Hercules, Inc. (Gibbstown Plant) Superfund Site

Gibbstown, New Jersey

Superfund Proposed Plan *July 2018*

PURPOSE OF THIS DOCUMENT

This document describes the remedial alternatives considered for the first and second operable units (OUs) of the Hercules, Inc. (Gibbstown Plant) Superfund Site (Site) and identifies the preferred remedy for those operable units, with the rationale 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 July 2018 remedial investigation (RI) report and feasibility study (FS) report, respectively. 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 as a supplement to the RI/FS reports to inform the public of EPA's and NJDEP's preferred remedy and to solicit public comments pertaining to all the remedial alternatives evaluated, including the preferred alternative. The preferred remedy consists of extraction of contaminated groundwater with on-Site treatment and long-term monitoring; excavation of lead-contaminated soil with off-Site disposal; excavation of volatile organic compound (VOC)-contaminated soil located 0-4 feet (ft.) below the ground surface (bgs) and treatment with ex-situ bioremediation and on-Site reuse; enhanced in-situ biodegradation of VOC-contaminated soil situated below 4 ft. bgs; hydraulic dredging of contaminated sediment with on-Site phytoremediation[1] and reuse; and institutional controls (ICs). [2]

The remedy described in this Proposed Plan is the preferred remedy for the Site. Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all the alternatives considered in the Proposed Plan and in the detailed analysis section of the FS report because EPA and NJDEP may select a remedy other than the preferred remedy.

[1] Phytoremediation is a process that uses living plants to remove, destroy or contain contaminants in environmental media.

[2] ICs are non-engineered controls, such as property or groundwater use restrictions placed on real property by recorded instrument 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.

MARK YOUR CALENDAR

July 30, 2018 – August 28, 2018: Public comment period related to this Proposed Plan.

August 16, 2018 at 7:00 p.m.: Public meeting at the Municipal Court Meeting Room, 2nd Floor, 21 N. Walnut Street, Gibbstown, NJ

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

Gloucester County Library System
Greenwich Township Branch
411 Swedesboro Road
Gibbstown, NJ 08027
856-423-0684

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

https://www.epa.gov/superfund/hercules-gibbstown

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 this Proposed Plan have been made available to the public for a public comment period that begins on **July 30, 2018** and concludes on **August 28, 2018**.

A public meeting will be held during the public comment period at the Municipal Court Meeting Room, 2nd Floor, 21 N. Walnut Street, Gibbstown, NJ on **August 16, 2018 at 7:00 p.m.** to present the conclusions of the RI/FS, to elaborate further on the reasons for recommending the preferred remedy and to receive public comments.

Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary section of the 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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SCOPE AND ROLE OF ACTION

Site remediation activities are sometimes segregated into different phases, or OUs, so that remediation of different aspects of a site can proceed separately, resulting in a more expeditious cleanup of the entire site.

The Site is being addressed by the EPA in three OUs. This Proposed Plan describes EPA's preferred remedial action for OU1, which addresses contaminated groundwater in the Former Plant Area, and for OU2, which addresses contaminated soil in the Former Plant Area and contaminated sediment in Clonmell Creek and the Stormwater Catchment Basin. The primary objectives of this action are to remediate the sources of groundwater, soil, and sediment contamination, minimize the migration of contaminants and minimize any potential future health and environmental impacts.

The third OU (OU3) addresses tar and mixed waste in the Solid Waste Disposal Area (SWDA). A remedial action for OU3 was selected by NJDEP in 1996 and included waste consolidation and capping, long-term groundwater monitoring, periodic inspections and ICs. The OU3 remedial action was completed in 2014 and maintenance of the cap is being performed under NJDEP oversight. EPA is conducts five- year reviews (FYRs) to ensure that the OU3 remedy continues to be protective of human health and the environment. The first FYR was conducted in 2015.

SITE BACKGROUND

Site Description

The Site, a former chemical manufacturing facility, is situated on approximately 350 acres located off South Market Street in Gibbstown, Gloucester County, New Jersey. The Site is bounded to the east by Paulsboro Refining Company, LLC, to the west by open land historically owned by E.I. du Pont de Nemours and Company (DuPont), to the north by the Delaware River, and to the south and southwest by residences. Area homes are served by municipal water supply wells.

Clonmell Creek flows northwest through the Site property toward the Delaware River. On the Site property, the creek ranges from 75 to 120 feet (ft.) wide and 0.25 to 3 ft. deep and separates the two primary areas of the Site -- the SWDA located to the north and the Former Plant Area located to the South.

The SWDA is situated approximately 2,000 ft. north of Clonmell Creek and covers nearly five acres. It is surrounded by wetlands and sits adjacent to the Delaware River.

The "Former Plant Area," the manufacturing portion of the facility during its operational period, occupies approximately 80 acres. An unlined stormwater retention pond, referred to as the "Stormwater Catchment Basin," is located within the Former Plant Area, about 600 ft. south of Clonmell Creek. The Stormwater Catchment Basin ranges in width from approximately 64 ft. on its south end to 125 ft. on the north, and 0.25. to 3 ft. deep, dependent upon precipitation levels. Historically, stormwater collected in the area now known as the Stormwater Catchment Basin and flowed through the 002 outfall (which was an NJDEP-permitted discharge point) into an adjacent drainageway before discharging into Clonmell Creek. However, there has been no connection between the Stormwater Catchment Basin and Clonmell Creek since 1991 (see Figure 1).

The Former Plant Area was divided into the following RI investigation areas, referred to as exposure areas: Active Process Area, Area A/Open Area, Area B, Chemical Landfill/Gravel Pit Area, Clonmell Creek and Wetlands, Inactive Process Area, Northern Chemical Landfill Area, Northern Warehouse Area, Shooting Range, Stormwater Catchment Basin Area, Tank Farm/Train Loading Area, and Township Refuse Area (see Figure 2). The Shooting Range exposure area is currently being used by the Township of Greenwich Police Department as a shooting range.

Site History

Before the property was transferred to Hercules Incorporated (Hercules) in 1952, DuPont reportedly used the area now designated as the SWDA and surrounding areas to dispose of lead fragments and tar generated from the production of aniline. In 1952, Hercules acquired title to the Site property from DuPont. Construction of the manufacturing plant began in 1953 and the plant was fully operational by 1959. Phenol and acetone were manufactured at the facility until 1970. After 1970, the plant produced three primary products — cumene hydroperoxide, diisopropylbenzene and dicumyl peroxide, which are compounds used in phenol and acetone production. Hercules used the SWDA from 1955 until 1974 to dispose of wastes generated from its manufacturing activities.

In 2010, the plant was decommissioned and the above-ground facility structures were demolished, except for a groundwater treatment system, a former administrative building and two surface impoundments. Significant subsurface sewer lines, process piping, and utilities associated with the former manufacturing facility remain in portions of the Active Process Area and Inactive Process Area. These structures were abandoned in place and filled with concrete.

In 1981, the U.S. Geological Survey released a report documenting the detection of benzene in a Site production well. Based upon this finding, Hercules, under NJDEP oversight, conducted additional groundwater studies, which led to the discovery of other Site-related chemicals in groundwater at the Site. Because of the contamination identified in the groundwater and the tar and other debris disposed of in the SWDA, the Site was added to the National Priorities List in December 1982.

