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Riverside Industrial Park Superfund Site

Newark, New Jersey

Superfund Proposed Plan *July 2020*

PURPOSE OF THE PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered for the Riverside Industrial Park Superfund Site (Site or Riverside Industrial Park), identifies EPA's Preferred Alternative for this Site, and provides the basis for this preference. This Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA) in consultation with the New Jersey Department of Environmental Protection (NJDEP). EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The nature and extent of the contamination at the Site and the remedial alternatives summarized in this Proposed Plan are described in the April 2020 Remedial Investigation (RI) report and July 2020 Feasibility Study (FS) report, respectively, both of which are available in the administrative record file. EPA and NJDEP encourage the public to review these documents to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site.

This Proposed Plan is being provided to inform the public of EPA's Preferred Alternative and to solicit public comments pertaining to all the remedial alternatives evaluated, including the Preferred Alternative. The Preferred Alternative consists of the following alternatives: Waste Alternative 2 – Removal and Off-Site Disposal; Sewer Water Alternative 2 – Removal and Off-Site Disposal; Soil Gas Alternative 2 – Institutional Controls,[1] Air Monitoring or Engineering Controls (in existing occupied buildings), and Site-Wide Engineering Controls (for future buildings); Soil/Fill Alternative 4 – Institutional Controls, Engineering Controls, Focused Removal with Off-Site Disposal of Lead, and Non-Aqueous Phase Liquid (NAPL)[2] Removal; and Groundwater Alternative 4 – Institutional Controls, Pump and Treat, and Targeted Periodic In-Situ Remediation.

MARK YOUR CALENDAR

July 22, 2020 – August 21, 2020: Public comment period related to this Proposed Plan.

August 5, 2020 at 7:00 P.M.: Virtual Public meeting. One may find meeting-participation details using the following link: www.epa.gov/superfund/riverside-industrial

Alternately, one may participate by telephone using the following conference line number: (315) 565-0493, Code ID: 304001388#. Please register in advance of the virtual meeting by accessing: https://epa-riverside-proposed-plan.eventbrite.com or emailing Shereen Kandil, Community Involvement Coordinator, at: Kandil.Shereen@epa.gov or calling her at (212) 637-4333.

Anyone interested in receiving materials for the public meeting in hard copy should either email or call Shereen Kandil with such a request by Thursday, July 30.

The Administrative Record (supporting documentation) for the site is available at:
www.epa.gov/superfund/riverside-industrial

And at the following information repository:

USEPA-Region 2
Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
212-637-4308

EPA, in consultation with NJDEP, may modify the Preferred Alternative or select another alternative presented in this Proposed Plan based on new information, additional data, or public comments. Therefore, EPA is soliciting public comment on all the alternatives considered in the Proposed Plan and in the detailed analysis section of the FS report. The final decision regarding the selected remedy will be

[1] Institutional controls are non-engineered controls, such as property or groundwater use restrictions, placed on real property by recorded instrument (such as deed notices) or by a governmental body by law or regulatory activity for reducing or eliminating the potential for human exposure to contamination and/or protecting the integrity of a remedy.

[2] NAPLs are liquid contaminants that do not easily mix with water and remain in a separate phase in the subsurface. They can potentially migrate independently of groundwater and remain as a residual source of groundwater or soil contamination.

made after EPA has reviewed and considered all information submitted during the public comment period.

COMMUNITY ROLE IN SELECTION PROCESS

EPA and NJDEP rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, the RI and FS reports and other related information in the administrative record file, and this Proposed Plan, have been made available to the public for a public comment period that begins on **July 22, 2020** and concludes on **August 21, 2020**.

A virtual public meeting will be held during the public comment period at https://epa-riverside-proposed-plan.eventbrite.com on **August 5, 2020** at 7:00 p.m. to present the conclusions of the RI/FS, explain the Proposed Plan and the alternatives presented in the FS, and to receive public comments.

Oral and written comments received at the public meeting, as well as written comments received during the public comment period, will be summarized and responded to by EPA 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:

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SITE BACKGROUND

Site Description

The Site is currently a 7.6-acre partially active industrial park known as the Riverside Industrial Park located in the North Ward community of the City of Newark, Essex County, New Jersey. PPG Industries, Inc. (PPG) and its predecessors occupied the Site and conducted paint and varnish manufacturing operations there from approximately 1902 until 1971. After 1971, the Site was subdivided into 15 parcels/lots, and is now identified as the Riverside Industrial Park. Both Riverside Avenue and McCarter Highway border the Site to the west along with a segment of railroad track adjacent to McCarter Highway. Currently, the central and northern portions of the Site contain active industrial/commercial businesses, operating in buildings formerly operated by PPG for paint manufacturing, while the south side of the Site contains mostly vacant, former PPG buildings. The main entryway is through a vehicle access point on Riverside Avenue; however, pedestrian trespassing occurs regularly through unsecured portions of the Riverside Industrial Park. Much of the Riverside Industrial Park surface area is covered by buildings or pavement. The Passaic River and its tidal mudflat border the Site on the east side. Sections of steel, concrete, and wooden bulkhead provide a retaining wall along most of the Site adjacent to the Passaic River; however, the bulkhead has fallen into disrepair in some locations and several sections of the wooden bulkhead have collapsed.

There are 14 existing buildings at the Site with five of the buildings being vacant (Buildings #6, #7, #12, #15, and #17) (Figure 1). At the time of the remedial investigation, Buildings #1, #2, #3, #9, #10, #13, #14, and #16 had ongoing business operations, and a small garage building (Building #19) was used for storage by the occupant of Building #13. Remnants of Buildings #4 and #5 are present at the Site; a fire in 1982 caused significant damage and resulted in the buildings being partially demolished.

Site History

The majority of the Site was reclaimed from the Passaic River with imported fill between 1892 to 1909. The origin of the fill material is unknown, but it consists mainly of sands, silts, gravel, and man-made materials, such as brick, glass, concrete block, wood, and cinders. The fill material may have been contaminated prior to placement at the Site and was further impacted by accidental spills, illegal dumping, improper handling of raw materials, and improper waste handling/disposal from subsequent industrial and commercial activities conducted at the Site.

PPG manufactured paint, varnish, linseed oil, and resins at the Site from approximately 1902 until 1971. The original paint plant was constructed in the early 1900s by the Patton Paint Company, which merged into the Paint and Varnish Division of Pittsburgh Plate Glass Company in 1920, which has been known as PPG since 1968. PPG mixed resins, solvents, and metal pigments (including lead-based compounds) to produce paints. Varnishes were made from resins, oils, and solvents.

Following the closure of PPG's operations in 1971, the property was subdivided into 15 lots, and since that time a wide variety of industrial and manufacturing companies have operated intermittently at the Site under various owners. Occupants and operations have included the following:

- Frey Industries, Inc./Jobar for warehousing, packaging, repackaging, and distribution of client-owned chemicals
- Baron Blakeslee, Inc. for product distribution, warehousing of a variety of chemical products, analysis of various chemical blends and waste samples, drum storage, and truck and tanker parking
- Universal International Industries for various manufacturing operations
- Samax Enterprises for chemical manufacturing
- HABA International, Inc./Davion Inc. for manufacturing nail polish remover and related products, and Acupak, Inc. for providing packaging services for HABA
- Roloc Film Processing for manufacturing foils utilized in various commercial products
- Gilbert Tire Corporation for storing used tires and wheel rims
- Chemical Compounds, Inc./Celcor Associates, LLC for manufacturing hair dyes and other personal hygiene products
- Teluca for packaging and distributing hair dyes, hair color, and related ingredients, hair dye research laboratory, offices, and warehousing
- Gloss Tex Industries, Inc. for manufacturing bulk nail enamel, lacquer, and related cosmetic products
- Ardmore, Inc. for manufacturing soaps and detergents, and storing their empty drums
- Monaco RR Construction Company for storing railroad rails, cross ties, and spikes
- Federal Refining Company for recycling metal
- Midwest Construction Company for storing and maintaining construction equipment and materials

Historic site operations, accidental spills, illegal dumping, improper handling of raw materials, and/or improper waste disposal are among the causes of the current soil and groundwater contamination at the Site.

In 2009, EPA and NJDEP responded to an oil spill that was discharging from a pipe into the Passaic River. The pipe was traced back to two basement tanks located in a vacant building on Lot 63 (Building # 7). Since the tanks contained several hazardous substances, EPA initiated an emergency removal action to stop the discharge and remove the source material. Further EPA investigations of Lots 63 and 64 led to the discovery of several 12,000-15,000 gallon underground storage tanks (USTs) adjacent to Building #7, numerous 3,000-10,000 gallon aboveground storage tanks (ASTs), an underlain concrete basement/impoundment, a number of 55-gallon drums, and pigment hoppers and other smaller containers in Buildings #7 and #12. Between 2011 and 2014, EPA performed a removal action to address these conditions on Lots 63 and 64. EPA's Removal Action activities included: removal of the liquids from the basements of Buildings #7 and #12; investigation of the USTs with removal of two of them; investigation and disposal of the ASTs, drums, and smaller containers; and soil, groundwater, and waste sampling.

In 2014, after the conclusion of the EPA's Removal Action, PPG signed an Administrative Settlement Agreement and Order on Consent (ASAOC) with EPA to complete the RI/FS for the Site. The RI was completed in April 2020 and the FS was completed in July 2020. The RI and FS and other related information in the administrative record file provide the basis for this Proposed Plan.

Prior to the start of the RI in 2017, at least seven lots at the Site were subject to Industrial Site Recovery Act (ISRA) remediation under New Jersey state law. The ISRA investigations resulted in institutional controls on these properties with either modified deed notices for engineering controls (such as pavement surface cover) or groundwater Classification Exception Areas (CEAs)/Well Restriction Areas (WRAs) to restrict use of contaminated groundwater. RI sampling was conducted site-wide and was not restricted by these State institutional controls.

SCOPE AND ROLE OF ACTION

Site remediation activities are sometimes segregated into different phases, or Operable Units (OUs), so that remediation of different aspects of a site can proceed separately. The entire Site is designated as OU1, and it is expected to be the only OU for the Site. This Proposed Plan describes EPA's preferred remedial action for OU1, which addresses contaminated soil, soil gas, sewer water, and groundwater present at the Site. This Preferred Alternative also addresses various wastes found across the Site. It is expected to be the final action for the Site.

SITE HYDROGEOLOGY

The majority of the Site was reclaimed from the Passaic River with imported fill. The fill is up to 15 feet (ft) thick and primarily consists of sands mixed with silts. Beneath the fill is the former riverbed, which is primarily silt.

Underlying deposits include glacial deposits of gravel and sand, followed by lake deposits consisting of silts, and ultimately bedrock.

Two groundwater units were investigated during the RI. The "shallow unit" represented groundwater at depths less than 12 ft below ground surface (bgs) in the fill material whereas the "deep unit" represented groundwater below the former riverbed at approximately 25 ft bgs.

The primary groundwater flow direction in both the shallow and deep units is east toward the Passaic River. Both the shallow and deep groundwater units at the Site are influenced by tidal changes, which are greatest in areas adjacent to the river. The tidal influence appears to be greater in the northern portion of the Site compared to the southern portion.

RESULTS OF THE REMEDIAL INVESTIGATION

The RI was conducted in two phases of work from 2017 through 2019. Soil, shallow and deep groundwater, indoor air, water and solids in sewer lines, sump pumps, bulkhead pipes, and miscellaneous abandoned containers were all sampled to define the nature and extent of contamination at the Site. Based on the results of the RI, EPA identified several concerns and organized them into the five categories of media below:

- Wastes. This medium includes light non-aqueous phase liquid (LNAPL)[3] in Building #15A, USTs containing LNAPL and an aqueous solution on Lot 64, the NAPL-impacted soil/fill material surrounding the USTs, and several containers of waste in abandoned buildings.
- Sewer Water. This medium includes water and solids with elevated concentrations of chlorinated organic chemicals in an inactive manhole.
- Soil Gas. The concentrations of volatile organic compounds (VOCs) in the soil/fill material may impact the quality of indoor air due to vapor intrusion.
- Soil/Fill. This medium was found to be impacted by several contaminants. These generally included metals, polychlorinated biphenyls (PCBs), VOCs, and semi-volatile organic compounds (SVOCs).
- Groundwater. This medium was also found to be impacted by several contaminants, which generally include metals, VOCs, and SVOCs.

EPA is also working in conjunction with NJDEP to address unregulated discharges to the Passaic River from a pipe along the bulkhead on Lot 57. See discussion on Lot 57 below for more information.

Each of the media mentioned above are discussed in more detail in the following sections of this Proposed Plan. Due to the extensive number of contaminants found at the Site, the following discussion focuses only on the most prominent contaminants in each medium. Furthermore, contaminants not discussed in this Proposed Plan are typically co-located with those that are discussed. Additional information can be found in the RI Report.

