
Total O&M Costs:	$6,015,498
Present-Worth Cost:	$13,548,991
Construction Time:	6 months to 1 year

Under this alternative, an in-situ thermal treatment method, such as Electric Resistivity Heating (ERH), would be employed to treat contaminated groundwater and soil. ERH uses the heat generated by the resistance of the soil matrix to the flow of electrical current between electrodes to raise subsurface temperatures up to 100°C. ERH applies electricity into the ground using heavy cables that connect the power control unit and electrodes. Electricity flows evenly between electrodes within the treatment volume. The water in the subsurface conducts electricity between electrodes. Soil is naturally resistant to the flow of electrical current, thereby heating the soil and groundwater. Heat causes the underground contaminants and water to evaporate, creating in-situ steam and vapor. Contaminated vapor and steam are extracted using vacuum extraction wells, captured and treated above-ground with granular activated carbon.

The conceptual design for AOC 1 estimates that approximately 221 electrodes co-located with 221 vacuum extraction wells would be installed. The conceptual design for AOC 2 estimates the installation of approximately 33 electrodes co-located with 33 vacuum extraction wells.

Each electrode boring would be 12-inches in diameter and installed vertically to a depth of 81 feet bgs. Each vacuum recovery well would be co-located with an electrode and installed to a depth of 10 feet bgs as groundwater is anticipated between 12 and 15 feet bgs. The average distance between electrodes would be approximately 16 feet. At each AOC, the recovery wells would be connected to a blower/treatment system. A temporary building or treatment trailer would be constructed at each AOC to house the treatment equipment. The exact location of the treatment buildings would be determined during the remedial design.

This conceptual design would require further evaluation during the remedial design if chosen to be implemented.

Alternative 4A: In-Situ Bioremediation; Long-Term Monitoring; Institutional Controls

AOC 1	
Capital Cost:	$3,798,403
Total O&M Costs:	$1,783,220
Present-Worth Cost:	$5,866,084
Construction Time:	6 months to 1 year

AOC 2	
Capital Cost:	$1,589,854
Total O&M Costs:	$1,382,456
Present-Worth Cost:	$3,186,371
Construction Time:	6 months to 1 year

Under this alternative, in-situ bioremediation would be implemented to transform VOC contamination into non-toxic compounds. Enhanced anaerobic biodegradation (EAB) involves the injection of an electron donor, nutrients, and/or dechlorinating microorganisms as necessary into the subsurface. Electron donors include lactate, whey, and emulsified vegetable oil (EVO). The electron donors are delivered via injection wells or direct push technology into the subsurface, creating strong reducing conditions where anaerobic biodegradation transforms chlorinated VOCs (CVOCs) through reductive dechlorination into innocuous compounds, such as carbon dioxide, ethene, ethane, and chloride.

The addition of soluble carbon to the subsurface supports the growth of indigenous microbes in groundwater. As bacteria feed on the soluble carbon, they consume dissolved oxygen and other electron acceptors (contaminants), thereby reducing the potential for oxidation reduction, or redox, in groundwater. As bacteria ferment the organic portion of the oil, they release various volatile fatty acids that diffuse and serve as electron donors for other bacteria.

The conceptual design for the implementation of this alternative at AOC 1 consists of a grid of approximately 63 injection wells and a treatment zone from 15 feet bgs to 80 feet bgs. At AOC 2, seven injection wells would be installed along the front of the building, near the area of highest groundwater contamination.

A pilot study would be conducted during the remedial design to determine a suitable, site-specific amendment and to develop site-specific engineering parameters, such as radius of injection, dosage, and frequency of injections.

Alternative 4B: In-Situ Bioremediation with Heat Enhanced Plume Attenuation; Long-Term Monitoring; Institutional Controls

AOC 1	
Capital Cost:	$15,768,864
Total O&M Costs:	$5,332,620
Present Worth Cost:	$21,552,450
Construction Timeframe:	6 months to 1 year

The alternative uses a hybrid approach, combining the EAB treatment described under Alternative 4A with heat enhancement. Under this approach, the injection of the bioremediation amendment would be followed by gently heating the saturated soil and groundwater with Heat

Enhanced Plume Attenuation (HEPA) to approximately 40°C to enhance the bioremediation rates in the subsurface.