In 1984, as an interim remedy, Hercules installed a groundwater extraction and treatment system to prevent contaminated groundwater from migrating off-property. The system was upgraded in 2008. Operation of the system is on-going and will continue until a final OU1 remedy is selected.

In 1986, Hercules entered into an Administrative Consent Order with NJDEP to perform an RI/FS in the SWDA and adjacent areas. Based upon the results of the OU3 RI, conducted between 1987 and 1993, NJDEP issued a ROD in 1996, selecting a remedy for OU3. The major components of the remedy include consolidation of tar material and miscellaneous solid wastes under an impermeable cap; implementation of engineering controls and ICs, such as fencing and environmental use restrictions; and the establishment of a Classification Exception Area (CEA)[3] for groundwater beneath and surrounding the SWDA. The OU3 remedial action was completed in 2014. Routine maintenance of the SWDA is performed by Hercules.

Under NJDEP oversight, Hercules initiated an RI/FS in 1987 to determine the nature and extent of contamination associated with OU1 and OU2. EPA assumed the enforcement lead for OU1 and OU2 in 2008 and in 2009, EPA entered into an AOC with Hercules for the completion of the RI/FS. RI/FS activities included the installation of monitoring wells and collection of soil and groundwater samples from the Former Plant Area; sediment, surface water, pore water and soil samples from the Stormwater Catchment Basin, at the 002 outfall, in the adjacent drainageway and in Clonmell Creek and its associated wetlands; geological, hydrogeological and residential vapor intrusion[4] investigations; preparation of a numerical groundwater flow model; human health and ecological risk assessments; and various treatability studies.

SITE HYDROGEOLOGY

Site Hydrogeology

The Site geology is characterized by the presence of thick unconsolidated sand, silt, gravel, and clay layers. The regional aquifer system, supplying water resources to Greenwich Township and the surrounding area, is generally considered to consist of three aquifers (Upper Middle, Lower Middle and Lower), which are separated by two confining units. At the Site, alluvial deposits overlie the regional aquifer. The “shallow” monitoring well network is screened into these deposits which range from 0 to 25 ft. bgs; the “intermediate” monitoring well network is screened in the Upper Middle aquifer, ranging from 25 to 75 ft. bgs; and the “deep” monitoring wells are screened in the Lower Middle aquifer, which ranges from 80 to 120 ft. bgs. The depth to groundwater in the Former Plant Area ranges between 8 and 10 ft. bgs.

Regional groundwater (intermediate and deep depths) generally flows from north to south, exhibiting some influence from conditions in the Delaware River. Groundwater at the Site flows to the south and downward, which results in shallow aquifer groundwater contamination flowing into the underlying intermediate aquifer and subsequently into the deep aquifer. A network of existing groundwater recovery wells that pump from the shallow, intermediate and deep aquifers, currently maintains hydraulic containment of the contaminated groundwater beneath the Site.

RESULTS OF THE REMEDIAL INVESTIGATION

Based upon the results of the RI, EPA has concluded that VOCs are the predominant contaminants in the Former Plant Area groundwater and soils and the Clonmell Creek and Stormwater Catchment Basin sediments. The contaminants of concern (COCs) identified for the Site are listed below in Table 1.

Table 1: Site COCs	
acetophenone	ethylbenzene
benzene	lead
cumene	phenol
toluene	

Benzene and cumene were found to be the most prevalent of the COCs present at the Site. Acetophenone, ethylbenzene, phenol and toluene are compounds typically associated with benzene and cumene and were only found to be present at the Site collocated with benzene and cumene. Trichloroethylene

[3] A CEA serves as an IC by providing notice that there is ground water pollution in a localized area caused by a discharge at a contaminated site.

[4] Vapor intrusion is a process by which VOCs move from a source below the ground surface (such as contaminated groundwater) into the indoor air of overlying or nearby buildings.

(TCE) and 1,2-dichloroethane (DCA) were detected at concentrations exceeding the RI screening values in the monitoring wells located in the downgradient areas of the property, in the groundwater recovery wells associated with the extraction and treatment system and in wells located off-property. EPA has determined, however, that TCE and 1,2-DCA are not Site-related and, therefore, are not COCs. Based upon these findings, the following discussion of the RI results will primarily focus on benzene and cumene.

Soil

Soil samples were collected in each of the exposure areas, both above (unsaturated) and below (saturated) the water table. Benzene and cumene were found to be present at levels exceeding RI screening values in the soils of the Active Process Area, Chemical Landfill/Gravel Pit, Inactive Process Area, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas. However, the bulk of the cumene and benzene is present in the Active Process Area saturated soils (to a depth of 17.5 ft.), either adsorbed to soil particles or as non-aqueous phase liquid (NAPL).[5]

The concentrations of benzene, cumene and collocated COCs found in the Site soils are an on-going source of contamination to the groundwater and are considered to be principal threat wastes. Principal threat wastes are materials that include or contain hazardous substances, pollutants or contaminants that act as a reservoir for the migration of contamination to groundwater, surface water or air or act as a source for direct exposure. The cumene and benzene sampling results for each of the exposure areas are summarized below in Tables 2 and 3.

Table 2: Maximum Soil Concentrations (mg/kg)		
Unsaturated		
	Benzene	Cumene
Active Process Area	58	17,000
Chemical Landfill/Gravel Pit	80	11,000
Inactive Process Area	27	2,500
Northern Chemical Landfill	0.55	1,295
Stormwater Catchment Basin	831	2,200
Tank Farm/Train Loading Area	1,292	35,439

Table 3: Maximum Soil Concentrations (mg/kg)		
Saturated		
	Benzene	Cumene
Active Process Area	4.8	200,000
Inactive Process Area	0	5,500
Northern Chemical Landfill	0	460
Stormwater Catchment Basin	130	1,700
Tank Farm/Train Loading Area	0.3	2,400

RI sampling results indicate the presence of lead in the Township Refuse Area and Shooting Range soils at concentrations as high as 2,300 mg/kg. Additional delineation of the lead contamination in these exposure areas is needed.

Sediment

Because no ecological screening value is available for cumene in sediment, a Site-specific value of 120 mg/kg was calculated for the RI. This value was developed based on information obtained from several studies related to cumene toxicity on aquatic organisms.

Sediment samples were collected throughout the Stormwater Catchment Basin (including the adjacent drainageway) and within the on-Site reach of Clonmell Creek (including the 002 outfall area). Upstream and downstream sediment samples were also obtained from Clonmell Creek. Samples were collected down to 3 ft. in the Stormwater Catchment Basin, 0.5 ft. in the drainageway and 5 ft. in Clonmell Creek.

Cumene concentrations were detected throughout the Stormwater Catchment Basin, ranging from 0.00059 to 710 mg/kg and extending down to 3 ft. in the central area of the basin. Cumene was detected in on-Site Clonmell Creek sediment at depths ranging from 0.5 to greater than 4 ft., and at concentrations ranging from 0.0014 to 240,000 mg/kg. Cumene was not detected at concentrations exceeding the screening value in downgradient samples collected from Clonmell Creek on the adjacent DuPont property.

Surface Water

Surface water samples were collected throughout the Stormwater Catchment Basin (including the adjacent drainageway) and within the on-Site reach of Clonmell Creek (including the 002 outfall area). No COCs were detected above the RI screening values.