Waste

The primary focus of this medium is the LNAPL in Building #15A, the USTs containing LNAPL and an aqueous solution on Lot 64, the NAPL-impacted soil/fill material surrounding the USTs, and several wastes in abandoned buildings. There are a limited number and small volume of waste containers found in Buildings #7, #12, and #17. These containers were not associated with current operations, and the contents are not characterized as hazardous wastes for disposal purposes under the Resource Conservation and Recovery Act (RCRA). However, based on RI sampling, there are some constituents within the wastes that are hazardous, such as, chromium or lead and there is potential for contaminants to be released into the environment. Within Building #7, a white chalky talc-looking substance remains in an approximately 5-foot diameter hopper. The top of the hopper is accessible from the second floor, and the chalky contents are visible approximately 5 feet below the top. The estimated volume of solid waste in the hopper is approximately 11 cubic yards (CY). In Building #12, a plastic 55-gallon drum contains approximately 50 gallons of liquid waste. In Building #17, a five-gallon bucket labeled as a filler contains a solid waste.

Six USTs were identified in a tank field north of Building #12 on Lot 64. One UST was found to contain 1,600 gallons of LNAPL, which was characterized as diesel/heating oil. Approximately 3,500 CY of NAPL-impacted soil/fill material is surrounding the USTs. All six USTs contained liquid that was sampled, and the results found that none of the UST liquid was classified as a hazardous waste for disposal purposes under RCRA. Each tank measured approximately 30 ft long by 8 ft in diameter, and they contained a combined volume of 34,700 gallons of liquid. While the liquid is considered

[3] LNAPLs is a type of NAPL where liquid contaminants do not easily mix with water and they are less dense than water. This means that LNAPL is generally found at the top of the water table.

non-hazardous for waste disposal, the liquid contains primarily VOCs and chlorinated VOCs. The same VOCs found in the USTs were also reported in nearby groundwater wells. The tank contents are a potential source of soil and groundwater contamination.

A portion of Building #15A also contains LNAPL in pooled water under a steel grated floor. The LNAPL is approximately 0.5-foot to 0.65-foot thick and very viscous. Assuming that the grate and liquid underlies the entire floor area (approximately 650 square ft), and assuming an average thickness of 0.6-ft, the volume of LNAPL in Building #15A is estimated at 2,900 gallons. Based on RI laboratory results, the LNAPL is characterized as diesel fuel/heating oil.

Sewer Water

The RI included an investigation of the sewer system at the Site, which involved collecting samples from manholes across the Site. Sampling results for water and solids collected from an inactive manhole on Lot 1 (identified in the RI as Manhole #8) found methylene chloride and trichloroethylene (TCE). The sewer at this location was determined to be inactive based on observations of no flow and because there are no current users upstream of the location. Although there is currently no flow within the sewer lines on the Site, there is potential for contaminants to be released into the environment. Other portions of the sewer system on the Site were not identified as potential sources of contamination to groundwater or soil/fill.

Soil Gas

Following the initial two rounds of groundwater sampling, the shallow groundwater results were screened against NJDEP vapor intrusion screening levels (VISLs). This comparison suggested that vapor intrusion may be a potential exposure risk. Since a potential risk was found, indoor air sampling was conducted in 2019 within occupied buildings of the Site (Buildings #1, #2, #3, #9, #10, #14, and #16). Additionally, three exterior ambient air samples were collected to determine potential background concentrations near the occupied buildings. Some VOCs were found in indoor air samples, but it was determined that they did not pose unacceptable risk to occupants of the currently occupied buildings. However, based on modeling using soil and groundwater data, an unacceptable risk may be posed to occupants in future buildings. The risk drivers were naphthalene, TCE, and total xylenes in soil/fill material.

Soil/Fill

A significant sampling regime was conducted to analyze the nature and extent of contamination in soil/fill material. Over 100 soil borings and a total of 210 soil samples were collected across the Site.

The RI identified a NAPL-impacted soil/fill material in several soil borings east and south of the USTs on Lot 64. Isolated areas of NAPL-impacted soil/fill material were also observed in the soil/fill material during the drilling of a monitoring well on Lot 63. However, monitoring wells in this area of the Site did not have a measurable thickness of LNAPL in the groundwater. The sources of the NAPL-impacted soil/fill material on Lots 63 and 64 are likely releases from the USTs or illegal dumping.

Of all the contamination at this Site, lead is one of the primary contaminants of concern. A significant amount of lead contamination was found in soil/fill material on Lots 63 and 64 around Building #7. Elevated lead (at concentrations that exceeded the NJDEP Non-Residential Direct Contact Soil Remediation Standard (NRDCSRS) of 800 mg/kg) was also found on Lots 1, 57, 58, 61, 65, 67, 68, 69, and 70. Copper and arsenic were also metals identified as a concern in the RI, and they were found to be primarily co-located with lead in soil on Lot 63.

The VOCs that were identified at the Site include benzene, naphthalene, vinyl chloride, TCE and total xylenes. The highest chlorinated VOC soil sampling results were from Lot 68, where a chlorinated solvent release is known to have occurred, and on Lot 64, adjacent to the USTs. Benzene, naphthalene, and vinyl chloride concentrations exceeded NJDEP NRDCSRS on Lots 62, 64, and 68. Note that naphthalene may be reported as a VOC or SVOC.

SVOCs of concern at the Site are a group of chemicals known as polycyclic aromatic hydrocarbons (PAHs). Benzo(a)pyrene was the most prevalent PAH across the Site, with concentrations exceeding the NJDEP NRDCSRS of 2 mg/kg on Lots 1, 57, 60, 61, 62, 63, 64, 66, 67, and 69. The other three PAH compounds of concern (including benzo[a]anthracene, benzo[b]fluoranthene, and dibenzo[a,h]anthracene) had elevated concentrations that exceeded the NJDEP NRDCSRS on Lot 63 adjacent to known NAPL-impacted soil and on Lot 67.

PCB concentrations exceeded the NJDEP NRDCSRS of 1 mg/kg on Lots 57, 64, 65, 67, and 70.

Groundwater

The RI characterized the nature and extent of groundwater contamination beneath the Site. To conduct this characterization, 31 monitoring wells were installed to sample the shallow groundwater unit (also referred to as the shallow fill unit) and five monitoring wells were installed to sample the deep groundwater unit. Note that groundwater characterization was done site-wide and not by lot as was done with the soil characterization, but lot numbers or building numbers were used to help identify the location of the contamination and the sources.

At this Site, groundwater is designated by NJDEP as a Class IIA aquifer, which means that this groundwater may be a source of potable water (e.g., drinking water). However, the groundwater is not currently used for potable water and is not reasonably expected to be used as a potable source in the future because the Site and surrounding area are served by the City of Newark's potable water system, and the site-specific conductivity readings of the groundwater indicate possible brackish conditions.

Shallow Groundwater Unit

Several VOCs were detected throughout the shallow groundwater unit (also known as the shallow fill unit) at levels that exceeded the NJDEP Class IIA standards. Benzene, toluene, ethylbenzene, and total xylenes (also known as BTEX) were the most common VOCs detected in the shallow groundwater unit and are indicative of petroleum impacts to the groundwater. BTEX was primarily found in the UST area on Lot 64, extending east/southeast onto Lot 63 downgradient of the UST area. It was also found in a well adjacent to Building #15 on Lot 58. Chlorinated VOCs (including methylene chloride, tetrachloroethylene (PCE), TCE, and vinyl chloride) were primarily detected in monitoring wells on Lots 63 and 64 surrounding the USTs. The source of these chlorinated VOCs is likely the UST, which also contain elevated levels of chlorinated VOCs.

SVOC (including 1,4-dioxane) and PAH compounds (including 2-methylnaphthalene, benzo[a]anthracene, benzo[b]fluoranthene, and indeno(1,2,3-cd)pyrene) were also present in the shallow groundwater unit at concentrations that exceed the NJDEP Class IIA standards. The PAH compounds were primarily detected in groundwater monitoring wells located within the vicinity of NAPL-impacted soils and where BTEX was also detected. 1,4-Dioxane exceedances were wide-spread across the Site, primarily focused on the eastern side of the Site.

Lead in groundwater was generally located in two areas: one area is on Lots 63 and 64, and the second area is north of Building #1 along the eastern and northern property boundaries. Lead concentrations in the shallow groundwater unit exceeded NJDEP Class IIA standards in wells located on Lots 57, 60, 61, 63, 64, 66, and 67.

As previously mentioned, while NAPL-impacted soil/fill material was observed in the UST area of Lot 64, measurable LNAPL was not observed in a shallow monitoring well. Furthermore, no dense non-aqueous phase liquid (DNAPL) was observed in the RI monitoring wells.

Deep Groundwater Unit

The deep groundwater unit had five sampling wells, with two wells in the northern portion of the Site and three in the southern portion.

Fewer VOCs were detected in the deep groundwater relative to the shallow groundwater unit. Benzene, PCE, 1,1,2,2-tetrachloroethane, and 1,1,2-trichloroethane (TCA) were the most common VOCs detected in the deep groundwater. These VOCs exceeded NJDEP Class IIA standards on Lot 63 and Lot 64, and on Lot 58 near Building #15.

For SVOCs, benzo[a]anthracene and 1,4-dioxane concentrations in the deep groundwater exceeded NJDEP groundwater standards on Lot 63 and Lot 64, and on Lot 57 near Building #10.

Lead and PCBs were not identified as a concern in the deep groundwater in the RI. LNAPL was not observed in any deep monitoring wells.

Lot 57: Discharge to the River

The RI identified two issues on Lot 57: 1) a river wall sewer pipe coming out of the bulkhead was found to be discharging elevated toluene and acetone concentrations to the river; and 2) elevated concentrations of acetone were found in the groundwater adjacent to the building. EPA determined that both issues are associated with ongoing operations at Lot 57 and is coordinating with NJDEP to resolve these issues. The Lot 57 sewer pipe, and the releases to the river from this waste line, are not being addressed as part of this proposed remedy, because there is no known impact on the Site from the sewer line. Further, it is EPA's current understanding that the cleanup of acetone in groundwater at Lot 57 is being conducted under NJDEP cleanup authorities, with work being overseen by a New Jersey Licensed Site Remediation Professional (LSRP). The NJDEP assigned case number for this remediation is 20-04-09-0923-04.

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

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

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

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

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health hazards, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals can cause 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 $1x10^{-4}$ 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 $1x10^{-4}$ to $1x10^{-6}$, corresponding to a one in ten thousand to a one in a million-excess cancer risk. For non-cancer health effects, a "hazard index" (HI) is calculated. The key concept for a non-cancer HI is that a threshold (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site and are referred to as COCs in the ROD.

PRINCIPAL THREATS

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP 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 groundwater, surface water, or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, LNAPLs 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. For this Site, LNAPL in the UST on Lot 64, LNAPL in Building #15A, and the NAPL-impacted soil/fill on Lot 63 and Lot 64 are considered to constitute a principal threat waste due to their mobility and potential impact to groundwater.

SITE RISKS

A baseline human health risk assessment (BHHRA) was conducted to evaluate cancer risk and noncancer health hazards posed by exposure to Site-related contaminants. The BHHRA was conducted in the absence of remedial actions or controls (see the "What is Human Health Risk and How is it Calculated?" textbox).

A screening-level ecological risk assessment (SLERA) was also conducted to evaluate the potential for adverse ecological effects from exposure to Site-related contamination (see the "What is Ecological Risk and How is it Calculated?" textbox, below). The BHHRA and SLERA results are discussed below.

The waste material and sewer water material were not evaluated in the BHHRA or SLERA. However, a remedial action is being identified in this Proposed Plan to address these media to remove a principal threat waste and to prevent an unacceptable release of hazardous contaminants to the environment.

Baseline Human Health Risk Assessment

EPA follows a four-step human health risk assessment process for assessing site-related cancer risks and noncancer health hazards. The four-step process is comprised of: Hazard Identification, Exposure Assessment, Toxicity Assessment, and Risk Characterization (see adjoining box "What is Risk and How is it Calculated" for more details on the risk assessment process).

The BHHRA began with selecting COPCs in the various media that could potentially cause adverse effects from exposure. COPCs were selected by comparing the maximum detected concentration of each chemical with a risk-based screening level for the specific medium. COPCs were identified for each of the 15 Lots; seven occupied (Lots 1, 57, 59, 60, 62, 69, and 70) and eight vacant (Lots 58, 61, 63, 64, 65, 66, 67 and 68). Due to the variety of COPCs evaluated in the BHHRA the following discussion only focuses on the contaminants that resulted in unacceptable cancer risk or noncancer hazard. For additional information please see the BHHRA.

Based on current zoning and future land use assumptions, the following current and future receptor populations and routes of exposure were considered for the various lots:

Outdoor workers are present at occupied Lots 1, 57, 59, 60, 62, 69, and 70. These receptors have the highest potential outdoor exposures, assuming they spend most of the workday outdoors conducting maintenance activities where they may be exposed to COPCs in surface soil (0 to 2 ft. bgs). Potential routes of exposure to surface soil include incidental ingestion, dermal contact, and inhalation of airborne soil particulates. Inhalation exposure of volatile COPCs released from surface and subsurface soils is also possible.