At AOC 1, it is estimated that in addition to the installation of 63 injection wells for the delivery of the amendment, approximately 91 electrodes, 12 inches in diameter, would also be installed vertically to a depth of approximately 81 feet bgs to heat the soil and groundwater. The average distance between electrodes would be approximately 25 feet and would be connected to the power supply present in the area. No such HEPA process would be used regarding AOC 2 because the contaminant levels are not as high as AOC 1.

A pilot study would be conducted during the remedial design to determine a suitable, site-specific amendment and to evaluate the effectiveness of heat enhancement. Site-specific engineering parameters, such as radius of influence, operating temperatures, dosage, and frequency of injections would also be developed.

EVALUATION OF ALTERNATIVES

In evaluating the remedial alternatives, each alternative is assessed against nine evaluation criteria set forth in federal regulation, 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 this page for a more detailed description of these evaluation criteria. This section of the Proposed Plan evaluates 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 EPA’s FS Report, dated March 2017.

Overall Protection of Human Health and the Environment

Alternative 1 (No Action) would not meet RAOs and would not be protective of human health and the environment since no action would be taken. Alternatives 2, 3, 4A, and 4B are active remedies that address soil and groundwater contamination and would restore groundwater quality over the long-term. Protectiveness under Alternatives 2, 3, 4A, and 4B requires a combination of actively reducing contaminant concentrations and limiting exposure to residual contaminants through institutional controls until RAOs are met.

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.

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.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

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

The aquifer at the Site is classified as Class GA (6 NYCRR § 701.18), meaning that it is designated as a potable drinking water supply. As groundwater within OU2 is a source of drinking water, achieving MCLs in the groundwater is an ARAR.

EPA has identified NYSDEC's unrestricted use soil cleanup objectives (6 NYCRR § 375-6.3(b)) as an ARAR, a "to-be considered," or other guidance to address contaminated soil at the Site. Refer to Table 2 for the preliminary remediation goals for soils.

Alternative 1 would not comply with ARARs for soil and groundwater. Action-specific ARARs do not apply to this alternative since no remedial action would be conducted.

Under Alternatives 2, 3, 4A, and 4B, it is intended that ARARs would be achieved. Alternatives 2, 3, 4A, and 4B would meet RAOs through the active treatment of source material that would eliminate the exposure pathways to human receptors. Implementation of in-situ treatment processes are expected to significantly reduce contaminant concentrations within the saturated treatment area. Concentrations of contaminants outside the active treatment area would gradually reduce to meet PRGs through natural processes in the long-term. Alternatives 2, 3, 4A, and 4B would meet the action-specific ARARs by following the health and safety regulations and waste handling and disposal regulations, as applicable.

Alternatives 2, 4A, and 4B are expected to achieve RAOs in 30 years, compared to 3 years for Alternative 3. Under Alternative 4A, RAOs would not be achieved in a reasonable timeframe in AOC 1 due to the presence of elevated contaminant concentrations and silty-clay layers.

There are no location-specific ARARs associated with OU2.

Long-Term Effectiveness and Permanence

Alternative 1 does not provide long-term effectiveness or permanence as no active remedial measures are proposed. Alternatives 2, 3, 4A, and 4B are considered effective technologies for treatment and/or containment of contaminated soil and groundwater, if designed and constructed properly.

Alternatives 2, 3, 4A, and 4B rely on a combination of treatment and institutional controls. Institutional controls for groundwater and soil use in AOC 1 and AOC 2 may include, as determined to be appropriate, existing governmental controls, such as well permit requirements, and deed restrictions. EPA intends to pursue the creation of environmental easements at the Cedarwood Cleaners and Piermont Cleaners properties and to file such environmental easements in the property records of Nassau County until such time that RAOs are attained.