[5] 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 contamination.

Groundwater

Groundwater has been monitored both on and off the property since 1984. A total of 92 monitoring wells are sampled on an annual basis, with 28 of the 92 wells being sampled quarterly. Benzene and cumene concentrations exceeding RI screening values were detected in the shallow, intermediate and deep aquifers. The most significant benzene and cumene detections were in the shallow aquifer in the Active Process Area, Stormwater Catchment Basin and Northern Chemical Landfill exposure areas. Maximum concentrations detected in each of these exposure areas are presented in below in Table 4.

Table 4: Maximum Groundwater Concentrations (μg/L)		
	Benzene	Cumene
Active Process Area	35,000	47,000
Stormwater Catchment Basin	160	130
Northern Chemical Landfill	200	30,000

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 contamination in the absence of any remedial action or controls (see the "What is Human Health Risk and How is it Calculated?" textbox, to the right).

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

Human Health Risk Assessment

The human health risk estimates summarized below are based on current reasonable maximum exposure scenarios and were developed by considering various conservative estimates about the frequency and duration of an individual's exposure to the COCs, as well as the toxicity of these contaminants.

The Site property is currently zoned for commercial/industrial use and it is not anticipated that the land use designation will change in the future. The baseline risk assessment identified the current and potential future receptors that may be affected by contamination at the Site, the pathways by which these receptors may be exposed to Site contaminants in various environmental media, and the parameters by which these

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 1×10^{-4} cancer risk means a "one in ten thousand excess cancer risk;" or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 1×10^{-4} to 1×10^{-6}, corresponding to a one in ten thousand to a one in a million-excess cancer risk. For non-cancer health effects, a "hazard index" (HI) is calculated. The key concept for a non-cancer HI is that a threshold (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site and are referred to as COCs in the ROD.

exposures and risks were quantified. The receptors evaluated under the current/future scenarios included outdoor industrial workers, construction/utility workers,trespassers, residents (vapor intrusion), recreational youth, recreational hikers, recreational hunters and recreational anglers.[6] Future scenarios also considered the exposure of indoor workers and on- and off-Site residents to groundwater as drinking water.

The risks associated with potential exposures to Site soils, surface water, and sediments, as well as groundwater, on- and off-property, were assessed. The area is served by municipal water, therefore, it is not likely that the groundwater underlying the Site will be used for potable purposes in the foreseeable future. However, potential exposure to groundwater was evaluated because regional groundwater is designated as a drinking water source.

The potential for off-Site indoor air vapor intrusion into nearby residences, was also evaluated by EPA and determined not to warrant further assessment. However, because no buildings were present on-Site at the time of the vapor intrusion investigation and VOCs are present in Site soils and groundwater above RI screening values, a deed notice will be placed on the property requiring that future on-Site buildings either be constructed with a vapor barrier or be evaluated for the vapor intrusion pathway prior to occupancy and periodically (*e.g.*, annually) until EPA determines that the pathway is incomplete.

The following exposure pathways resulted in excess lifetime cancer risks that exceed EPA's target risk range of $1x10^{-4}$ to $1x10^{-6}$: current/future outdoor industrial workers (Sitewide: $3x10^{-4}$) as a result of direct contact with benzene and cumene in the shallow aquifer and future on-Site residents (Active Process Area: up to $8x10^{-3}$, Northern Chemical Landfill Area: up to $2x10^{-4}$ and Tank Farm/Train Loading Area: up to $2x10^{-4}$) as a result of direct contact with benzene, cumene, phenol, TCE and 1,2-DCA in the intermediate/deep aquifer.[7]

The following exposure pathways resulted in a noncancer hazard index (HI) greater than the EPA threshold value of one: future residents (Active Process Area: HI up to 168 for children) as a result of ingestion of benzene, cumene, phenol and 1,2-DCA in the intermediate/deep aquifer, current/future outdoor industrial workers (Sitewide: HI of 8.8 and Inactive Process Area: HI up to 11.6) and current/future construction/utility workers (Sitewide: HI of 3.2, mainly resulting from exposure in the Inactive Process Area) as a result of dermal contact with benzene and cumene in the shallow aquifer.

The following modeled exposure pathways resulted in elevated blood lead levels [over 5 migrograms per deciliter (μg/dL)] as a result of direct contact with lead in soils: outdoor industrial workers in the Shooting Range exposure area (11.8 μg/dL) and Township Refuse Area (6.3 μg/dL) and construction/utility workers in the Shooting Range exposure area (17.2 μg/dL) and Township Refuse Area (7.9 μg/dL).

Ecological Risk Assessment

Sediment, surface water, pore water and soil samples were collected as part of the ecological risk assessment. The areas of the Site evaluated in the BERA include the Stormwater Catchment Basin (including at the 002 outfall and within the adjacent drainageway), Clonmell Creek and the adjacent wetland area. Aquatic plants, benthic invertebrates and fish, and semi-aquatic mammals and birds were assessed in the Stormwater Catchment Basin (including at the 002 outfall and within the adjacent drainageway) and in Clonmell Creek. In the wetland area, terrestrial plants and invertebrates along with terrestrial mammals and birds were evaluated. Toxicity testing and macroinvertebrate surveys were also conducted to support the BERA.

Measurement endpoints consisted of a comparison of estimated or measured exposure levels of contaminants to levels reported to cause adverse effects, evaluation of macroinvertebrate community metrics, sediment toxicity testing results, and comparison of observed effects at the site with those observed at reference locations. The results for each ecological area evaluated in the BERA are summarized below.

The results of the macroinvertebrate survey in the Stormwater Catchment Basin indicated a slight to moderate impairment of the benthic community. Toxicity testing indicated a significant decrease in survival compared to the reference location. The potential for adverse effects to semi-aquatic mammals and birds is negligible.

The results of the macroinvertebrate survey in the drainageway indicated the presence of a slightly impaired benthic community with marginal habitat quality. No significant toxicity was observed and risk to mammalian and avian receptors is considered negligible.

The results of the macroinvertebrate survey in Clonmell Creek suggest a moderately impaired benthic community at several locations and suboptimal habitat quality at most locations. Toxicity testing results at several sampling

[6] Recreational anglers were evaluated because Clonmell Creek is fishable, however, access controls are in-place to prevent fishing on-Site.

[7] Phenol is present in the Active Process Area and Tank Farm/Train Loading Area groundwater at levels that pose a human health exposure risk. Although TCE is present in the Tank Farm/Train Loading Area groundwater and 1,2-DCA is present in the Active Process Area groundwater at levels that pose a human health exposure risk, EPA has determined that these contaminants are not Site-related, and therefore, are not COCs.

locations indicated a significant decrease in survival compared to the reference location. Unacceptable risk to mammalian receptors was identified, primarily due to exposure to cumene.

In the Clonmell Creek Wetland Area, the likelihood of adverse effects to terrestrial plants and invertebrates, mammals and birds exposed to contaminants in wetlands soils is essentially non-existent.

The BERA concluded that there is a potential for adverse ecological effects associated with Site contaminants in the sediments of the Stormwater Catchment Basin and in Clonmell Creek, in the vicinity of the 002 outfall.