Indoor workers at occupied Lots 1, 57, 59, 60, 62, 69, and 70 spend most of the work day indoors and may be exposed via inhalation of volatile COPCs in subsurface soil (i.e., 0 ft. bgs to approximately 13 ft. bgs) and shallow groundwater due to vapor intrusion. Indoor worker exposures also include incidental ingestion and dermal contact with outdoor surface soil that has been incorporated into indoor dust.

Utility workers occasionally perform repair of underground utilities at the Site and are potentially present at occupied or unoccupied lots. The depth of underground utilities (i.e., the surface of the frost line) is typically 4 ft. These receptors are not employees at the Site, and may be on-site occasionally to repair underground utilities resulting in exposures to surface and subsurface soil (0 to 4 ft. bgs) and shallow groundwater during subsurface excavation. Potential routes of exposure include incidental ingestion, dermal contact, and inhalation of soil or groundwater vapors and airborne soil particulates.

Construction workers may be exposed at Lots 57, 58, 61, 63, 64, 68, and 70 during future development. Construction workers may be on-site for relatively short periods (up to several months) to perform building construction. These receptors may contact surface and subsurface soil and shallow groundwater during subsurface excavation. Potential routes of exposure include incidental ingestion, dermal contact, and inhalation of soil or groundwater vapors and airborne soil particulates.

Trespassers are potentially present at occupied or unoccupied lots. Adolescents/teenagers (10 to 18 years) are the most likely age group to trespass on the Site. These receptors may contact COPCs in surface soil in unpaved areas. Potential routes of exposure to surface soil include incidental ingestion, dermal contact, and inhalation of airborne soil particulates. Inhalation exposure to volatile COPCs from surface and subsurface soils is also possible while trespassers are outdoors. Adult trespasser exposures to soil were evaluated using outdoor worker exposures.

Visitors may potentially be present at the occupied lots. Child and adult visitors are on-site for short time periods during which they may contact COPCs in surface soil in unpaved areas via incidental ingestion, dermal contact, and inhalation of airborne soil particulates. Inhalation exposure to volatile COPCs from surface and subsurface soil is also possible while outdoors. Visitors may also be exposed to volatile COPCs in subsurface soil and shallow groundwater due to vapor intrusion.

Off-site workers may potentially be exposed to COPCs in on-site surface soil that migrates off-site via windblown soil vapor and particulates or on-site groundwater that might migrate off-site in the future in the small area in the northwestern corner of the Site. Off-site worker exposures were evaluated using on-site worker exposures. No site-related contamination (soil or groundwater) is known to extend off-site.

Off-site residents may be exposed to COPCs in on-site surface soil that migrates off-site via windblown soil vapor and particulates emanating from on-site areas without groundcover. The potential for this exposure is expected to be minimal for off-site residents located across McCarter Highway, which is elevated and uphill from the Site. Off-site residential exposures were evaluated using on-site future residential exposures. No site-related contamination (soil or groundwater) is known to extend off-site.

Hypothetical future resident exposure assumes medium-density residential units and hypothetical future potable use scenarios for shallow and deep groundwater. Exposure to volatile COPCs in shallow groundwater via vapor intrusion was also assessed.

For COPCs other than lead, exposure point concentrations (EPCs) were estimated using either the maximum detected concentration or the 95% upper-confidence limit (UCL) on the average concentration. Chronic daily intakes were calculated based on 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.

Lead Exposure Evaluation Process

It is not possible to evaluate health hazards from lead exposure using the same methodology as for the other COPCs because there are no published quantitative toxicity values for lead. However, since the toxicokinetics (i.e., the absorption, distribution, metabolism, and excretion of toxins in the body) of lead are well understood, lead risks are assessed based on blood lead (PbB) level, which can be correlated with both exposure and adverse health effects. Consequently, lead hazards were evaluated using blood lead models, which predict PbB levels based on the total lead intake from various environmental media. Lead hazards for non-resident adults (e.g., outdoors workers, construction workers) were assessed using the EPA Adult Lead Model (ALM). The target receptor for this model is an adult female of child-bearing age in order to protect a developing fetus. Lead hazards for children were evaluated using the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK model). Both models estimate a central tendency (geometric mean) PbB level on the basis of average or typical exposure parameter values. Therefore, the EPCs for lead were the arithmetic mean of all the samples within the exposure area from the appropriate depth interval.

The BHHRA included an evaluation of potential cancer risks and noncancer hazards based on the chemical-specific recommendations found in literature on the chemical toxicity (e.g., EPA's Integrated Risk Information System Chemical File). Section 6.2 of the BHHRA summarizes the results of the assessments for cancer risks, noncancer hazards, and exposure to lead.

Human Health Risk Assessment Findings by Exposure Route:

Current Land Use (Section 6.2.1 of the BHHRA). Average soil lead EPCs are greater than the EPA Region 2 nonresidential screening level of 800 mg/kg at currently occupied Lot 70 and unoccupied Lot 63. The estimated portion of the fetal PbB distribution exceeding the goal of protection of no more than 5% of the population with PbBs greater than 5 ug/dL (micrograms/deciliter) is identified for outdoor workers at Lot 70, construction workers at Lots 61, 63, 64, 68, and 70, and trespassers at Lots 63 and 70. For visitors, the estimated portion of the child PbB distribution exceeding the goal of protection of no more than 5% of the population with PbBs greater than 5 ug/dl is identified for child visitors at Lots 1, 62, and 70.

Cancer risks and noncancer hazards are within or less than the NCP risk range of 10^{-4} to 10^{-6} (cancer risk of one in ten thousand to one in a million) and below the goal of protection of a hazard index (HI) = 1, respectively.

Future Commercial/Industrial Land Use (Section 6.2.2 of the BHHRA). For exposures to COPCs in soil and groundwater, the cumulative cancer risk estimates are below or within NCP risk range.

The noncancer HIs above the goal of protection of a HI = 1 are:

- *Indoor worker* exposure to soil via vapor intrusion at Lot 58 (HI = 4 for TCE and xylenes), Lot 62 (HI = 3 for naphthalene), Lot 64 (HI = 2 for benzene and xylenes), and Lot 68 (HI = 5 for TCE)

- *Child visitor* outdoor exposure to soil at Lot 63 (HI = 3 for copper and single-chemical HI = 2 for copper)

Soil lead EPCs are greater than the EPA Region 2 nonresidential screening level of 800 mg/kg at Lots 63 and 70. The estimated portion of the fetal PbB exceeding 5 ug/dL is greater than 5% for future outdoor workers and trespassers at Lots 63 and 70, future indoor workers at Lot 63, and future construction workers at Lots 61, 62, 63, 64, 65, 68, and 70. For future visitors, the estimated portion of the child visitor's PbB exceeding the 5 ug/dL level is greater than 5% for child visitors at Lots 1, 62, 63, 64, 65, 68, and 70.

These results remain the same for the scenario in which soil below the 0 to 2 ft. depth interval (or 0 to 4 ft. depth interval for future utility worker) is brought to the surface in the future, except for the lead hot spot analysis. A hot spot analysis identified three locations on Lot 64 (8,690 mg/kg at 1 to 3 ft. bgs, 3,080 mg/kg at 3 to 4 ft bgs. and 3,020 mg/kg at 5 to 7 ft. bgs), which are adjacent to Lot 63) that could affect the conclusions of the risk assessment for future outdoor worker exposure to lead in soil if subsurface soil is brought to the surface.

Hypothetical Future Residential Land Use and Potable Groundwater Use (Section 6.2.2.9 of the BHHRA). A hypothetical future residential land use scenario assuming medium-density residential units was evaluated. Additionally, future hypothetical potable use of the shallow and deep groundwater was evaluated for on- and off-site workers, visitors and residents.

For outdoor exposures to surface soil, the cancer risks for the future resident exceed the NCP risk range for Lot 67 (2×10^{-4} for the future adult/child resident). For the future adult resident, the HI = 2 for Lot 63 and for the future child resident, HIs ranged from 2 to 20 for all lots except Lot 59 (HI = 1).

For soil below the 0 to 2 ft. depth interval brought to the surface, cancer risks are within or at the upper end of NCP risk range for the adult/child resident for all lots. For the adult resident, the HI = 2 for Lot 63. For the child resident, the HIs are above 1 for all properties except Lot 59, ranging from 2 to 20. COPCs with single-chemical cancer risks above the NCP risk range or HIs above the protection goal of HI = 1 are arsenic, benzene, TCE, PAHs, PCBs, and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD).

For the 0 to 2 ft. interval, the soil lead EPCs are above the USEPA Region 2 residential screening level of 200 mg/kg at each property except Lots 60 and 66. For the scenario in which subsurface soil is moved to the surface during future site redevelopment, the soil lead EPCs exceed the USEPA Region 2 residential screening level of 200 mg/kg at each property except Lots 59 and 60. For the future child resident the estimated portion of the child's PbB exceeding the 5 ug/dL level is greater than 5% for soil from the 0 to 2 ft. interval at all properties except Lots 60 and 66 and for soil from all sampled depths at all properties except Lots 59 and 60.

For soil vapor intrusion exposures, cancer risks for future residents are above the NCP risk range for Lots 1, 57, 62, 64, 67, 68, and 70. HIs for both adult and child residents are above the protection goal of HI = 1 for every property except for Lots 59 and 69. For shallow groundwater vapor intrusion exposures, HIs above the goal of protection of HI = 1 were found at Lots 58 and 59 due to xylenes, using the maximum concentrations as the EPCs.

Cancer risks and HIs for future potable use of the shallow and deep groundwater are above NCP risk range and protection goal of HI = 1 for all lots. Section 6.2.2.9 of the BHHRA indicates that the COPCs with the highest single-chemical cancer risks above the NCP risk range are 1,3-dichloropropene (total), 1,2-dibromo-3-chloropropane, benzene, vinyl chloride, pentachlorophenol, benzo[a]pyrene, dibenz[a,h]anthracene, naphthalene, and arsenic. The COPCs with the highest single chemical HI values are TCE, 1,2,4-trichlorobenzene, 2-hexanone, xylenes, naphthalene, cyanide, and iron.

For shallow groundwater exposure to lead, the maximum lead concentration is below the federal action level of 0.015 mg/L at each property except Lots 57, 60, 63, 64, 67, and 69. As indicated above, the Site receives drinking water from the City of Newark's potable water system.

To summarize, unacceptable noncancer health hazards were found for copper and lead in soil/fill. Naphthalene, TCE, and total xylenes are soil/fill COPCs with unacceptable risks/hazards associated with soil gas. In addition, several VOCs, SVOCs, and metals are groundwater COPCs with unacceptable risks/hazards based on hypothetical potable use scenarios.

Screening Level Ecological Risk Assessment

A SLERA was conducted and focused on the potential for terrestrial exposure from on-site surface soil/fill material. Approximately 70% of the Site is covered with impervious surfaces, such as asphalt. The remaining 30% of the Site contains pervious areas that may support potential ecological habitat. The habitat present on the Site is fragmented and of low value to wildlife with opportunistic, invasive, and transient species, such as the Japanese knotweed, being the dominant species observed or expected to be on the property. Although groundwater under the Site discharges to the Passaic River through the sediment, there are no groundwater discharges to the surface soil/fill material; therefore, the groundwater ecological exposure pathway was determined to be incomplete for the terrestrial portion of the Site.

Primary exposure pathways include direct contact (e.g., plant roots and soil invertebrates), soil ingestion (e.g., earthworms), incidental soil ingestion (e.g., preening by birds), and ingestion of soil invertebrates and small mammals. For wildlife, prey ingestion is assumed to dominate exposure. Due to the limited, fragmented, and low-quality ecological habitat available on-site and the proximity to active industrial and commercial operations, it is unlikely that federal-listed or state-listed sensitive species would be present on-site. The likely future use of

WHAT IS ECOLOGICAL RISK AND HOW IS IT CALCULATED?

A Superfund baseline ecological risk assessment is an analysis of the potential adverse health effects to biota caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current and future land and resource uses. The process used for assessing site-related ecological risks includes:

Problem Formulation: In this step, the contaminants of potential ecological concern (COPECs) at the site are identified. Assessment endpoints are defined to determine what ecological entities are important to protect. Then, the specific attributes of the entities that are potentially at risk and important to protect are determined. This provides a basis for measurement in the risk assessment. Once assessment endpoints are chosen, a conceptual model is developed to provide a visual representation of hypothesized relationships between ecological entities (receptors) and the stressors to which they may be exposed.

Exposure Assessment: In this step, a quantitative evaluation is made of what plants and animals are exposed to and to what degree they are exposed. This estimation of exposure point concentrations includes various parameters to determine the levels of exposure to a chemical contaminant by a selected plant or animal (receptor), such as area use (how much of the site an animal typically uses during normal activities); food ingestion rate (how much food is consumed by an animal over a period of time); bioaccumulation rates (the process by which chemicals are taken up by a plant or animal either directly from exposure to contaminated soil, sediment or water, or by eating contaminated food); bioavailability (how easily a plant or animal can take up a contaminant from the environment); and life stage (*e.g.*, juvenile, adult).

Ecological Effects Assessment: In this step, literature reviews, field studies or toxicity tests are conducted to describe the relationship between chemical contaminant concentrations and their effects on ecological receptors, on a media-, receptor- and chemical-specific basis. To provide upper and lower bound estimates of risk, toxicological benchmarks are identified to describe the level of contamination below which adverse effects are unlikely to occur and the level of contamination at which adverse effects are more likely to occur.