Alternative 2, AS/SVE, may be effective in removing VOC contamination in saturated soil and groundwater. However, the effectiveness of this technology in areas with clay/silty soils may be limited. The effectiveness of Alternative 2 is limited in scope to the extraction of contaminants in the saturated zone. Alternative 4A would be more reliable than Alternative 2 since bioremediation has been proven effective in OU1 pre-design investigations. Alternative 4B allows for a combination of bioremediation and heat enhancement to target and treat areas containing VOC contamination at elevated concentrations that are sorbed to the silty clay.

Alternative 3 is expected to be more effective and reliable in significantly removing VOC contamination in saturated soil and groundwater because the high temperatures used in in-situ thermal remediation significantly enhance soil vapor extraction. Among Alternatives 2, 3, 4A, and 4B, it is anticipated that Alternative 3, using in-situ thermal remediation, would provide the highest mass reduction of soil and groundwater contamination in the shortest period of time, followed by Alternative 4B using bioremediation and HEPA (not applicable for AOC 2). Alternative 4A, using bioremediation alone, would enhance degradation of contaminants, but we estimated that it would require a longer remedial timeframe.

As mentioned previously, the effectiveness of each of these technologies is contingent upon the proper design, including the installation of infrastructure such as electrodes, injection wells, extraction wells, and vacuum extraction wells in the most appropriate locations to treat the contamination. Because the areas requiring remediation are located in a densely populated urban area with little or no available space for construction, adjustments that could impact the effectiveness of the technology may need to be taken into consideration. Among the alternatives, the challenges posed by the densely populated area to the effectiveness of the technology are greatest for Alternative 3 and would require further evaluation during the remedial design.

Alternatives 2, 3, 4A, and 4B would provide adequate control of risk to human health through the implementation of institutional controls until PRGs are achieved.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 1 would not provide any reduction of toxicity, mobility, or volume of contaminants because no remedial action would be conducted, and the alternative does not include long-term monitoring of soil or groundwater conditions.

Alternatives 2, 3, 4A, and 4B would reduce the toxicity, mobility, and volume of contaminants through treatment of soil and groundwater.

Alternative 3, using in-situ thermal remediation, is anticipated to be the most reliable mass reduction technology since the high temperatures achieved in the subsurface volatilize the contaminants, including those sorbed to the silty clay.

Alternative 4B, using in-situ bioremediation and HEPA, provides the next most reliable means of mass reduction because heating the subsurface to approximately 40°C enhances the bioremediation rates in silty soils.

Alternative 4A, using in- situ bioremediation, provides the next best mass removal technology. The treatability study conducted as part of the remedial design for OU1 demonstrated significant reduction of contaminant concentrations within the treatment area using LactOil®, an emulsified vegetable oil, as the bioremediation amendment. Since the subsurface would not be heated under this alternative, bioremediation rates would not be enhanced.

Alternative 2, using AS/SVE system, would be the least reliable mass reduction technology because of the limitations of this technology in clay/silty soils.

Short-Term Effectiveness

Alternative 1 would not have short-term impacts since no action would be implemented.

Alternatives 2, 3, 4A, and 4B would have significant short-term impacts on remediation workers and the public during implementation.

Based on the extent of contamination present at AOC 1, the presence of contamination beneath West Broadway, and the challenges of implementing a remedy in a densely populated urban area with little or no available space for construction, Alternatives 2, 3, 4A, and 4B would have a significant negative impact on certain local businesses, privately owned properties, and transportation infrastructure. The implementation of any of these alternatives would specifically impact the property and business operation of Cedarwood Cleaners, as well as the privately owned former Vacant Lot across the street. Implementation of these alternatives would require, at a minimum, the total suspension of commercial operations at the Cedarwood Cleaners property, with the associated, resulting loss of income and employment at this small business for a period of six months or more. Injection and/or treatment wells would have to be installed under the Cedarwood Cleaners facility, which may lead to the creation of VOC vapors that could possibly accumulate inside the building. Although measures would be implemented to mitigate the potential impact of VOC vapors that may be released to other nearby properties, these measures would be insufficient to guard against the potential VOC vapor releases to the Cedarwood Cleaners facility. Because of the significantly higher temperatures employed, Alternative 3 has the potential to produce more vapors than Alternatives 2, 4A and 4B and would require significant vapor management.