Based upon the results of the RI and risk assessments, EPA has determined that actual or threatened releases of hazardous substances from the Site, if not addressed by the preferred remedy or one of the other active measures considered, may present a current or potential threat to human health and the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and site-specific risk-based levels.

The following RAOs were established for the Site:

- Protect human health by preventing exposure to contaminated groundwater, soil and soil vapor;
- Prevent off-Site migration of contaminated groundwater;
- Minimize exposure of fish, biota and wildlife to contaminated sediments;
- Mitigate potential for contaminant migration from soils into groundwater and surface water; and
- Restore groundwater to levels that meet state and federal standards within a reasonable time frame.

EPA and NJDEP have promulgated maximum contaminant limits (MCLs) and NJDEP has promulgated groundwater quality standards (GWQSs), which are enforceable, health-based, protective standards for various drinking water contaminants. The more stringent of the MCLs and GWQSs will be used as the preliminary remediation goals (PRGs) for the COCs in the Site groundwater.

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.

The more stringent of the NJDEP nonresidential direct contact soil remediation standards (NRDCSRSs) and the NJDEP default impact to groundwater soil remediation standards (IGWSRS) will be used as the Site PRGs for the unsaturated soils. Because there is no default IGWSRS established for cumene, a Site-specific value was developed using the NJDEP Soil-Water Partition Equation Calculator (back calculated from either the MCL or GWQS). The NJDEP NRDCSRSs will be used as the Site PRGs for the saturated soils. When no NRDCSRS is available, the EPA RSL for industrial soil will be used.

As discussed above, because there is no screening value available for cumene in sediment, a Site-specific value of 120 mg/kg was developed for comparison with the RI sampling results. In lieu of developing a Site-specific sediment cleanup criterion for cumene, a mass-removal based approach will be used to ensure that the RAO of minimizing exposure of fish, biota and wildlife to contaminated sediments is achieved. The goal for cumene mass removal is 100% for the Stormwater Catchment Basin and 99% for Clonmell Creek.

The PRGs established for the Site COCs are identified in Table 5 below.

Table 5: Site PRGs

COC	Unsaturated Soil (mg/kg)	Saturated Soil (mg/kg)	Groundwater (mg/L)
acetophenone	3	5	700
benzene	0.005	5	1
cumene	28	990	700
ethylbenzene	13	25	700
lead	90	800	5
phenol	8	25,000	2,000
toluene	7	4,700	600

EPA has determined that the COCs acetophenone, ethylbenzene and toluene, which were found at the Site collocated with the primary COCs, cumene and benzene, do not pose a human health exposure risk. These contaminants are COCs because they are present at concentrations that exceed the ARARs.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA §Section121(b)(1), 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, comply with ARARs, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives, to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA 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. To facilitate the presentation and evaluation of the alternatives, the FS report alternatives were reorganized in this Proposed Plan to formulate the remedial alternatives discussed below.

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

A number of studies were conducted during the RI to evaluate the use of various treatment techniques and processes to address the contamination at the Site. A treatability study was conducted in the Active Process Area exposure area to evaluate the use of both aerobically- and anaerobically-enhanced biodegradation to treat source-area soils. Because the study results showed that anaerobically-enhanced biodegradation resulted in greater cumene concentration reductions, only anaerobic processes were considered for in-situ soil treatment.

An air sparging/soil vapor extraction pilot test was also performed in the Active Process Area. Based upon the results of the study, it was concluded that the heterogeneity of the soil conditions at the Site resulted in preferential flow paths in the subsurface lithology that inhibited the effective treatment of air flow through the saturated soil. Because this would likely limit the effectiveness of the treatment technology, this technology was eliminated from further consideration.

In addition, a pilot study was conducted in Clonmell Creek to evaluate the use of hydraulic dredging versus mechanical excavation for the removal of contaminated sediments. Hydraulic dredging was determined to be the more suitable of the two removal techniques because of its ability to target the unconsolidated sediments rather than the underlying clay, its ability to minimize fugitive emissions and downstream sediment transport, and the minimal impact that it has on the surrounding wetland area. Therefore, only hydraulic dredging is considered for the sediment alternatives involving dredging.

Along with the pilot study, a 12-month treatability study was conducted on the dredged material to evaluate the viability of utilizing phytoremediation for the treatment of the cumene-contaminated sediments at the Site. Phytoremediation can occur through several mechanisms, including stabilization, accumulation, volatilization, degradation, and rhizosphere biodegradation. During the study period, plants were allowed to grow in the dredged sediment. At the end of the study period, sediment and plant tissue samples (above- and below-ground) were collected. The study results showed that the cumene in the sediment was reduced from concentrations ranging from 18 to 98 mg/kg to concentrations ranging from “non-detect” to 0.10 mg/kg. Cumene was not detected in any of the plant tissue samples, indicating that the cumene was destroyed through rhizosphere degradation, which is the breakdown of contaminants in the rhizosphere (soil surrounding the roots of plants) through microbial activity that is enhanced by the presence of plant roots. Based upon these results, it was determined that cumene-contaminated sediments at the Site can effectively be treated using phytoremediation.

As was noted above, for more than 30 years, a groundwater extraction and treatment system has been operated at the Site as an interim action. This system has successfully reduced contaminant concentrations in the groundwater and prevented contaminated groundwater from migrating off-property. Because of the effectiveness of the existing system and the anticipated removal of the contaminant source under an active soil remedial alternative, additional groundwater alternatives to address this groundwater contamination were not considered. The remedial alternatives are summarized below.

Soil Alternative S-1: No Action

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

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative for soil does not include any physical remedial measures that address the soil contamination at the Site. Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain contaminated soils.

Soil Alternative S-2: Excavation with Off-Site Disposal and Enhanced In-Situ Biodegradation

Capital Cost:	$11,183,360
Annual OM&M Cost:	$248,181
Present-Worth Cost:	$12,191,308
Construction Time:	12 months

Under this alternative, the soils in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas with COC concentrations exceeding the PRGs would be excavated to a depth of 4 ft. bgs in preparation for the enhanced in-situ biodegradation process discussed below. As noted above, significant subsurface structures remain in the Active Process Area and Inactive Process Area. Because the presence of these structures would make excavation impracticable, a limited volume [approximately 500 cubic yards (CY)] of the soils in these exposure areas exceeding the PRGs would be treated in-situ rather than being excavated.

The soil in the Township Refuse Area with lead concentrations exceeding the PRGs would be excavated. A Best Management Practices (BMP) plan would be developed and implemented to manage lead and minimize contamination of the Shooting Range exposure area while the shooting range remains active. If the shooting range becomes inactive, delineation of the lead contamination would be performed and the soils the in the Shooting Range exposure area with lead concentrations exceeding the PRGs would be excavated and disposed of off-Site.

An estimated 13,804 CY of contaminated soil would be excavated under this alternative, consisting of 1,052 CY[8] of lead-contaminated soil and 12,752 CY of soil contaminated with benzene, cumene and collocated COCs.

The contaminated soil would be excavated using standard construction equipment, such as backhoes and track excavators. The excavated soil would be placed directly onto a dump truck and transported to an on-Site staging area. The staging area would be designed with proper controls, including, but not limited to, an impermeable liner, to maintain containment of the excavated soils and prevent any impacts to the surrounding soil and groundwater. The lead-contaminated soils would be segregated from other soils at the staging location because they may require disposal at a different facility. The excavated soil would then be sampled and transported off-Site for treatment and/or disposal at a Resource Conservation and Recovery Act (RCRA)-compliant facility.