Risk Characterization: In this step, the results of the previous steps are used to estimate the risk posed to ecological receptors. Individual risk estimates for a given receptor for each chemical are calculated as a hazard quotient (HQ), which is the ratio of contaminant concentration to a given toxicological benchmark. In general, an HQ above 1 indicates the potential for unacceptable risk. The risk is described, including the overall degree of confidence in the risk estimates, summarizing uncertainties, citing evidence supporting the risk estimates and interpreting the adversity of ecological effects.

this Site is to remain developed for commercial/industrial purposes and redevelopment of any portion of the Site will remove or alter the existing ecological resources in that area.

Based on the results of the SLERA, the primary terrestrial ecological pathway is contaminated surface soil/fill material. The SLERA identified this pathway as being related to unacceptable ecological risk. Chemicals of potential ecological concern (COPECs) identified in surface soil included several VOCs, PAHs and other SVOCs, one pesticide (heptachlor epoxide), PCBs, dioxin, and several metals. These compounds were identified using stringent comparison values and given the lack of quality habitat the overall ecological risk is overestimated in the SLERA. In lieu of conducting an additional, more in-depth ecological evaluation for the Site, EPA has made a management decision to consider risk-based concentrations that are protective of ecological receptors in the selection of preliminary remediation goals to ensure that the remedial alternatives will address the potentially unacceptable ecological risks identified in the SLERA.

Based upon the results of the RI and risk assessments, EPA has determined that the Preferred Alternative or one of the other active measures considered in the Proposed Plan is necessary to protect public health, welfare, and the environment from actual or threatened releases of hazardous substances from the Site.

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) advisories, criteria and guidance, and site-specific risk-based levels.

The following RAOs were established for the Site for contaminants of concern (COCs):

Waste

- Secure or remove wastes that act as a source of COCs to other media to the extent practicable.
- Prevent uncontrolled movement of COCs in wastes (i.e., spills and free-phase liquid) that may impact other media.
- Minimize or eliminate human and ecological exposure to NAPL.

Sewer Water

- Prevent exposure to COCs in sewer water and solids associated with a release from the inactive sewer system.
- Minimize concentrations of COCs in sewer water (inactive system).
- Prevent or minimize discharge of sewer water COCs to surface water to minimize the potential for interaction between the Site and the Passaic River.

Soil Gas

- Minimize contaminant levels in sources of COCs in soil gas that may migrate to indoor air.

Soil/Fill

- Remove COCs or minimize COC concentrations and eliminate human exposure pathways to COCs in soil and fill material.
- Remove COCs or minimize COC concentrations and eliminate or minimize ecological exposure pathways to COCs in soil and fill material.
- Prevent or minimize off-site transport of soil containing COCs to minimize the potential for interaction between the Site and the Passaic River.
- Prevent or minimize potential for leaching of COCs to groundwater and surface water from soil and fill.

Groundwater

- Minimize COC concentrations and restore groundwater quality.
- Prevent exposure to COCs in groundwater.
- Prevent or minimize migration of groundwater containing COCs.
- Prevent or minimize discharge of groundwater containing COCs to surface water to minimize the potential for interaction between the Site and the Passaic River.

PRELIMINARY REMEDIATION GOALS

Preliminary remediation goals (PRGs) are chemical-specific, quantitative goals that are intended to be protective of human health and the environment and meet RAOs. PRGs were developed for soil/fill material, soil gas, and groundwater based on ARARs and risk-based concentrations (RBCs)[4] (human health and ecological), with consideration of current and reasonably anticipated future use, background concentrations, analytical detection limits, guidance values, and other available information. Furthermore, PRGs were only established for site-related contaminants.

No PRGs have been developed for sewer water or waste. These are discussed in more detail in the Summary of Remedial Alternatives section. However, soil/fill material impacted by NAPL will be evaluated and compared to NJDEP extractable petroleum hydrocarbon (EPH) promulgated requirements and delineated per NJDEP guidance.

PRGs for soil/fill material were developed by comparing RBCs to NJDEP NRDCSRS to determine the appropriate remediation goals for the Site. For this Site, NRDCSRS were identified based on the reasonably anticipated use of the Site as commercial/industrial. The more conservative of the RBCs and the NRDCSRSs were identified as the chemical-specific soil PRGs. The PRGs for soil gas were based on RBCs for naphthalene, TCE, and total xylenes; the PRGs were developed for soil/fill but are protective of vapor intrusion (soil gas) for workers. The PRGs established for the site-related soil COCs, identified in Table 1, are protective of human health.

Table 1: Site PRGs for Soil

Soil COC	PRG (milligrams/kilogram, (mg/kg))
Lead	800
Copper	526
Naphthalene (Vapor Intrusion) *See Note 1*	0.62
Naphthalene (Soil) *See Note 1*	17
TCE *See Note 2*	0.02
Total Xylenes *See Note 2*	6.5
Arsenic	19
Total PCBs	1
Benzene	5
Benzo[a]anthracene	17
Benzo[a]pyrene	2
Benzo[b]fluoranthene	17

[4] RBCs for human health and ecological receptors are derived for each risk driver/receptor scenario identified in the BHHRA and SLERA as posing risk/hazard in excess of EPA acceptable levels.

Dibenz[a,h]anthracene	2
Vinyl chloride	2

Note 1: Naphthalene has two soil/fill PRGs, one to address vapor intrusion and another to address soil/fill. Where these two PRGs overlap in the remedial footprint the more conservative value will be used.

Note 2: The soil/fill PRGs for TCE and total xylene are for soil/fill, but are protective of vapor intrusion (soil gas) for workers.

EPA and NJDEP have promulgated maximum contaminant levels (MCLs), and NJDEP has promulgated groundwater quality standards (GWQSs), which are enforceable, health-based, protective standards for various drinking water contaminants. For the Site, NJDEP GWQS are equal to, or more stringent than the MCLs and have been selected as the PRGs for site-related COCs in groundwater (Table 2).

Table 2: Site PRGs for Groundwater

Groundwater COCs	PRG (micrograms/liter, (ug/L))
Lead	5
Acetone	6,000
Benzene	1
Ethylbenzene	700
Methylene chloride	3
Tetrachloroethylene	1
Toluene	600
Trichloroethylene	1
Vinyl chloride	1
Total Xylene	1,000
Cresol, p-	50
Benzo[a]anthracene	0.1
Benzo[a]pyrene	0.1
Benzo[b]fluoranthene	0.2
Bis(2-ethylhexyl)phthalate	3
Dioxane, 1,4-	0.4
Indeno[1,2,3-cd]pyrene	0.2
Methylnaphthalene, 2-	30

To evaluate the vapor intrusion pathway in the future, indoor air, sub-slab VOC and SVOC concentrations, and shallow groundwater will be compared to the chemical-specific EPA and NJDEP VISLs.

SUMMARY OF REMEDIAL ALTERNATIVES

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

Detailed descriptions of the remedial alternatives for addressing the contamination associated with the Site can be found in the FS Report. Since contamination would be left on the Site above levels that allow for unlimited use and unrestricted exposure for certain media, five-year reviews would be conducted to monitor the contaminants and evaluate the need for future actions. Capital costs are based on Year 2020 dollars. Present worth assumes that construction would begin in 2022 and assumes a 7 percent discount rate.

Waste Alternative 1: No Action

Capital Cost:	$0
Annual OM&M Cost:	$0
Present Worth Cost:	$0
Construction Time:	0 months

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, remaining source materials at the Site would be left in place, and no means of securing the materials to prevent future release to the environment would be implemented.

Waste Alternative 2: Removal and Off-Site Disposal

Capital Cost:	$1,798,211
Annual OM&M Cost:	$0
Present Worth Cost:	$1,580,700
Construction Time:	1-2 months

This alternative focuses on removal of principal threat waste along with removal of the various small volume wastes found across the Site to prevent an uncontrolled release to the environment. This alternative includes the removal of a chalky talc-looking substance in Building #7, aplastic 55-gallon drum in Building #12, a five-gallon bucket in Building #17, the USTs on Lot 64, the waste and LNAPL within the USTs, NAPL-impacted soil/fill material surrounding the USTs, and the LNAPL in the pooled water in Building #15A, These wastes will then be properly disposed. The LNAPL in the USTs and Building #15A are considered principal threat wastes, and the removal and disposal of these wastes will address this concern.

Upon removal of USTs and their contents, confirmation soil/fill (including underneath the tank) and groundwater sampling will occur consistent with substantive requirements of New Jersey tank closure regulations and NJDEP Technical Requirements (N.J.A.C. 7:26E-5.1(e)).

Contaminated soil/fill and groundwater observed in the excavation after tank removal would be addressed in accordance with substantive requirements of New Jersey tank closure regulations and NJDEP Technical Requirements found at N.J.A.C. 7:26E-5.1(e). It is assumed that approximately 3,500 CY of NAPL-impacted soil/fill adjacent to the USTs would require excavation and off-site disposal as part of this alternative. It is anticipated that excavation will extend 13 ft bgs. Note that removal of NAPL-impacted soil/fill on Lot 63, not directly associated with UST removal on Lot 64, is addressed in the soil/fill alternatives.

The total volume of liquid waste estimated to be removed for off-site disposal is approximately 39,000 gallons: consisting of 55 gallons of waste from Buildings #12 and #17; 2,900 gallons of LNAPL in Building #15A; 1,600 gallons of LNAPL in the UST; and 34,700 gallons of water in the six USTs. The total volume of solid waste estimated to be removed is approximately 3,511 CY, consisting of 11 CY in Building #7 and 3,500 CY of NAPL-impacted soil/fill associated with the UST removal and closure.

Sewer Water Alternative 1 – No Action

Capital Cost:	$0
Annual OM&M Cost:	$0
Present Worth Cost:	$0
Construction Time:	0 months

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, the water and solids in the designated section of sewer and associated line would be left in place, and no means of securing the materials to prevent future release to the environment would be implemented.

Sewer Water Alternative 2 – Removal and Off-Site Disposal

Capital Cost:	$27,981
Annual OM&M Cost:	$0
Present Worth Cost:	$24,900
Construction Time:	1 month

This alternative consists of transferring the sewer water and solids (approximately 0.75 CY) from the inactive sewer line into appropriate containers or transport vehicles for off-site treatment and/or disposal along with proper closure of the line. Liquid materials would be pumped into drums and transferred to an appropriate facility for treatment and disposal. Remaining solids in the manhole would be placed into a drum and disposed in an appropriate solid waste landfill.

Upon removal of the contents, the interior of the manhole and associated line would be water-jetted, and then closed in place by plugging/filling to prevent future buildup of water and solids in the manhole. Cleaning of the manhole and the one unplugged pipe (estimated to be 125 liner feet) would generate an estimated 3,000 gallons of additional liquid.

Soil Gas Alternative 1 – No Action

Capital Cost:	$0
Annual OM&M Cost:	$0
Present Worth Cost:	$0
Construction Time:	0 month

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, no measures would be taken to protect future indoor workers from exposure to soil vapors.

Soil Gas Alternative 2 – Institutional Controls, Air Monitoring or Engineering Controls (existing

occupied buildings) and Site-Wide Engineering Controls (future buildings)

Capital Cost:	$123,525
Annual OM&M Cost:	$31,500
Present Worth Cost:	$449,800
Construction Time:	1-2 months

This alternative consists of establishing or enhancing deed notices and/or CEAs/WRAs site-wide to provide notice of certain restrictions upon the use of the property and groundwater. Such restrictions (institutional controls) would require that prior to existing buildings being occupied in the future, a building-specific assessment of sub-slab soil gas and/or indoor air quality would be performed and, if needed, some means of protecting the future occupants of such existing buildings from vapor intrusion risks/hazards would be implemented. Additional restrictions would require that future new construction include a vapor barrier or other appropriate means of sealing the ground surface underneath the new building slab or installation of a subsurface depressurization system (SSDS).

In addition, the NJDEP Vapor Intrusion Technical Guidance (VIT) is a TBC for soil gas. A comparison of the shallow groundwater concentration to NJDEP VISLs identified potential risks/hazards due to vapor intrusion for any building within 100 feet of the monitoring well where the exceedance was reported.

Ongoing indoor air monitoring or engineering controls (such as a SSDS) would be required in the seven existing occupied buildings (Buildings #1, #2, #3, #9, #10, #14, and #16). to confirm previous BHHRA results and/or to ensure the indoor workers are protected, due to the presence of soil gas or VOCs in groundwater above NJDEP VISLs in shallow monitoring wells within 100 feet of the building. If air monitoring indicates vapor intrusion, then property owners or other responsible parties would be required to implement engineering controls.

Soil Gas Alternative 3 – Institutional Controls, Air Monitoring or Engineering Controls (future buildings), and In-Situ Remediation of Soil/fill (existing occupied buildings)

Capital Cost:	$4,591,968
Annual OM&M Cost:	$0
Present Worth Cost:	$4,050,800
Construction Time:	4-6 months (for initial round of injection)

This alternative includes the same site-wide institutional controls and continued air monitoring or engineering controls (such as SSDS) for existing occupied and future buildings associated with soil gas and VOCs in groundwater above NJDEP VISLs, as described for Soil Gas Alternative 2.