Until recently, the former Vacant Lot property was operated as a parking lot. The owner of the former Vacant Lot property obtained a building permit from the local municipality and has begun construction of a new structure on the property. Under Alternatives 2, 3, 4A, and 4B, injection and/or treatment wells would have to be installed at the former Vacant Lot property, which may lead to the creation of VOC vapors. In addition, Alternative 3 generates heat during the treatment process. Depending on the proximity to the new structure, the potential exists for the generation of heat close to the building floor and, therefore occupancy may not be permitted during active treatment. Depending on the use of the property at the time of the implementation of any of the active alternatives (2, 3, 4A, or 4B), a temporary shutdown of commercial operations or other long-term prohibitions at the former Vacant Lot property may be necessary. During the remedial design, measures would be evaluated to minimize disruptions to operations at the property.

At Piermont Cleaners, which is part of an active strip mall with multiple other businesses, it is anticipated that Alternative 2, 3, and 4A would be implemented without significant disruption to Piermont Cleaners or the other businesses located in the strip mall. To the extent practicable, construction activities would be performed during weekends or after hours, and injection and/or treatment wells could be installed near the front and potentially the rear of the building, rather than inside. However, under Alternative 3 heat would likely be generated close to the building floor during the treatment process, therefore tenants would not be permitted to occupy Piermont Cleaners and the immediately adjacent businesses during active treatment. During the remedial design, measures would be evaluated to minimize disruptions to the businesses.

The implementation of any of Alternatives 2, 3, 4A, or 4B regarding AOC 1 would require street closings (full and partial) for extended periods. Efforts could be taken to minimize traffic disruption, such as the development during remedial design of a traffic plan to re-route the traffic through alternate streets. Coordination and access would be required from the municipality and County and/or New York State Department of Transportation for work that requires any road-closures.

The possibility of exposure of workers, the surrounding community, and the local environment to contaminants during the implementation of Alternatives 2, 3, 4A, and 4B is present, but minimal. VOC vapors may be generated by the remedial activities. Alternative 3 would produce more vapors than the other alternatives because higher temperatures would be generated in the aquifer. Extraction wells could be used to collect vapors generated in the subsurface thereby minimizing the impact of vapors to adjacent parcels.

Drilling activities, including the installation of monitoring, extraction, and injection wells, could produce contaminated liquids that present some risk to remediation workers at OU2 of the Site. However, measures would be implemented to mitigate exposure risks, including the installation of fencing to restrict access to above-grade treatment components.

Alternatives 2, 3, 4A, and 4B 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. Risk from exposure to contaminated saturated soil and groundwater during any construction activities would require management through occupational health and safety controls.

The implementation timeframe required for Alternative 2 is estimated to be 10 years. For Alternative 3, the implementation timeframe is estimated to be 18 months. For Alternative 4A, a timeframe of 10 years is estimated. The time estimated for Alternative 4B is estimated to be 20 years.

Implementability

All the alternatives are implementable. Alternative 1 would be easiest both technically and administratively to implement as there are no activities to implement. Alternatives 2, 3, 4A, and 4B are all implementable, although each present significant challenges.

Alternatives 2, 3, 4A, and 4B would be technically implementable since services, materials, and experienced vendors would be readily available. Pilot studies would be necessary during the design phase to obtain site-specific design parameters for Alternatives 2, 3, 4A, and 4B.