[8] The estimated soil excavation volumes and associated costs do not include the lead-contaminated soil in the Shooting Range exposure area.

Post-excavation sampling would be conducted to identify/confirm the areas where the PRGs are exceeded in the soils situated below 4 ft. bgs These soils (saturated and unsaturated) would be treated using enhanced in-situ biodegradation. Enhanced in-situ biodegradation would involve applying a magnesium sulfate solution to the contaminated soils to stimulate activity and reproduction in naturally-occurring anaerobic microorganisms. The microorganisms would then destroy or transform the COCs into less toxic compounds by using them as a food and energy source. Because the extent of the contamination is much greater and deeper in the Active Process Area and Inactive Process Area than in the other exposure areas, application of the anaerobic treatment solution would be achieved using lateral infiltration galleries, consisting of perforated piping installed at the base of the excavated areas. The solution would be applied directly to the base of the excavations in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas. The final design criteria for the infiltration galleries would be detailed in the remedial design.

Certified clean soil, meeting applicable state regulations, would be imported and used to backfill excavated areas and construct an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. Vegetation would be placed in areas disturbed during excavation activities to stabilize the soil and maintenance of the soil cover would be performed.

Performance and compliance monitoring would be conducted to determine residual contaminant concentrations and assess the need for additional treatment. The estimated timeframe to achieve the RAOs and meet the PRGs under this alternative is 10 years. An IC, in the form of a deed notice, would be put in place to prevent intrusive activities in in-situ treatment areas until the PRGs are met.

Soil Alternative S-3: Excavation with Off-Site Disposal, Ex-Situ Bioremediation/Reuse and Enhanced In-Situ Biodegradation

Capital Cost:	$5,198,118
Annual OM&M Cost:	$248,181
Present-Worth Cost:	$6,206,066
Construction Time:	18 months

Under this alternative, the contaminated soils would be excavated as detailed above for Alternative S-2. The volumes and on-Site handling of excavated soils and the backfilling of excavated areas with certified clean fill would be the same as for Alternative S-2, the lead-contaminated soil from the Township Refuse Area would be transported to an off-Site treatment and/or disposal facility. This alternative would also include the development and implementation of a BMP plan in the Shooting Range, as described in Alternative S-2.

The soils excavated from the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas would be treated on-Site using ex-situ bioremediation instead of being transported of-Site for treatment/disposal. Conventional methods of ex-situ bioremediation include biopiles/composting, landfarming with tilling, phytoremediation or a combination of these methods. All methods were evaluated in the FS and biopiles/composting was determined to be the most suitable for application at the Site.

The excavated soil would be mixed with soil amendments, formed into piles and aerated, either passively or actively (using blowers or vacuum pumps). As part of the remedial design, an analysis would be performed to confirm that the average VOC concentrations that may be generated and released from ex-situ treatment of the soils would not exceed applicable state and federal air emissions standards. If air emissions controls are determined to be necessary based upon these calculations, then those controls would be detailed in the remedial design. In addition, vapors from the VOCs in the biopiles that volatilize into the air would be monitored to protect Site workers and ensure that state and federal air emission standards are not exceeded. Post-remedial sampling would be conducted to ensure that the PRGs are met.

The ex-situ-remediated soils would be reused on-Site as part of an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. Vegetation would be placed in areas disturbed during excavation activities to stabilize the soil and maintenance of the soil cover would be performed for a period of 15 years.

The contaminated soils situated below 4 ft. bgs in the excavated areas would be treated using enhanced in-situ biodegradation, as described in Alternative S-2. The estimated timeframe to achieve the RAOs and meet the PRGs under this alternative is 10 years. An IC, in the form of a deed notice, would be put in place to prevent intrusive activities in in-situ treatment areas until the PRGs are met.

Sediment Alternative SED-1: No Action

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

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative for sediment does not include any physical remedial measures that address the sediment contamination at the Site.

Because this alternative would result in cumene remaining in the sediments above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to remove, treat, or contain contaminated sediments.

Sediment Alternative SED-2: Hydraulic Dredging with Off-Site Disposal

Capital Cost:	$4,086,780
Annual OM&M Cost:	$0
Present-Worth Cost:	$4,086,780
Construction Time:	12 months

Under this alternative, a hydraulic dredge would remove a mixture of contaminated sediment and water (referred to as slurry) from the bottom surfaces of the Stormwater Catchment Basin and Clonmell Creek. The work area would be enclosed with silt curtains to prevent downstream migration of contaminated sediment during dredging activities. Also, the surface water outside the work area would be monitored to ensure that contaminated sediments are not being resuspended in the water column and transported downstream.

The slurry would be transferred via pipeline into geotextile tubes (located in a staging area) for dewatering. The staging area would be designed with proper controls, including but not limited to an impermeable liner, to prevent any impacts to the surrounding soil and groundwater and maintain containment of the dredged sediments and effluent water from the geotextile tubes.

The effluent would be sampled and, if necessary, treated on-Site before being discharged to the Stormwater Catchment Basin in compliance with substantive New Jersey Pollutant Discharge Elimination System (NJPDES) discharge to groundwater permit requirements. The details of the effluent treatment system would be finalized during the remedial design. Monitoring of groundwater wells around the Stormwater Catchment Basin would be conducted to ensure compliance with substantive permit requirements. The dewatered solids left in the geotextile tubes would be transported off-Site to a RCRA-compliant treatment and/or disposal facility.

As discussed above, because there is no screening value available for cumene in sediment, a Site-specific value of 120 mg/kg was developed for comparison with the RI sampling results. In lieu of developing a Site-specific sediment cleanup value for cumene, the volumes of sediment to be dredged were determined using a mass-removal approach. It is estimated that 1,225 CY of sediment from the Stormwater Catchment Basin and 7,275 CY of sediment from Clonmell Creek would be dredged. These volumes represent removal of 100 percent of the cumene mass in the Stormwater Catchment Basin sediment and approximately 99 percent of the cumene mass within the Clonmell Creek sediment and include all the sediment identified in the BERA as posing a risk to ecological receptors. The estimated timeframe to achieve RAOs under this alternative is 12 months.

Sediment Alternative SED-3: Hydraulic Dredging with On-Site Treatment/Reuse

Capital Cost:	$1,860,320
Annual OM&M Cost:	$0
Present-Worth Cost:	$1,860,320
Construction Time:	24 months

This alternative is the same as Alternative SED-2, except instead of being transported off-Site for treatment and/or disposal, the dredged sediments would be treated on-Site using phytoremediation and, if necessary, ex-situ bioremediation.

Under this alternative, the geotextile tubes would be located in a treatment area, designed with proper controls, including but not limited to an impermeable liner, to maintain containment of the dredged sediments and prevent any impacts to the surrounding soil and groundwater. Plants would be planted in the cumene-contaminated sediment within the geotextile tubes for a pre-determined growth period[9].

Based upon the results obtained during the phytoremediation pilot study, it is expected that cumene concentrations in the sediment would be reduced to “non-detect.” However, if sampling results indicate that cumene concentrations remain above the PRGs[10] at the end of the growth period, then ex-situ bioremediation, as described above for Alternative S-3, would be used to further treat the sediments.