This alternative also includes in-situ remediation of soil/fill containing TCE, total xylenes, and naphthalene above the PRGs within 100 feet of existing occupied buildings. Buildings inside the treatment area would not need air monitoring or engineering controls. This alternative assumes a remedial footprint of 1.95 acres with an estimated depth to groundwater of 6 ft for a total of 18,900 CY. In-situ remediation of the designated soil/fill would be performed using chemical oxidation injection. Remaining soil/fill with VOCs above the associated PRGs (i.e., not within 100 ft of existing occupied buildings) is addressed by the site-wide institutional controls requiring assessment and, if needed, mitigation prior to occupancy of existing buildings, and site-wide engineering controls for future construction.

Soil/Fill Alternative 1 – No Action

Capital Cost:	$0
Annual OM&M Cost:	$0
Present Worth Cost:	$0
Construction Time:	0 month

Under this alternative, no action would be taken. This alternative is retained for comparison with the other alternatives as required by the NCP. Under no action, new deed restrictions and other institutional controls would not be implemented, and future use of the subject areas would be unrestricted, except that existing NJDEP-approved institutional and engineering controls would remain in place although they would not be enforced by EPA.

Soil/Fill Alternative 3 – Institutional Controls, Engineering Controls and NAPL Removal[5]

[5] Soil/Fill Alternative 2 includes institutional controls and NAPL removal but was screened out and not included in this Proposed Plan because it did not comply with ARARs and was therefore not eligible for selection.

Capital Cost:	$11,140,405
Annual OM&M Cost:	$75,000
Present Worth Cost:	$10,450,900
Construction Time:	6-10 months

Soil/Fill Alternative 3 includes institutional controls (deed notices) and engineering controls (cover system) to contain COCs, including lead which is a site-related contaminant. In addition, the bulkhead would be reinforced or reconstructed, as appropriate, in order to minimize the potential for interaction between the Site and surface water and minimize soil erosion.

Deed notices would be recorded on all 15 lots. Existing deed notices would be revised to reflect RI results and existing engineering controls for applicable lots. Use restrictions identified in the deed notices would ensure future use of the Site remains commercial or industrial, and identify areas of the Site where contamination exceeds NRDCSRS. Fencing would be maintained and enhanced as appropriate to limit unauthorized access to the Site and use of the Site in a manner which may expose human receptors to unacceptable risk. Access restrictions could also include concrete barriers or guard rails. Other institutional controls include existing zoning and local ordinances that regulate use of the Site, which could be reviewed and modified as appropriate to ensure compliance with the objectives of this alternative.

NAPL-impacted soil/fill on Lot 63 would be excavated and disposed off-site under this alternative (assume 311 CY based on 1,200 square ft area and a depth of 7 ft bgs where NAPL-impacted soil/fill was observed during installation of a monitoring well). (NAPL in soil/fill adjacent to the USTs is addressed under the waste alternatives.) A pre-design investigation would be completed to further refine the extent of NAPL in soil/fill on the Lot 63 area. NJDEP guidance on NAPL-impacted soil/fill would be considered in determining the extent of soil excavation during remedial design and in documenting attainment of RAOs.

Capping of contaminated areas consists of the construction of a barrier over/around the contaminated areas. The cap would be intended to prevent access to and contact with the contaminated media and/or to control its migration. Impermeable caps, like asphalt caps, also address the soil-to-groundwater pathway by reducing vertical infiltration. Existing building floor slabs in contact with soil/fill are incorporated into the cap. (If a building is demolished in the future and its floor slab removed, a new surface barrier could be warranted at that location.)

Existing pavement cover could be incorporated into the cap component of Alternative 3 if the existing pavement cover was constructed to meet all cap design requirements. Current conditions at the Site are as follows: 1) an engineering control (concrete slab) has been established for portions of the building footprint on Lot 63, documented in a deed notice; 2) asphalt pavement is the engineering control on Lots 68 and 70, documented in a deed notice. Other lots at the Site have concrete or asphalt surface pavement, although not documented as part of deed notices. During the remedial design, these surfaces would be inspected to determine whether they are suitable to be used as a cover. Some existing pavement may need to be repaired to be function as an engineering control if the pavement otherwise meets the specifications of the cap design.

Asphalt capping as an engineering control is a typical component of a NJDEP remedy for historic fill that has been further impacted from current or historic discharge. Accordingly, this alternative would include a site-wide six-inch asphalt cap along with a 6-inch gravel subsurface over exterior unpaved portions of the Site to prevent direct exposure to soil/fill. In areas to be capped that have existing surface pavement, the thickness of new asphalt pavement could be adjusted to include the existing pavement as long as the combined system of the existing and new cap would be protective of human health and the environment. The estimated extent of the asphalt cap, including Lots 67 and 69, is approximately 5.62 acres, some of which is currently covered by concrete or asphalt. Surface water management would also be evaluated during remedial design, to reduce potential off-site transport of soil/fill with COCs. Also during remedial design, the use of different cover methods and material for different lots could be evaluated.

The existing bulkhead along the riverfront consists of various materials (steel, wood, concrete), and varies in condition from poor/failing to good, with the wood bulkhead sections generally in poor/failing condition and the steel and concrete sections generally in good condition. A geotechnical investigation would be required for both bulkhead enhancement process options. Approximately 800 ft of new bulkhead walls would be constructed with an on-river operation (due to the limited space available on-site, assuming no building demolition). The deteriorating sections of bulkhead would be removed and properly disposed of.

Design and installation of the bulkhead enhancement would incorporate active stormwater discharge pipes as appropriate, and inactive outfalls would be sealed. During the remedial design, the effective height of the bulkhead wall could be increased with soil/fill berms for surface water management; however, the cost estimate assumes replacement to current site conditions. The bulkhead enhancement will reduce the potential interaction between the Site and the Passaic River. This enhancement would also be compatible with, and will take into account as necessary, remedial action being designed in the Lower 8.3 miles of the Lower Passaic River as part of the Diamond Alkali Superfund Site OU2 remedial design. Currently, the OU2 remedial design incorporates bank-to-bank sediment capping with dredging to accommodate the cap without increasing flooding. During construction, any disturbance to the sediment cap would need to be repaired.

Soil/Fill Alternative 4 – Institutional Controls, Engineering Controls, Focused Removal with Off-Site Disposal of Lead, and NAPL Removal

Capital Cost:	$13,623,160
Annual OM&M Cost:	$75,000
Present Worth Cost:	$12,633,300
Construction Time:	8-12 months

Alternative 4 combines the institutional controls, engineering controls (capping with bulkhead replacement), and NAPL removal from Soil/Fill Alternative 3 with a focused excavation and off-site disposal of lead-impacted soil/fill in the vicinity of Building #7. Alternative 4 focuses on lead removal (in soils above the water table) at concentrations above the lead PRG of 800 mg/kg around Building #7, which is predominantly located on Lot 63 and Lot 64. The footprint for this remedial alternative (approximately 0.5 acres) is based on single-point compliance with the PRG, delineated using soil borings collected in the vicinity of Building #7. Delineation of the area would be confirmed during the remedial design. The focused excavation would be based on assessment during remedial design to achieve goal of protection for lead, cumulative cancer risk estimates below or within the NCP risk range (10^{-4} to 10^{-6}), the noncancer HI estimates are at or below the protection goal of 1, or to meet the PRGs to achieve ARAR compliance. The assessment would include consideration of RI soil/fill samples along with remedial design samples and/or confirmation samples if necessary. The excavated areas would be backfilled with fill material selected considering the NJDEP "Fill Material Guidance for SRP Sites" dated April 2015. To prevent soil erosion, the excavated area would be covered with gravel.

Removal of soil/fill reduces and/or would eliminate potential impact-to-groundwater sources, primarily localized lead. Because of the extent of soil/fill, some of which has been identified as historic fill, excavation under this alternative would not reduce the extent of capping needed. The remaining affected soil/fill site-wide would be capped to address the associated potential unacceptable risks as described in Soil/Fill Alternative 3.

Excavation adjacent to existing buildings raises building stability considerations. Additional measures would be undertaken to address building stability, including sequential smaller excavation areas around the perimeter of the building. The structural integrity of the building would be evaluated in the remedial design following an engineering assessment.

Soil/Fill Alternative 5 – Institutional Controls, In-Situ Remediation, Engineering Controls, and NAPL Removal

Capital Cost:	$15,222,505
Annual OM&M Cost:	$68,750
Present Worth Cost:	$13,971,400
Construction Time:	8-12 months

Alternative 5 combines the institutional controls, engineering controls (capping with bulkhead replacement), and NAPL removal from Soil Alternative 3 with in-situ treatment to address lead along with other contaminants. The footprint of this alternative is estimated to be 3.62 acres but would be delineated during the remedial design. Because of the mixture of inorganic and organic contaminants on Site, an in-situ stabilization/solidification technology was assumed for cost-estimating purposes (instead of an in-situ treatment technology).

Stabilization/solidification would be the most viable type of in-situ treatment for this Site. This process would involve the injection and mixing of an appropriate binding agent (such as cement, lime, or kiln dust) using a backhoe or large-diameter auger. Alternatively, an iron sulfide amendment could be used to immobilize the metals as insoluble metal sulfides incorporated into secondary metal precipitates. After completion of stabilization activities, the treated areas would be capped as described under Soil/Fill Alternative 3. Untreated areas of Lots 67 and 69 would be capped also. Note that due to the increase in soil/fill volume inherent with this approach, along with the need to cap treated soils, it may be necessary to remove and properly dispose of the top 12 to 18 inches of soil/fill prior to treatment, so that the elevation of the final surface does not change. Treatability studies and/or pilot test(s) would be needed to determine the most effective binding agent and mixing ratio to treat Site soil/fill.

Groundwater Alternative 1 – No Action

Capital Cost:	$0
Annual OM&M Cost:	$0
Present Worth Cost:	$0
Construction Time:	0 month

Under this alternative, no action would be taken to reduce the potential for unacceptable exposures of humans to impacted groundwater or minimize further aquifer degradation. Existing NJDEP-approved institutional controls would remain intact although they are not enforceable by EPA. This alternative is retained for comparison with the other alternatives as required by the NCP.

Groundwater Alternative 2 – Institutional Controls, Site Containment at River Edge, and Pump and Treat

Capital Cost:	$30,590,844
Annual OM&M Cost:	$1,125,000
Present Worth Cost:	$34,258,600
Construction Time:	12-18 months

Alternative 2 includes institutional controls on the entire Site, a physical barrier (wall) constructed at the river edge and an active groundwater remedy to achieve ARARs. Interaction with the existing CEAs and WRAs would be coordinated with NJDEP along with the property owners or other parties responsible for having recorded these controls. The CEAs provide notice that groundwater in the area does not meet designated use requirements, and the existing WRAs prohibit the installation and use of wells for potable and other uses within the designated area. During remedial design, groundwater samples will be collected, analyzed, and reported to update shallow and deep groundwater quality. Updated results will be used for site-wide institutional controls and establishment of a site-wide CEA and WRA. Consistent with the requirements of New Jersey law, periodic monitoring and reporting to demonstrate compliance with the restrictions would be required as part of this alternative.

A vertical sheet pile barrier wall would be constructed along the river's edge as a means of reducing the potential for interaction between groundwater and the river. Sheet piling would be constructed to the top of an underlying confining layer, most likely the glacial lake bottom silt deposits, with a depth to be determined during remedial design. The barrier wall would have a total length of approximately 1,300 ft. The barrier wall is not intended to address geotechnical issues related to property redevelopment or to enhance the structural stability of the current bulkhead. A geotechnical investigation will occur during remedial design to determine wall alignment, depth and specifications.

Additionally, approximately 20 extraction wells would be installed throughout the Site to alleviate hydrostatic pressure behind the barrier wall and to recover both shallow and deep groundwater impacted by organics and shallow groundwater impacted by inorganics (such as lead). Extracted groundwater would be pumped to a new groundwater treatment facility, likely at least 5,000 to 7,500 square ft in floor area, to be constructed at an appropriate location on the Site.

The number of extraction wells, pumping rate, and individual processes to be utilized for treatment would be determined during the remedial design. For cost-estimating purposes, a 200-gallon per minute (GPM) system (i.e., 20 wells at 10 GPM per extraction well) including chemical oxidation, filtration, metals precipitation (chemical), and carbon polishing was assumed. Approval and/or permit equivalency would be sought for discharge of treated water to the local Publicly Owned Treatment Works (POTW) or surface water.

This alternative's ability to achieve the PRGs would be challenged by the on-going impacts of residual COCs in the soil/fill to groundwater that would need to be treated; however, response actions undertaken for other media that include source control measures (i.e., UST removal and removal of elevated lead in the vicinity of Building #7), would remove potential groundwater sources, potentially allowing the pump and treat system to achieve RAOs faster.