Although technically implementable, Alternatives 2, 3, 4A and 4B would have a notable impact on certain local businesses, privately owned properties, transportation infrastructure, and other operations in the vicinity of the Site. They will require traffic re-routing and management in the vicinity of West Broadway and the Hewlett Parkway because the installation of injection and extraction wells would impact adjacent areas because of the limited space. The alternatives would also impose onerous restrictions on the operations of Cedarwood Cleaners, as discussed above. As for the former Vacant Lot, the property owner of the former Vacant Lot has obtained a building permit from the local municipality and has begun construction of a structure on the property. Implementation of Alternatives 2, 3, 4A, and 4B would be adversely affected by these construction activities.

The use of in-situ thermal remediation under Alternative 3 is a well-established technology to address the elevated levels of contamination in the clay/silty layers, followed by Alternative 4B, using in-situ bioremediation via HEPA, and then Alternative 4A, using in-situ bioremediation. As mentioned previously, significant contamination reduction was observed during the treatability study conducted as part of the remedial design for OU1. The limitations of AS/SVE in clay/silty layers and concentrations of contaminants in the source area, make the successful implementation of Alternative 2 less likely than the other alternatives. Although technically implementable, the densely populated area, with little or no available space for construction, poses significant implementability challenges for each of the active alternatives. These challenges, which are discussed above, are greatest under Alternative 3, followed by Alternative 4B, and then Alternatives 4A and 2.

Cost

The estimated capital cost, operation and maintenance (O&M), and present worth cost are discussed in detail in the OU2 FS. The cost estimates are based on the best available information. Alternative 1 (No Action) has no cost because no activities would be implemented. The present worth cost for Alternatives 2, 3, 4A and 4B are provided below. The estimated capital, O&M, and present-worth cost for each of the alternatives are as follows:

Alternative	Capital Cost ($)	Total O&M Cost ($)	Present Worth ($)
1	0	0	0
2 AOC 1	2,899,086	7,211,883	10,492,429
2 AOC 2	1,736,759	4,422,318	6,399,321
3 AOC 1	21,632,524	18,722,129	41,048,610
3 AOC 2	7,256,345	6,015,498	13,548,991
4A AOC 1	3,798,403	1,783,220	5,866,084
4A AOC 2	1,589,854	1,38 2,456	3,186,371
4B AOC 1	15,768,864	5,332,620	21,552,450

State/Support Agency Acceptance

NYSDEC, in consultation with NYSDOH, concurs with the preferred alternative.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and all comments are reviewed. Comments received during the public comment period will be addressed in the Responsiveness Summary section of the ROD for this OU. The ROD is the document that formalizes the selection of the remedy for an OU.

PREFERRED REMEDY

Based upon an evaluation of the remedial alternatives, EPA, with the concurrence of NYSDEC, proposes a combination of Alternatives 4A and 4B. EPA proposes Alternative 4B to address AOC 1, namely through in-situ bioremediation with heat enhanced plume attenuation, long-term monitoring, and institutional controls, and Alternative 4A to address AOC 2, namely through in-situ bioremediation, long-term monitoring, and institutional controls as the preferred remedial alternative for OU2.

Alternative 4A has the following key components: the in-situ treatment of contaminated groundwater and soil through anaerobic bioremediation at AOC 2, long-term monitoring, implementation of institutional controls, and development of a SMP.

As described above, under Alternative 4A, electron donors, nutrients, and/or dechlorinating microorganisms would be injected into the subsurface at AOC 2. Electron donors include lactate, whey, and emulsified vegetable oil. The electron donors are delivered via injection wells or direct push technology into the subsurface, creating strong reducing conditions where anaerobic biodegradation transforms CVOCs through reductive dechlorination into innocuous compounds, such as carbon dioxide, ethene, ethane, and chloride.

The addition of soluble carbon to the subsurface supports the growth of indigenous microbes in groundwater. As bacteria feed on the soluble carbon, they consume dissolved oxygen and other electron acceptors (contaminants), thereby reducing the redox potential in groundwater. As bacteria ferment the organic portion of the oil, they release various volatile fatty acids that diffuse and serve as electron donors for other bacteria. A pilot study would be conducted during the remedial design to determine a suitable site-specific amendment and to develop site-specific engineering parameters, such as radius of injection, dosage, and frequency of injections.