[9] Additional studies would be conducted during the remedial design phase to refine plant species selection and determine the optimal growth period.

[10] Because the treated sediment would be reused on-Site in an engineered soil cover, the final COC concentrations would need to meet the unsaturated soil PRGs.

The treated sediments would be reused on-Site as part of an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater and control surface water runoff/drainage. The plant residuals would be harvested and composted on-Site. The estimated timeframe to achieve RAOs under this alternative is 18 months.

Groundwater Alternative GW-1: No Further Action

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

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. Under this remedial alternative, operation of the existing groundwater treatment system would be discontinued and no further remedial measures would be taken to address the groundwater contamination at the Site.

Because this alternative would result in contaminants remaining on-Site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years. If justified by the review, remedial actions may be implemented to treat the contaminated groundwater.

Groundwater Alternative GW-2: Extraction with On-Site Treatment and Long-Term Monitoring

Capital Cost:	$409,826
Annual OM&M Cost:	$225,938
Present-Worth Cost:	$3,181,534
Construction Time:	12 months

As discussed above, as an interim remedy, operation of a groundwater extraction and treatment system has been on-going at the Site since 1984. The current system consists of extraction wells and subsurface pipelines that capture and carry contaminated groundwater into a treatment unit (currently housed in an on-Site trailer), with a treatment capacity of 125 gallons per minute (gpm). The treatment process consists of filtration through sand units to reduce iron and suspended solids, followed by transmission through a series of granular activated carbon (GAC) canisters to remove the COCs. The treated groundwater is then pumped through a pipeline and discharged into the Delaware River under a NJPDES discharge to surface water permit. Groundwater quality monitoring is conducted on a quarterly basis to verify that the system continues to maintain hydraulic control of the contaminated groundwater beneath the Site.

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Under this alternative, a new treatment unit, with an approximate treatment capacity of 125 gpm, would be built to replace/upgrade the existing one and a small building would be constructed in the Stormwater Catchment Basin exposure area to house the new treatment unit. The extracted groundwater would be pumped from the existing extraction well infrastructure into an equalization tank within the treatment building and then treated with a polymer. The polymer would be combined with pH adjustment, if necessary, to promote flocculation of iron and other solids in the groundwater.

The groundwater would then be pumped through conventional geotextile tubes followed by GAC-impregnated geotextile tubes, if necessary, to remove iron and solids and treat the COCs. The flocculated iron and solids would be captured in the geotextile tubes. The COCs would partition to the solids in the geotextile tubes where they would biodegrade. The spent tubes would be transported off-Site to a permitted disposal facility. Treated water would be discharged to the groundwater in compliance with substantive NJPDES discharge to groundwater permit requirements (using the Stormwater Catchment Basin as an infiltration point). Long-term groundwater monitoring would be continued until the PRGs are met.

It is estimated that, in combination with active treatment of source-area soils, it would take 10 years to remediate the contaminated groundwater to PRGs under this alternative. However, a conservative 15-year timeframe is used for groundwater monitoring to provide maximum protection of human health and the environment. The groundwater monitoring timeline may be truncated if the PRGs can be met in a shorter timeframe.

ICs would be put in place at the Site, including the establishment of a CEA to prevent groundwater use and the placement of a deed notice on the property, restricting the land use to commercial/industrial and requiring that future buildings on the Site either be subject to a vapor intrusion evaluation or be built with vapor intrusion mitigation systems until the PRGs are met.

Because this alternative would result in contaminants remaining on-Site above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Site be reviewed at least once every five years.

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. The evaluation criteria are described below.

Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or ICs.

Compliance with ARARs addresses whether a remedy 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 refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

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

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

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

Cost includes estimated capital and OM&M costs, and net present-worth costs.

State acceptance indicates if, based on its review of the RI/FS and Proposed Plan, the state concurs with the preferred remedy 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 these alternatives, based upon the evaluation criteria noted above.

Overall Protection of Human Health and the Environment

Alternative S-1 would not be protective of human health because it would not actively address the contaminated soils, which are acting as a source of contamination to the groundwater and pose a human health risk. Alternatives S-2 and S-3 would be protective of human health, because these alternatives would employ a remedial strategy capable of removing/treating the source of groundwater contamination and the threat to public health.

Alternative SED-1 would not be protective of the environment because no action would be taken to eliminate or mitigate ecological exposure to the contaminated sediments in the Stormwater Catchment Basin and Clonmell Creek. Alternatives SED-2 and SED-3 would be protective of the environment because, under these alternatives, the contaminated sediments posing an ecological risk in the Stormwater Catchment Basin and Clonmell Creek would be removed.

Alternative GW-1 would not be protective of human health because it would not prevent off-Site migration or actively treat the contaminated groundwater, which poses a human health risk. Alternative GW-2 would be protective of human health because it would rely upon groundwater extraction to prevent contamination from reaching downgradient receptors and active treatment to restore groundwater quality to levels that meet state and federal standards within a reasonable time frame. The ICs under Alternative GW-2 would provide protection of public health until groundwater standards are met.

Compliance with ARARs

Soil PRGs for the Site were established based on NJDEP's NRDCSRSs and IGWSRS (chemical-specific ARARs) and EPA's RSLs for industrial soil (TBC criteria).

No action would be taken under Alternative S-1 to address contaminated soils. Therefore, this alternative would not achieve the soil PRGs. Alternatives S-2 and S-3 would comply with ARARs because both alternatives would actively remediate contaminated soil to achieve the soil PRGs.

Because Alternatives S-2 and S-3 would involve the excavation of contaminated soils, these alternatives would require compliance with fugitive dust and VOC emission regulations.

Both Alternatives S-2 and S-3 would be subject to state and federal regulations related to the transportation and off-site treatment and/or disposal of wastes.

There are currently no federal or state promulgated standards for contaminant levels in sediments. There are, however, other federal or state advisories, criteria, or guidance (which are used as TBC criteria). Specifically, New Jersey Ecological Screening Criteria (NJESC) are TBC criteria. The primary location-specific ARARs for sediment would be the Freshwater Wetlands Protection Act (NJSA 13:9B-1 *et seq.*) and Flood Hazard Area Control Act Regulations (NJAC 7:13-10 and 11).

Alternative SED-1 would not take any action to address contaminated sediments exceeding NJESC and, therefore, would not comply with this TBC criteria. Alternatives SED-2 and SED-3 would comply with NJESC because these alternatives would involve removing the contaminated sediments posing a risk to ecological receptors in the SCB and Clonmell Creek. Alternatives SED-2 and SED-3 would result in minimal disturbance to the surrounding area and would not likely involve replacing the dredged sediment, therefore, both alternatives would comply with location-specific ARARs.

EPA and NJDEP have promulgated MCLs and NJDEP has promulgated GWQSs, which are enforceable health-based, protective standards for various drinking water contaminants (chemical-specific ARARs). Although the groundwater at the Site is not presently being utilized as a potable water source, achieving MCLs in the groundwater is an applicable standard because the aquifer beneath the Site is designated as a Class II-A potable water source.