Groundwater Alternative 3 – Institutional Controls and In-Situ Remediation

Capital Cost:	$28,459,770
Annual OM&M Cost:	$113,250
Present Worth Cost:	$20,844,800
Construction Time:	9-12 months (for initial round of injection)

Alternative 3 includes the institutional controls described for Groundwater Alternative 2. Additionally, impacted groundwater would be subject to in-situ remediation. The objective of this alternative is to reduce COC concentrations (organic and inorganic) in groundwater, eventually restoring groundwater quality.

The potential in-situ treatment methods would include in-situ chemical treatment, biosparging, and air sparging. Pilot- and bench-scale testing would be required as part of the remedial design to determine the most appropriate treatment approach and reagents for Site groundwater. However, tidal influences and geochemical conditions on in-situ treatment may limit effectiveness and may need to be assessed during the remedial design.

It should be recognized that many of the COCs are co-located or are in close proximity, which could lead to complications in that different, potentially incompatible treatment approaches might be required. (Sequential treatment with different agents to address different classes of COCs was not assumed as part of this alternative.) Additional groundwater sampling and performance of treatability studies would be required as part of the remedial design to evaluate and select the most cost-effective means for addressing both organic and inorganic constituents in groundwater. This assessment may need to evaluate tidal influences and geochemical conditions. This alternative does not eliminate the need for institutional controls or reduce their expected duration.

This alternative's ability to achieve the PRGs would be challenged by the on-going impacts of residual COCs in the soil/fill to groundwater that would need to be treated; however, response actions undertaken for other media that include source control measures (i.e., UST removal and removal of elevated lead in the vicinity of Building #7), would remove potential groundwater sources, potentially allowing in-situ remediation to achieve RAOs faster.

Groundwater Alternative 4 – Institutional Controls, Pump and Treat, and Targeted Periodic In-Situ Remediation

Capital Cost:	$12,831,750
Annual OM&M Cost:	$1,500,000
Present Worth Cost:	$24,234,400
Construction Time:	8-10 months (not including periodic injections)

This alternative combines the institutional controls and the site-wide pump and treat system of Groundwater Alternative 2 (with no barrier wall), and a targeted, periodic in-situ treatment approach described in Groundwater Alternative 3 for upgradient portions of the Site.

As with Groundwater Alternative 2, the pumping wells near the river would be located to provide hydraulic containment at the river's edge to capture groundwater COCs at concentrations exceeding ARARs. The groundwater level would be monitored, and the extraction rates would be variable, to provide maximum containment/capture without causing excessive induced infiltration from the river. The number of extraction wells, pumping rate, and individual processes to be utilized for treatment would be determined during the remedial design. For cost-estimating purposes, a 200-gallon per minute (GPM) system (i.e., 20 wells at 10 GPM per extraction well), including chemical oxidation, filtration, metals precipitation (chemical), and carbon polishing, was assumed. The flow rate through the treatment system would be appropriately adjusted during periods of in-situ treatment to promote remediation. Approval would be sought for discharge of treated water to the local POTW or surface water.

As with Groundwater Alternative 3, the extent of groundwater to be addressed by periodic in-situ applications and the specific means for addressing it would be determined during the remedial design, including additional groundwater sampling and the performance of treatability studies. For costing purposes, this alternative assumes targeted, periodic in-situ applications would occur annually during the first five years of operation, and the effectiveness of the various approaches would be evaluated and modified, as needed, between each event. Under this hybrid approach, periodic in-situ remediation would be focused on the upgradient portion of the Site, targeting contaminated areas in both the shallow and deep groundwater. During the periodic injections, pumping at upgradient wells could be temporarily reduced or halted, as appropriate to give the amendments adequate contact time with COCs in the groundwater. In any area where in-situ treatment did not achieve PRGs, regardless of the location on-site, pump and treat would be relied upon to achieve the remedial objectives. To prevent uncontrolled release of injection fluids into the river, injection wells along the river may not be a viable option.

COMPARATIVE ANALYSIS OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria, namely, overall protection of human health and the environment, compliance with 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. Seven of the nine evaluation criteria are discussed below. The final two criteria, "State Acceptance" and "Community Acceptance" are discussed at the end of the document.

<u>Overall protection of human health and the environment</u> addresses whether an alternative provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled

through treatment, engineering controls, or institutional controls.

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

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

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

Short-term effectiveness addresses the time needed to achieve protection and any adverse impacts on the community and workers, and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

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

Cost includes estimated capital and OM&M costs, and net present worth costs, calculated using a 7% discount rate. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

State acceptance indicates if, based on its review of the RI/FS and Proposed Plan, the state concurs with the preferred alternative at the present time.

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

The following is a comparative analysis of the alternatives for each medium, based upon the evaluation criteria noted above.

Waste

Overall Protection of Human Health and the Environment
Waste Alternative 1 (no action) is not protective of human health and the environment because it does prevent exposure to or reduce contamination. No action-specific or location-specific ARARs would be triggered, because no action would be taken. Accordingly, it will not be carried through the remaining criteria analysis.

Waste Alternative 2 (removal and off-site disposal) would provide protection of human health and the environment, as the wastes (and principal threat waste) would be removed from the Site, thereby eliminating the potential for exposure of human and ecological receptors and release of the materials to environmental media.

Compliance with ARARs
Waste Alternative 2 would be implemented in compliance with location-specific ARARs, such as the substantive requirements of New Jersey UST closure regulations and NJDEP Technical Requirements (N.J.A.C. 7:26E-5.1(e)) that apply to treatment or removal of free product.

Long-term Effectiveness and Permanence
Waste Alternative 2 would achieve long-term effectiveness through the removal and off-site disposal of waste, including principle threat waste identified on Lot 64.

Reduction of TMV through Treatment
Toxicity, mobility or volume may be reduced in Waste Alternative 2 if material is treated on-site to comply with disposal requirements, as required by the disposal facility.

Short-Term Effectiveness
Waste Alternative 2 would be implemented within one month, so any short-term impacts to workers, the surrounding community and environment will be minimal.

Implementability
Removal of the wastes and USTs is readily implementable, as equipment and experienced vendors for this type of work are available along with backfill material and disposal facilities.

Cost
The present worth cost for each of the Alternatives is:

Waste Alternative 1 - $0
Waste Alternative 2 - $1,580,700

Sewer Water

Overall Protection of Human Health and the Environment
Sewer Alternative 1 (no action) is not protective of human health and the environment because it does not prevent

exposure to or reduce contamination, nor does it meet chemical-specific ARARs. No action-specific or location-specific ARARs would be triggered, because no action would be taken. Accordingly, it will not be carried through the remaining criteria analysis.

Sewer Alternative 2 (removal and off-site disposal) would be protective because the sewer materials would be removed from the Site, thereby eliminating the potential exposure of humans and ecological receptors, release of contamination to the environment, or potential discharge of sewer water COCs to surface water.

Compliance with ARARs
Location- and action-specific ARARs will be met during implementation by Sewer Alternative 2. This alternative would also meet chemical-specific ARARs for sewer water.

Long-term Effectiveness and Permanence
Sewer Alternative 2 would achieve long-term effectiveness through the removal and off-site disposal of the contents of the inactive sewer system.

Reduction of TMV through Treatment
Toxicity, mobility or volume may be reduced in Sewer Alternative 2 if material is treated on-site to comply with disposal requirements, as required by the disposal facility.

Short-Term Effectiveness
Sewer Alternative 2 would be implemented in one and a half months, so any short-term impacts to workers, the surrounding community and environment will be minimal.

Implementability
Removal of the sewer materials and filling of the manhole and piping is readily implementable, as equipment and experienced vendors for this type of work are available.

Cost
The present worth cost for each of the Alternatives is:

Sewer Alternative 1 - $0
Sewer Alternative 2 - $24,900

Soil Gas

Overall Protection of Human Health and the Environment
Soil Gas Alternative 1 (no action) is not protective of human health and the environment because it does not prevent exposure to or reduce contamination. No action-specific or location-specific ARARs would be triggered, because no action would be taken. Accordingly, it will not be carried through the remaining criteria analysis.

Soil Gas Alternatives 2 (institutional controls, air monitoring, and engineering controls) and Soil Gas 3 (in-situ treatment in lieu of air monitoring and engineering controls in existing buildings) would both be protective of human health, as potential risks/hazards associated with soil gas are directly addressed through air monitoring and engineering controls for both existing occupied buildings and future construction.

Compliance with ARARs
Soil Gas Alternatives 2 and 3 would both comply with location- and action-specific ARARs for addressing potential vapor intrusion, such as NJDEP VISLs. No chemical-specific ARARs were identified for soil gas.

Long-term Effectiveness and Permanence
Soil Gas Alternative 3 would have greater long-term effectiveness than Soil Gas Alternative 2, as this alternative includes actions to directly address soil/fill associated with potential vapor intrusion risks/hazards at occupied buildings.

Reduction of TMV through Treatment
Soil Gas Alternative 3 would provide reduction of toxicity, mobility, or volume through treatment, assuming that the selected in-situ technology destroys contaminant mass.

Short-Term Effectiveness
Soil Gas Alternative 2 would have fewer short-term impacts to workers, the community and the environment than Soil Gas Alternative 3 because the activities are limited to the seven occupied on-site buildings where collection of vapor samples would take place, and, if needed, installation of engineering controls. These risks/hazards would be readily controlled by following appropriate health and safety practices.

Implementability
Soil Gas Alternatives 2 and 3 are implementable. Both would require the cooperation of the property owners and/or operators of the seven occupied buildings, in order to conducting air monitoring and install and maintain compliance with engineering controls. As the implementation of institutional controls is the main component of Soil Gas Alternative 2, apart from potential challenges associated with imposing institutional and engineering controls, this alternative would be more easily implemented, with minimal disruption to ongoing activities, compared to Soil Gas Alternative 3, which also includes in-situ treatment.

Cost
The present worth cost for each of the Alternatives is:

Soil Gas Alternative 1 - $0
Soil Gas Alternative 2 - $449,800
Soil Gas Alternative 3 - $4,050,800

Soil/Fill

Overall Protection of Human Health and the Environment
Soil/Fill Alternative 1 (no action) is not protective of human health and the environment because it does not prevent exposure to or reduce contamination, nor does it meet chemical-specific ARARs. No action-specific or location-specific ARARs would be triggered, because no action would be taken. Accordingly, it will not be carried through the remaining criteria analysis.

Soil/Fill Alternative 3 (cap and bulkhead enhancement), Soil/Fill Alternative 4 (focused excavation/disposal with capping and bulkhead enhancements) and Soil/Fill Alternative 5 (in-situ remediation with capping and bulkhead enhancement) would be protective of human health, as potential risks/hazards associated with direct contact of the soil/fill material would be addressed with an engineered cap.

Compliance with ARARs
Soil/Fill Alternatives 3 through 5 would comply with chemical-specific ARARs by eliminating direct contact to concentrations exceeding NJ NRDCSRS with a site-wide cap and deed notices. Location- and action-specific ARARs would be met by Soil/Fill Alternatives 3 through 5. None of the alternatives eliminate the need for institutional controls.

Long-term Effectiveness and Permanence
Soil/Fill Alternatives 3 through 5 would achieve long-term effectiveness and permanence by minimizing human and ecological exposure to soil/fill and preventing off-site transport of soil/fill containing COCs. Soil/Fill Alternative 4 would provide greater permanence: under Alternative 4, contaminated soil/fill would be excavated for off-site disposal in a licensed disposal facility; under Alternative 5 in-situ treatment would permanently stabilize the contaminated soil/fill, making future exposure to the COCs less likely. Soil/Fill Alternatives 3 through 5 incorporate similar long-term O&M obligations through institutional controls, none anticipated to be less than the 30 years assumed for cost-estimating purposes.

Reduction of TMV through Treatment
Soil/Fill Alternative 5 would provide the greatest reduction of toxicity and mobility through treatment by stabilization/solidification of all COCs (organic and inorganic). However, the volume would not be reduced since contaminants are stabilized and solidified but remain on-site. Soil/Fill Alternative 4 would reduce mobility of COCs on-site, not through treatment but through removal and off-site disposal of elevated lead around Building #7, which also remove co-located contaminants; however, toxicity and volume would only be reduced if material is treated prior to disposal. Soil/Fill Alternatives 3 through 5 include NAPL removal, which would reduce mobility of a principal threat waste, though not through treatment. The toxicity and volume may be reduced if material is treated to comply with disposal requirements at the off-site disposal facility.

Short-Term Effectiveness
Soil/Fill Alternatives 3 through 5 will all disrupt businesses to some extent, thus having a short term impact on workers and potentially, the local community. The northern portion of the Site is extremely congested with ongoing business activities and also provides the only vehicle access point. The short-term impacts of Soil/Fill Alternatives 3 and 4 would be similar, as they are similar in scope. Soil/Fill Alternative 5 would cause the most short-term impacts because of the treatment areas in the northern portion of the Site which would cause significant disturbances to businesses as reagent delivery to the subsurface will require the use of either large diameter augers and closely spaced injection points, due to the relatively shallow depth of impacts.