A long-term groundwater monitoring program would be implemented to track and monitor changes in soil and groundwater contamination in OU2 to ensure the RAOs are attained. The results from the long-term monitoring program would be used to evaluate the migration and changes in VOC contaminants over time.

Institutional controls to ensure that the remedy remains protective until RAOs are achieved are incorporated into this proposed alternative for protection of human health over the long term. A plan would be developed that would specify institutional controls to ensure that the proposed alternative is protective. Institutional controls for groundwater and soil use may include, as determined to be appropriate, existing governmental controls, such as well permit requirements, and deed restrictions. EPA intends to pursue the creation of environmental easements at the Cedarwood Cleaners and Piermont Cleaners properties and to file such environmental easements in the property records of Nassau County until such time that RAOs are attained.

An SMP would be developed to provide for the proper management of the Site remedy for OU2 post-construction, such as the use of institutional controls until RAOs are met, and will also include long-term groundwater monitoring and certifications.

The major components of the preferred remedy for AOC 1 are the same as those identified for AOC 2 above, but also include the heating of contaminated soil and groundwater with ERH to approximately 40°C to increase the bioremediation rates (Alternative 4B). Alternative 4B has the following key components: the in-situ treatment of contaminated groundwater and saturated soil through in-situ anaerobic bioremediation with heat enhancement, long-term monitoring, implementation of institutional controls, and development of an SMP.

Pilot studies would be conducted during the remedial design to develop site-specific engineering parameters.

The environmental benefits of the preferred remedial alternative 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[3]. This would include consideration of green remediation technologies and practices, including GAC regeneration.

The total estimated, present-worth cost for the selected remedy is $24,738,821. Further detail of the cost is present in Appendix A of the FS Report. 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.

While this alternative would ultimately result in reduction of contaminant levels in groundwater and saturated soil 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 performance standards are achieved and unrestricted use is permissible.

Basis for the Remedy Preference

While Alternative 2, AS/SVE, and Alternative 3, in-situ thermal remediation, are both proven technologies to actively remediate VOC-contaminated groundwater and saturated soils, Site-specific considerations at OU2 of this Site present impediments that make these alternatives less suitable for addressing Site soil and groundwater than the proposed use of Alternative 4A for AOC 2 and Alternative 4B for AOC 1.

Under Alternative 2, the presence of fine grained clay/silt layers is expected to affect the performance of the AS/SVE system by limiting the migration of air and thereby limiting the effectiveness of air delivery and vapor recovery. Extracted vapor could be trapped within the remediation area depending on the continuity of the clay/silt layer.

Although in-situ thermal remediation under Alternative 3 would be effective in removing the contamination in the fine grained clay/silt layer, controlling vapors generated during implementation of this technology is expected to be challenging and the vapors would have the potential to migrate and impact the surrounding community.