Alternative GW-1 would not provide for any direct remediation of groundwater and would, therefore, rely upon natural processes to achieve chemical-specific ARARs. Alternative GW-2 would be more effective in reducing groundwater contaminant concentrations below MCLs and GWQSs, because it involves active remediation of the contaminated groundwater. Alternative GW-2 would also be subject to discharge to groundwater ARARs because treated water would be discharged to the groundwater using the Stormwater Catchment Basin as an infiltration point.

The provisions of State of New Jersey Administrative Requirements for the Remediation of Contaminated Sites (N.J.A.C. 7:26C) are applicable to the ICs included in Alternatives S-2, S-3 and GW-2.

Long-Term Effectiveness and Permanence

Alternative S-1 would not involve any active remedial measures and, therefore, would not be effective in preventing exposure to contaminants in the soil and would allow the continued migration of contaminants from the soil to the groundwater. Alternatives S-2 and S-3 would both be effective in the long term and would provide permanent remediation by removing contaminated soils (from 0-4 ft. bgs) in the Chemical Landfill/Gravel Pit, Northern Chemical Landfill, Stormwater Catchment Basin, and Tank Farm/Train Loading Area exposure areas and either treating them on-Site or treating/disposing of them off-Site, and by treating the source-area soils in the Active Process Area exposure area to achieve the PRGs. Both Alternatives S-2 and S-3 would rely on an IC, in the form of a deed notice, to prevent intrusive activities in in-situ treatment areas until the PRGs are met and would maintain reliable protection of human health and the environment over time.

Under Alternative S-2, lead-contaminated soils and VOC-contaminated soils (from 0 to 4 ft. bgs) would be disposed of off-Site, whereas Alternative S-3 would involve treating the excavated VOC-contaminated soils on-Site and reusing the treated soils as part of an engineered soil cover. Alternative S-2 would result in a more rapid reduction in risk, because the contaminated soils would be removed from the Site. However, it is anticipated that, under Alternative S-3, proper management and successful treatment of VOCs in the soils would be achievable within a reasonable timeframe using ex-situ bioremediation. Therefore, on-Site reuse of the treated soils would not result in an unacceptable exposure risk at the Site.

Alternative SED-1 would not involve any active remedial measures and, therefore, would not be effective in minimizing the exposure of ecological receptors to contaminated sediments. Alternatives SED-2 and SED-3 would be equally effective in the long term and both would provide permanent remediation by removing the contaminated sediments posing a risk to ecological receptors in the Stormwater Catchment Basin and Clonmell Creek.

Under Alternative SED-2, the contaminated sediments would be disposed of off-Site, whereas Alternative SED-3 would involve treating the contaminated sediments on-Site and reusing the treated sediments as part of an engineered soil cover. Alternative SED-2 would result in a more rapid reduction in risk, because the contaminated sediments would be removed from the Site. However, it is anticipated that, under Alternative SED-3, proper management and successful remediation of cumene in the sediments (to non-detectable concentrations) would be achievable within a reasonable timeframe using phytoremediation and, if necessary, ex-situ bioremediation. Therefore, on-Site reuse of the treated sediments would not result in an unacceptable exposure risk at the Site.

Alternative GW-1 would be expected to have minimal long-term effectiveness and permanence because it would rely upon natural processes to restore groundwater quality and would not prevent off-Site migration of contaminated groundwater. Alternative GW-2 would provide long-term effectiveness and permanence because it would rely on groundwater extraction and treatment and ICs (in combination with one of the action soil alternatives) to achieve the PRGs, prevent off-Site migration of contaminants, and prevent human exposure to contaminated groundwater and soil vapor.

Reduction in Toxicity, Mobility or Volume Through Treatment

Alternative S-1 would involve no active remedial measures and, therefore, would provide no reduction in toxicity, mobility, or volume. Alternative S-2 would reduce the mobility of contaminants by removing the lead-contaminated soils and the VOC-contaminated soils (from 0 to 4 ft. bgs) from the property and reduce the toxicity, mobility, and volume through in-situ treatment of the remaining source-area soils. Alternative S-3 would reduce the mobility of the contaminants by excavating the lead-contaminated soils and the VOC-contaminated soils (from 0-4 ft. bgs) and removing the lead-contaminated soil from the property. The toxicity and volume of the contaminants would be reduced through ex-situ treatment of the excavated VOC-contaminated soils. The toxicity, mobility, and volume of the source-area soils would be addressed through in-situ treatment.

Alternative SED-1 would involve no active remedial measures and, therefore, would provide no reduction in toxicity, mobility, or volume. Both Alternatives SED-2 and SED-3 would reduce the mobility of the contaminants by removing the contaminated sediments posing a risk to ecological receptors in the Stormwater Catchment Basin and Clonmell Creek. However, Alternative SED-3 would also provide a reduction in the toxicity and volume of the contaminated sediments through on-Site treatment.

Alternative GW-1 would not effectively reduce the toxicity, mobility or volume of contaminants in the groundwater, because this alternative involves no active remedial measures. Alternative GW-2, on the other hand, would reduce the toxicity, mobility, and volume of contaminated groundwater through extraction and treatment in the on-Site treatment system, thereby satisfying CERCLA's preference for treatment.

Short-Term Effectiveness

Because no actions would be performed under Alternative S-1, there would be no implementation time. The timeframes for the excavation of the unsaturated soils (12 months) and in-situ treatment of the source-area soils (10 years) would be the same for Alternatives S-2 and S-3. Ex-situ treatment of the excavated VOC-contaminated soils under Alternative S-3 would take approximately 18 months.

Alternative S-1 would not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to remediation workers or the community as a result of its implementation. Alternatives S-2 and S-3 could present some limited adverse impacts to remediation workers through dermal contact and inhalation related to the excavation of contaminated soils. The risks to remediation workers under Alternatives S-2 and S-3 could be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Both Alternatives S-2 and S-3 would require the off-Site transport of contaminated soils, which could potentially adversely affect local traffic and may pose the potential for traffic accidents, which in turn could result in releases of hazardous substances. However, the volume transported under Alternative S-2 (approximately 830 truckloads) would be significantly greater than for Alternative S-3 (approximately 63 truckloads).

For Alternatives S-2 and S-3, there is a potential for increased stormwater runoff and erosion during construction and excavation activities that would have to be properly managed to prevent or minimize any adverse impacts. For these alternatives, appropriate measures would have to be taken during excavation activities to prevent transport of fugitive dust and exposure of workers and downwind receptors to the VOCs in the Site soils.

The installation of infiltration galleries and interim- and post-remediation soil sampling activities, associated with the in-situ treatment of source-area soils under Alternatives S-2 and S-3, would pose an additional risk to on-Site workers, because these activities would be conducted within areas of potential soil and groundwater contamination.

Because no actions would be performed under Alternative SED-1, there would be no implementation time. Both Alternatives SED-2 and SED-3 would require some infrastructure construction, however, the infrastructure required to implement Alternative SED-3 would be more extensive and, therefore, would require more time to complete. It is estimated that it would take 12 months to implement Alternative SED-2 and 18 months to implement Alternative SED-3.

Alternative SED-2 would require the off-Site transport of contaminated sediments (approximately 550 truckloads), which has the potential to adversely affect local traffic and may pose the potential for traffic accidents, which in turn could result in releases of hazardous substances. Both Alternatives SED-2 and SED-3 would present some limited risk to remediation workers through dermal contact and inhalation related to the handling of the dredged sediments, however, this risk would be increased under Alternative SED-3 due to the longer potential exposure time associated with on-Site treatment. The risks to remediation workers under Alternatives SED-2 and SED-3 could be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment.