Implementability
Soil/Fill Alternatives 3 and 4 are both relatively implementable, though the excavation included Soil/Fill Alternative 4 might be limited by proximity to buildings and underground utilities. Soil/Fill Alternative 5 would be the most technically challenging to implement because this alternative requires the use of specialized equipment and experienced vendors; pilot studies would be required to determine the appropriate reagent; and treatments may not be feasible due to underground utilities and closely spaced injection points due to the relatively shallow depth of impacts. Soil/Fill Alternatives 3 through 5 require engineering controls, including bulkhead enhancements. During construction of the bulkhead, if the engineered cap in the Lower Passaic River is disturbed, the parties implementing the remedy at the Site would be responsible to work with EPA and/or the parties performing work in the river to address any such impacts.. Soil/Fill Alternatives 3 through 5 would require long-term maintenance in the form of site inspections to ensure compliance with institutional controls, verify inspection of fencing, and maintain integrity of the cap and bulkhead.

Cost
The present worth cost for each of the Alternatives is:

Soil/Fill Alternative 1 – $0
Soil/Fill Alternative 3 – $10,450,900
Soil/Fill Alternative 4 – $12,633,300
Soil/Fill Alternative 5 – $13,971,400

Groundwater

The performance of all the active groundwater alternatives will be impacted by the on-going impacts of residual COCs in the soil/fill to the groundwater, which will need to be treated. Response actions undertaken for other media that include source control measures (i.e., UST removal and NAPL-impacted soil/fill removal) would remove potential groundwater sources and capping or excavation of contaminated soil/fill could also reduce residual COC infiltration into groundwater from unsaturated soil/fill.

Overall Protection of Human Health and the Environment
Groundwater Alternative 1 (no action) is not protective of human health and the environment because it does not prevent exposure to or reduce contamination, nor does it meet chemical-specific ARARs. No action-specific or location-specific ARARs would be triggered, because no action would be taken. Accordingly, it will not be carried through the remaining criteria analysis.

Groundwater Alternative 2 (containment at river edge and pump and treat), Groundwater Alternative 3 (in-situ remediation), and Groundwater Alternative 4 (pump and treat with targeted periodic in-situ remediation) would be protective of human health because all of these alternatives would restore the groundwater quality to meet the standards applicable for a Class IIA aquifer.

Compliance with ARARs
Location- and action-specific ARARs would be met by Groundwater Alternatives 2, 3, and 4. In the short-term, Groundwater Alternatives 2, 3, and 4 would not comply with chemical-specific ARARs (NJ GWQS) associated with the restoration of groundwater; however, over time, the impacted groundwater may eventually reduce COC concentrations to meet chemical-specific ARARs. Groundwater Alternative 4 will likely achieve chemical-specific ARAR before Groundwater Alternatives 2 and 3, because Alternative 4 includes both pump and treat technology and in-situ treatment, whereas Alternative 2 relies solely on pumping and treating, and Alternative 3, on in-situ treatment . Groundwater Alternatives 3 may face challenges in meeting chemical specific ARARs because of the complex interaction between the in-situ treatments and the geochemistry of the aquifer. This would be true for Groundwater Alternative 4 as well; however, because the in-situ component of Groundwater Alternative 4 would be more targeted, the challenge would be lesser.

Long-term Effectiveness and Permanence
Groundwater Alternatives 2, 3, and 4 all require long-term O&M through institutional controls and long-term groundwater monitoring to remain effective, until the NJ GWQS are attained. The O&M period for all four groundwater alternatives is anticipated to be at least the 30 years assumed for cost-estimating purposes, although it is possible that the source removal activities implemented to address the waste and soil/fill contamination may reduce the duration of O&M obligations, particularly for Groundwater Alternative 4, which includes both pump and treat and in-situ treatment technologies.

Reduction of TMV through Treatment
Groundwater Alternatives 2 and 4 would effectively reduce the toxicity, mobility and volume of all COCs in the groundwater through use of a pump and treat system. Groundwater Alternatives 3 and 4 could reduce toxicity, mobility and volume of organic COCs depending on success of the reagent used for in-situ treatment; however, inorganic metals (including lead) cannot be destroyed, only precipitated out of solution, so for metals, only toxicity and mobility would be reduced through treatment.

Short-Term Effectiveness
Groundwater Alternatives 2 and 4 would be disruptive to business activities thus having a short term impact on workers and potentially, the local community, as a result of the installation of monitoring wells (for all alternatives) and the construction of a pump and treat system. The in-situ treatment activities associated with both Groundwater Alternatives 3 and 4 also lead to short-term impacts, but Alternative 3 would be more disruptive to business activities, workers and the local community, than Groundwater Alternative 4 because multiple large-scale injections would be required. For Groundwater Alternative 4, in-situ treatments would be targeted periodic injections and generally at a smaller scale than Groundwater Alternative 3.

Implementability
Of the active groundwater alternatives, Groundwater Alternative 4 is the most implementable, while Groundwater Alternative 2 is the most challenging to implement because of the technical complexities of the construction of the barrier wall. The implementability challenges for Groundwater Alternative 3 are caused by the need to undertake multiple targeted rounds of in-situ injection. In addition, groundwater sampling and treatability studies would be required to evaluate how to address both organic and inorganic constituents in

groundwater, taking into account tidal influences and geochemical conditions. The implementability of Groundwater Alternatives 2 and 4 is also affected by the need for access to a sufficiently sized portion of the Site property for construction of a groundwater treatment facility, which could lead to administrative challenges. All three Groundwater Alternatives 2 through 4 would require long-term maintenance in the form of site inspections to ensure compliance with institutional controls and to perform operation and maintenance. Since Groundwater Alternative 4 is likely to achieve the RAO is the shortest time, the challenges associated with implementation over a long duration are less.

<u>Cost</u>
The present worth cost for each of the Alternatives is:

Groundwater Alternative 1 – $0
Groundwater Alternative 2 – $34,258,600
Groundwater Alternative 3 – $20,844,800
Groundwater Alternative 4 – $24,234,400

PREFERRED ALTERNATIVE

Based upon an evaluation of the various alternatives, the Preferred Alternative is comprised of the following:

- Waste Alternative 2 – Removal and Off-Site Disposal
- Sewer Water Alternative 2 – Removal and Off-Site Disposal
- Soil Gas Alternative 2 – Institutional Controls, Air Monitoring or Engineering Controls (existing occupied buildings), and Site-Wide Engineering Controls (future buildings)
- Soil/Fill Alternative 4 – Institutional Controls, Engineering Controls, Focused Removal with Off-Site Disposal of Lead, and NAPL Removal
- Groundwater Alternative 4 – Institutional Controls, Pump and Treat, and Targeted Periodic In-Situ Remediation

Waste

The preferred waste alternative includes removal of various wastes found across the Site and disposing them off-site. The wastes identified in this preferred alternative include:

- Approximately 34,700 gallons of water and 1,600 gallons of LNAPL within the six USTs located north of Building #12 on Lot 64
- Excavated NAPL-impacted soil/fill material following UST removal (approximately 3,500 CY)
- The six tanks in the UST area
- Approximately, 2,900 gallons of LNAPL pooled under a steel grated floor in Building #15A
- 11 CYs of a white chalky talc-looking substance in a hopper in Building #7
- 50 gallons of liquid waste in a plastic drum in Building #12
- A five-gallon bucket of a waste labeled as a filler in Building #17

This preferred alternative would provide the greatest protection of human health and the environment and long-term effectiveness because removing the waste will prevent an uncontrolled release into the environment. In removing this waste, all ARARs will be complied with.

Furthermore, removing the USTs and addressing the LNAPL in the USTs and the NAPL-impacted soil/fill surrounding the USTs would eliminate the principal threat waste.

The preferred waste alternative should also improve the effectiveness of the groundwater alternatives with respect to organics. Removal of the USTs and their contents along with the LNAPL and NAPL-impacted soil/fill material will also remove a potential groundwater source. This action is expected to result in improved groundwater quality with respect to VOCs and may reduce the scope/footprint and time needed to achieve certain groundwater chemical-specific ARARs.

Sewer Water

The preferred sewer water alternative includes removal of sewer water and associated solids from an inactive portion of the northern sewer line (known as Manhole 8) on Lot 1. These wastes will then be properly disposed off-site.

This preferred alternative is expected to provide the greatest protection of human health and the environment and long-term effectiveness because removing the sewer water and solids will prevent an uncontrolled release into the environment. In removing this material, all ARARs will be complied with.

Soil Gas

The preferred soil gas alternative includes establishing deed notices and/or CEAs/WRAs site-wide, and/or updating existing deed notices and/or CEA/WRAs, to provide notice of certain restrictions upon the use of the property and groundwater. In addition, ongoing indoor air monitoring or engineering controls (such as a SSDS) would be required.

While there are no unacceptable risks for indoor air in any currently occupied building on the Site, EPA has concluded that reoccurring air monitoring should be conducted in each occupied building to ensure there are no unacceptable levels of soil gas in the future. Furthermore, this alternative includes institutional controls to ensure that any new building has an engineering control to prevent potential vapor intrusion. Institutional controls and engineering controls will require consent of property owners for deed notices/restrictions. This preferred alternative can be implemented in a relatively short period, assuming the property owners at the Site provide their consent. The preferred alternative also is protective in the long-term, although it does not include in-situ treatment of COCs as does Soil Gas Alternative 3 (in-situ treatment). The present worth cost of this alternative is $449,800, as compared to the $4,050,800 cost of Soil Gas Alternative 3.

Soil/Fill

Soil/Fill Alternative 4, the preferred soil/fill alternative includes bulkhead replacement, capping of the entire the Site, NAPL removal on Lot 63, and a focused removal of lead around the perimeter of Building #7. This preferred alternative focuses on lead removal (in soil/fill material above the water table) at concentrations above the PRG of 800 mg/kg around Building #7, which is predominantly located geographically on Lot 63 and Lot 64. This alternative would reduce mobility of COCs on-site through removal and off-site disposal of not only lead but also co-located contaminants. The alternative also addresses the deteriorating portions of the bulkhead to minimize the potential for interaction between the Site and surface water and to minimize soil erosion. The site-wide cap would also prevent access and direct contact with the contaminated media and/or control contaminant migration. Impermeable caps, like asphalt caps, also address the soil-to-groundwater pathway by reducing vertical infiltration. Soil/fill with NAPL on Lot 63 will be excavated and disposed off-site.

The preferred soil alternative provides the best overall protection of human health/environment and compliance with ARARs while also being relatively easily to implement. Soil/Fill Alternative 5 (in-situ treatment) provides reduction of toxicity and mobility through treatment (which the preferred soil alternative does not) and is comparable to the preferred alternative for long-term effectiveness and permanence, but with respect to short-term effectiveness and implementability Soil/Fill Alternative 5 does not compare favorably. Soil/Fill Alternative 5 treatment areas in the northern portion would cause significant disturbances to businesses, as reagent delivery to the subsurface would require the use of either large diameter augers, which may not be feasible due to underground utilities, and closely spaced injection points, due to the relatively shallow depth of impacts. While Soil/Fill Alternative 3 would eliminate contact with soil/fill at concentrations exceeding PRGs through capping, the preferred soil alternative would offer better overall protection and compliance with the PRGs since, in addition to capping, lead contaminated soil/fill around Building #7 (along with co-located contamination) would be removed from the Site.

Furthermore, the preferred soil/fill alternative also improves the effectiveness of the groundwater alternatives with respect to organics and metals. First, removal of the NAPL-impacted soil/fill material on Lot 63 and the lead-impacted soil/fill material around Building #7 will also remove a potential groundwater source. This action is expected to result in improved groundwater quality with respect to VOCs and lead and may reduce the scope/footprint and time needed to achieve certain groundwater chemical-specific ARARs. In addition, the site-wide cap will limit the amount of surface water infiltrating through the soil/fill and impacting groundwater.

Groundwater

The preferred groundwater alternative, Groundwater Alternative 4, includes the installation of a site-wide pump and treat system, and a targeted, periodic in-situ treatment approach in upgradient portions of the Site. Ongoing groundwater monitoring would be performed to demonstrate that groundwater treatments continued to be protective of human health and the environment. The pumping wells near the river would be located to provide hydraulic containment at the river's edge to capture groundwater COCs at concentrations exceeding ARARs. The targeted, periodic in-situ applications would occur annually, and the effectiveness will be evaluated and modified, as needed, between each event.

The preferred groundwater alternative provides the best overall protectiveness, compliance with ARARs, long-term effectiveness, and reduction of toxicity, mobility and volume through treatment. Groundwater Alternatives 2 (river barrier and pump and treat only) and 3 (in-situ only) provide less long-term effectiveness and permanence, due to their sole reliance on pump and treat, and in-situ applications, respectively, which will likely extend the timeframe to achieve the goal of groundwater restoration.

Basis for the Remedy Preference

The Preferred Alternative is believed to provide the best balance of tradeoffs among the alternatives based on the information available to EPA at this time. EPA believes the Preferred Alternatives would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The Preferred Alternative may change in response to public comment or new information. The total present worth cost for all the Preferred Alternatives is $38,923,100.

Because the Preferred Alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA would require that the Site be reviewed at least once every five years.