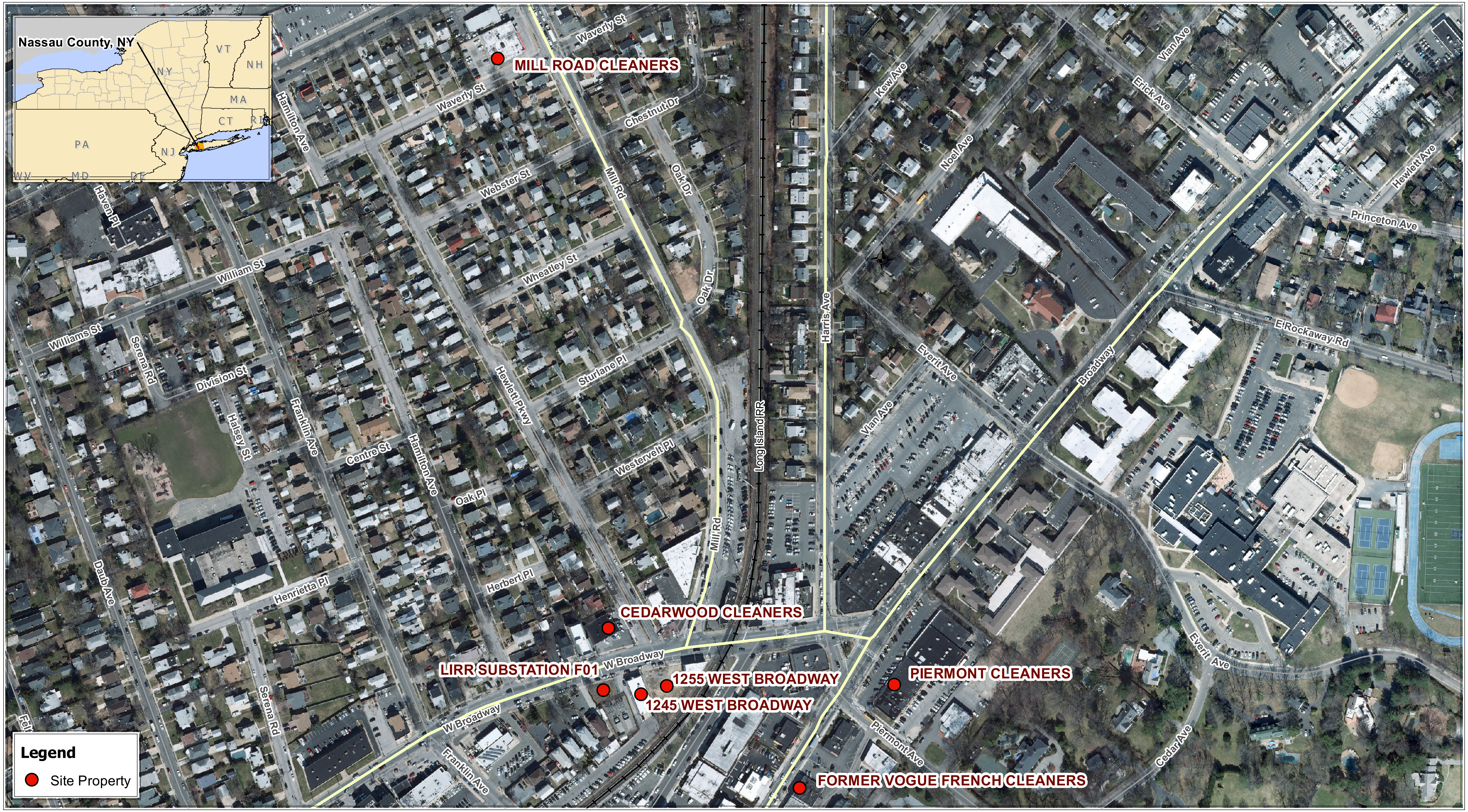
Utilizing heat enhancement in AOC 1 increases bioremediation rates thereby increasing the effectiveness for in-situ anaerobic bioremediation to remove elevated concentrations of VOC-contamination in the saturated soils.

These are among the reasons why EPA is proposing a combination of Alternative 4A for AOC 2 and Alternative 4B for AOC 1. The proposed remedy will result in substantial risk reduction by treating the heavily contaminated sources constituting principal threat wastes at the Site.

Furthermore, treatability studies conducted for OU1 at the Site have demonstrated the effectiveness of treating elevated concentrations of VOCs in groundwater by injecting amendments to treat the groundwater.

Based upon the information currently available, EPA believes the aspects of the preferred alternatives best meet the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing criteria. EPA expects the preferred alternative to satisfy the following statutory requirements of Section 121(b) of CERCLA: 1) the proposed remedy 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. Long-term monitoring would be performed to assure the protectiveness of the remedy. 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.

[3] 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



Map created using 2010 orthoimagery data from NY state.