Consistent with EPA Region 2's Clean and Green policy, EPA will evaluate the use of sustainable technologies and practices with respect to implementation of a selected remedy.

State Acceptance

The Proposed Plan is currently under review by NJDEP.

Community Acceptance

Community acceptance of the Preferred Alternative will be addressed in the ROD following review of the public comments received on this Proposed Plan.

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Information can also be found on the web:
www.epa.gov/superfund/riverside-industrial

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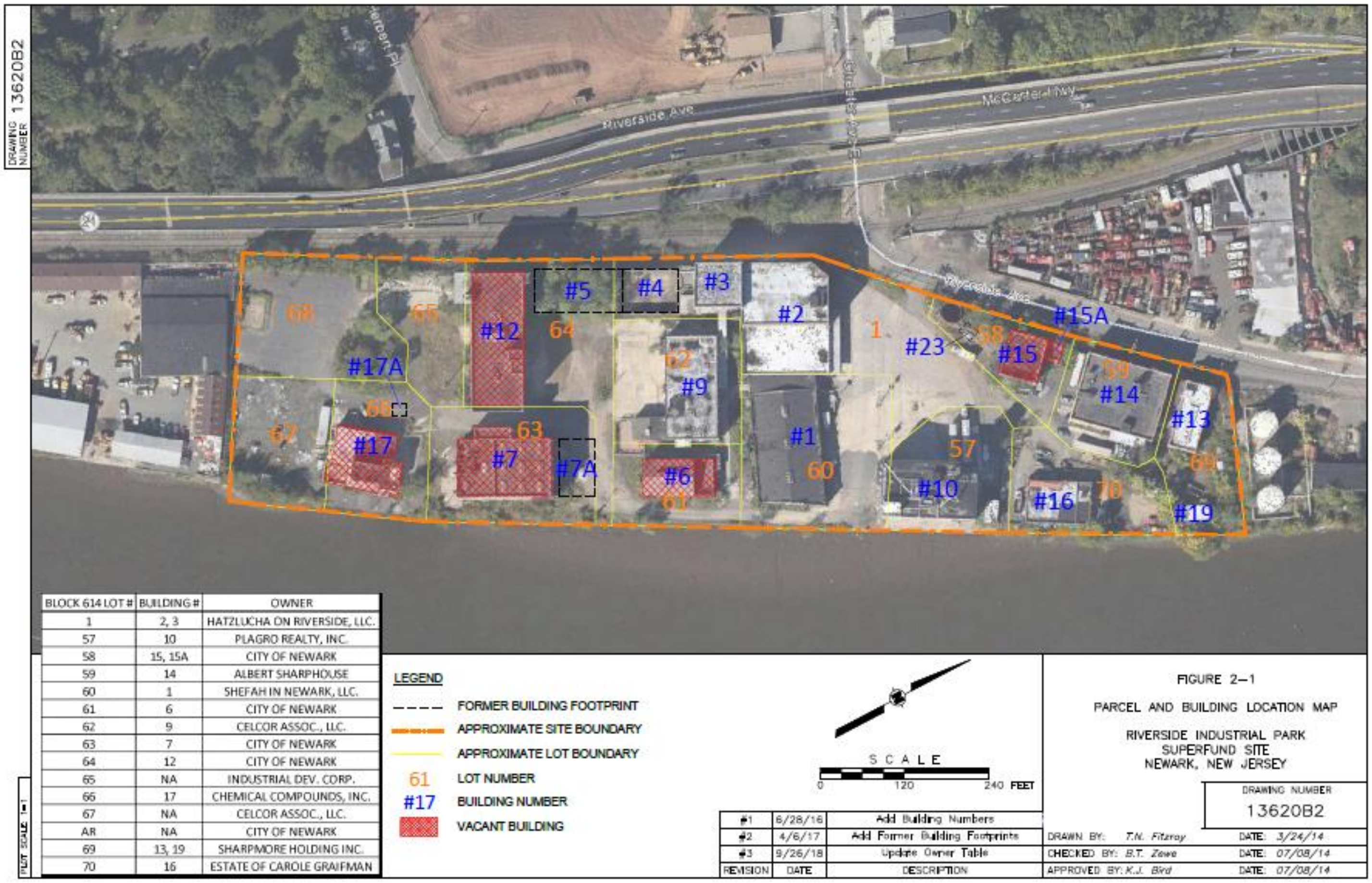
Edison, New Jersey 08837-3679



BLOCK 614 LOT #	BUILDING #	OWNER
1	2, 3	HATZLUCHA ON RIVERSIDE, LLC.
57	10	PLAGRO REALTY, INC.
58	15, 15A	CITY OF NEWARK
59	14	ALBERT SHARPHOUSE
60	1	SHEFAH IN NEWARK, LLC.
61	6	CITY OF NEWARK
62	9	CELCOR ASSOC., LLC.
63	7	CITY OF NEWARK
64	12	CITY OF NEWARK
65	NA	INDUSTRIAL DEV. CORP.
66	17	CHEMICAL COMPOUNDS, INC.
67	NA	CELCOR ASSOC., LLC.
AR	NA	CITY OF NEWARK
69	13, 19	SHARPMORE HOLDING INC.
70	16	ESTATE OF CAROLE GRAIFMAN

Figure 1: Map of Riverside Industrial Park Superfund Site

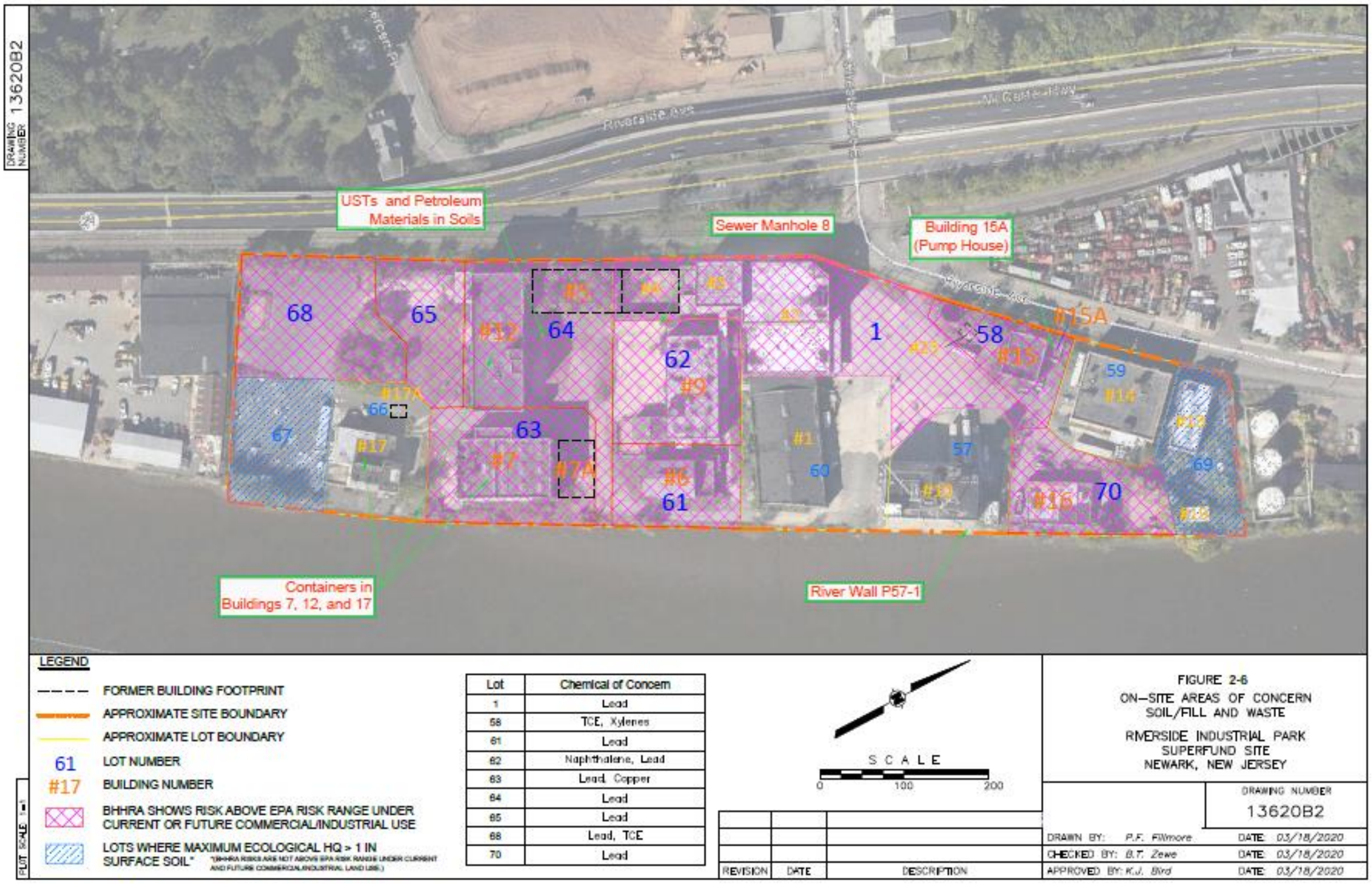


Figure 2: Map of Areas of Concerns for the Site

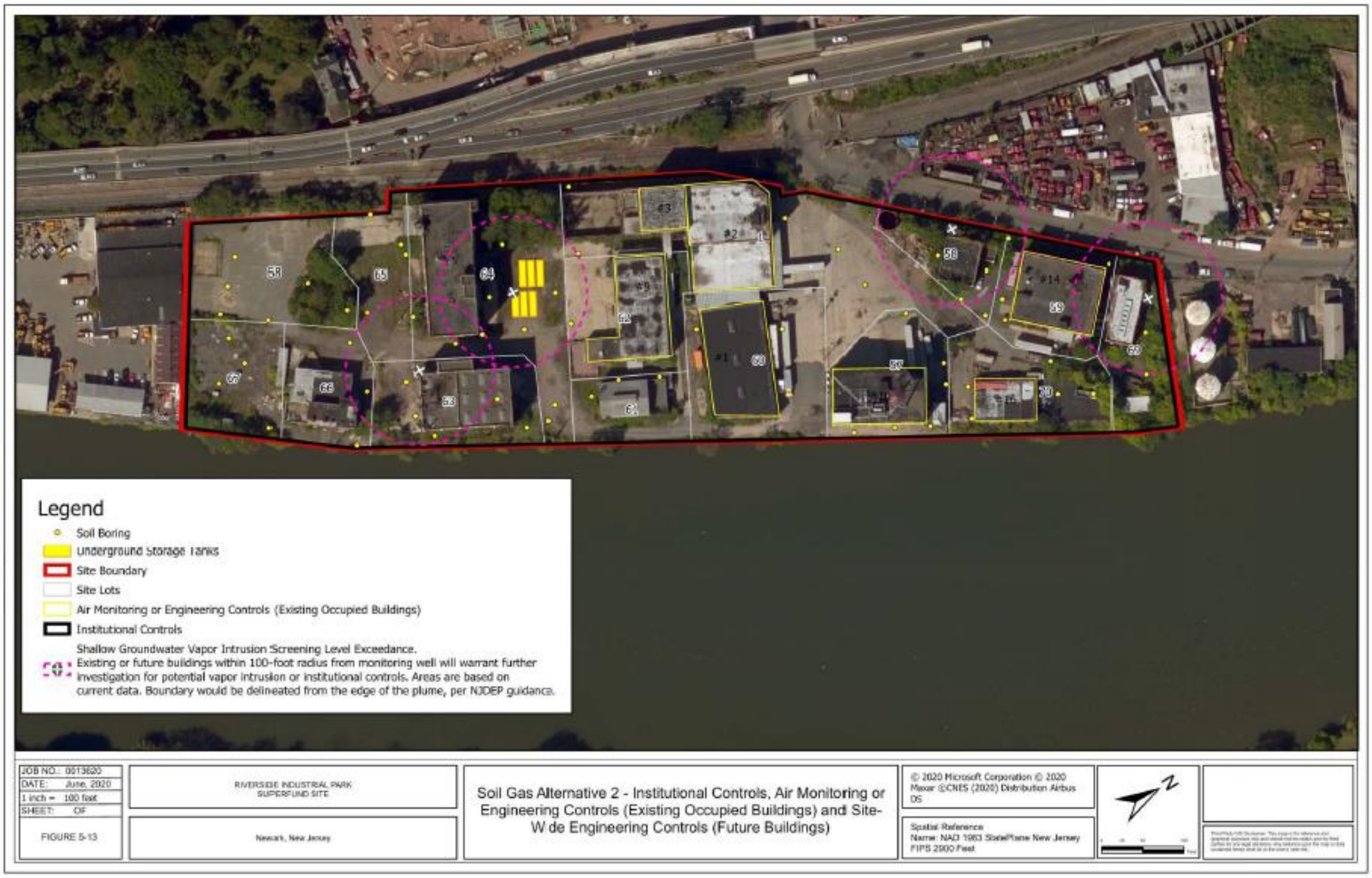


Figure 3: Map of Preferred Soil Gas Alternative

Figure 4: Map of Preferred Soil/Fill Alternative

Figure 5: Map of Preferred Groundwater Alternative