Map Creation Date: 04 April 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

240 0 240
Feet

Figure 1: Map
Peninsula Boulevard Site
Hewlett, NY

Area of Concern 1

Area of Concern 2

Figure 2: Area of Concern 1 (AOC 1) and Area of Concern 2 (AOC 2)

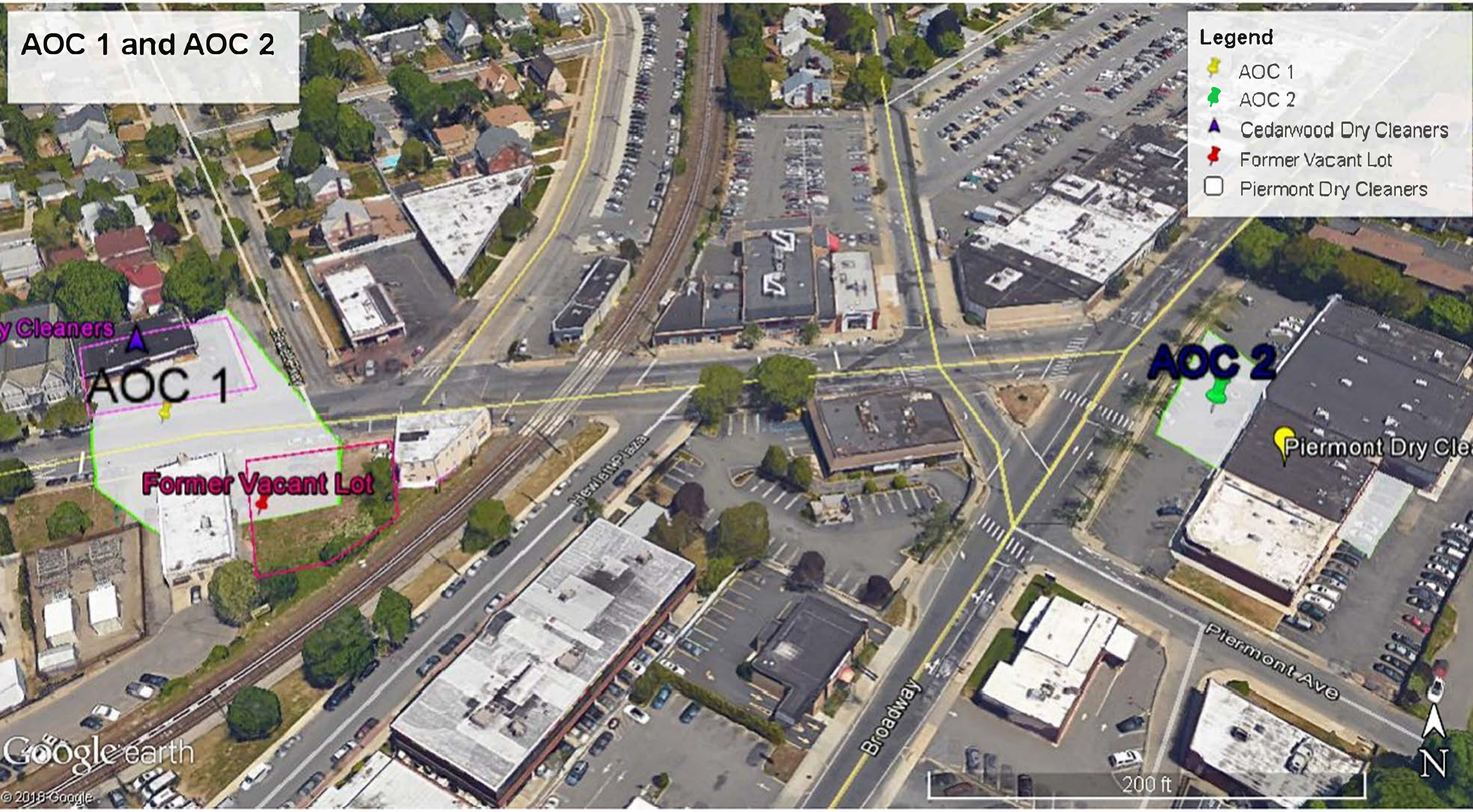


Figure 3: AOC 1 and AOC 2