Because no actions would be performed under Alternative GW-1, there would be no implementation time. It is estimated that, under Alternative GW-2, it would take 12 months to complete the modifications to the existing underground piping, build the structure to house the new treatment system and install the new treatment system. The overall time to meet the PRGs throughout the entire groundwater plume under Alternative GW-2 (in combination with one of the action soil alternatives) is estimated to be 10 years.

Alternative GW-1 would have no short-term impact to remediation workers or the community and would have no adverse environmental impacts from implementation, because no actions would be taken under this alternative. Alternative GW-2 could present some limited risk to remediation workers through dermal contact and inhalation related to construction activities associated with the underground piping modifications, building construction and periodic groundwater sampling activities. The risks to remediation workers could be mitigated by following appropriate health and safety protocols, exercising sound engineering practices and utilizing proper personal protective equipment.

Implementability

Alternative S-1 would be the easiest soil alternative to implement because there are no activities to undertake. Both Alternatives S-2 and S-3 would employ technologies known to be reliable and that are readily implementable. The equipment, services and materials needed to implement Alternatives S-2 and S-3 are readily available and the actions under these alternatives would be administratively feasible.

Under Alternatives S-2 and S-3, real-time air quality monitoring for VOCs and dust during excavation activities would need to be conducted to protect remediation workers and downwind residents. Sufficient facilities are available for the treatment and disposal of the excavated materials and determining the achievement of the soil PRGs could be easily accomplished through post-excavation soil sampling and analysis. under Alternatives S-2 and S-3.

Alternative SED-1 would be the easiest sediment alternative to implement because it would not involve undertaking any actions. Alternatives SED-2 and SED-3 would employ hydraulic dredging, which is a commonly-used technology proven to be effective in the removal of contaminated sediments. Alternative SED-3 would involve on-Site treatment of contaminated sediments through phytoremediation in geotextile tubes, which was successfully demonstrated during the treatability study conducted on the Clonmell Creek sediment during the RI. The equipment, services and materials needed to implement Alternatives SED-2 and SED-3 are readily available and the actions under these alternatives would be administratively feasible.

Alternative GW-1 would be the easiest groundwater alternative to implement, because it would not entail the performance of any activities. The equipment, services and materials needed to implement Alternative GW-2 are readily available and the actions under this alternative would be administratively feasible. The existing extraction and treatment system has been successful at maintaining hydraulic control and reducing COC concentrations in the groundwater at the Site and the ICs under Alternative GW-2 would be relatively easy to implement.

In accordance with CERCLA, no permits would be required for on-site work (although such activities would comply with substantive requirements of otherwise required permits). Permits would be obtained as needed for off-Site work.

Cost

The present-worth costs for the soil alternatives were calculated using a discount rate of 7 percent and a 15-year timeframe for soil cap maintenance. The present-worth cost for Alternative GW-2 was calculated using a discount rate of 7 percent and a 10-year time interval for operation and maintenance of the treatment system (the estimated time to meet the groundwater PRGs) and a discount rate of 7 percent and a 15-year time interval for groundwater monitoring.

The estimated capital, OM&M, and present-worth costs are summarized below in Table 5.

Table 5: Summary of Alternative Costs

Alternative	Capital	Annual OM&M	Total Present Worth
S-1	$0	$0	$0
S-2	$11,183,360	$248,181	$12,191,308
S-3	$5,198,118	$248,181	$6,206,066
SED-1	$0	$0	$0
SED-2	$4,086,780	$0	$4,086,780
SED-3	$1,860,320	$0	$1,860,320
GW-1	$0	$0	$0
GW-2	$409,826	$225,938	$3,181,534

State Acceptance

NJDEP concurs with the proposed remedy.

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.

PREFERRED REMEDY

Based upon an evaluation of the various alternatives, EPA, in consultation with NJDEP, recommends Alternative S-3 (excavation of lead-contaminated soil with off-Site disposal, excavation of VOC-contaminated soil located 0-4 ft. bgs and treatment with ex-situ bioremediation, followed by on-Site reuse, and enhanced in-situ biodegradation of VOC-contaminated soil situated below 4 ft. bgs) as the preferred alternative to address the contaminated soil at the Site; Alternative SED-3 (hydraulic dredging of contaminated sediment with on-Site phytoremediation and on-Site reuse) as the preferred alternative to address the contaminated sediment at the Site; and Alternative GW-2 (extraction of contaminated groundwater with on-Site treatment, long-term monitoring and ICs) as the preferred alternative to address the groundwater contamination at the Site. The proposed soil and sediment remediation areas are shown in Figure 3.

The soils in the Active Process Area, Chemical Landfill/Gravel Pit, Inactive Process Area, Northern Chemical Landfill, Stormwater Catchment Basin and Tank Farm/Train Loading Area exposure areas with COC concentrations exceeding the PRGs would be excavated to a depth of 4 ft. bgs[11]

The soil in the Township Refuse Area with lead concentrations exceeding the PRGs would be excavated. Additional delineation of the lead contamination in this area would be performed during the remedial design.

A BMP plan would be developed and implemented to manage lead and minimize contamination of the Shooting Range exposure area while the shooting range remains active. If the shooting range becomes inactive, delineation of the lead contamination would be performed and the soils the in the Shooting Range exposure area with lead concentrations exceeding the PRGs would be excavated and disposed of off-Site.

The excavation would be performed using standard construction equipment, such as backhoes and track excavators. An estimated 13,804 CY of contaminated soil would be excavated, consisting of 1,052 CY of lead-contaminated soil and 12,752 CY of soil contaminated with benzene, cumene and collocated COCs would be excavated.

The excavated lead-contaminated soil would be transported to an off-Site treatment and/or disposal facility. The excavated soil containing benzene, cumene and collocated COC concentrations above the PRGs would be treated on-Site using ex-situ bioremediation. Specifically, these soils would be mixed with soil amendments, formed into piles and aerated, either passively or actively (using blowers or vacuum pumps). As part of the remedial design, an analysis would be performed to confirm that the average VOC concentrations that may be released from ex-situ treatment of the soils would not exceed applicable state and federal air emissions standards. If air emissions controls are determined to be necessary based upon these calculations, then those controls would be included in the remedial design. In addition, vapors from the VOCs in the biopiles that volatilize into the air would be monitored to protect Site workers and ensure that state and federal air emission standards are not exceeded and post-remedial sampling would be conducted to ensure that the PRGs are met.

Post-excavation sampling would be conducted to identify/confirm the areas where the PRGs are exceeded in the soils situated below 4 ft. bgs. These soils (saturated and unsaturated) would be treated using enhanced in-situ biodegradation. Enhanced in-situ biodegradation would involve injecting a magnesium sulfate solution into the contaminated soils to stimulate activity and reproduction of naturally-occurring anaerobic microorganisms. The microorganisms would then destroy or transform COCs into less toxic compounds by using them as a food and energy source. Application of the anaerobic treatment solution would be achieved using lateral infiltration galleries consisting of perforated piping installed in a series of shallow trenches. Performance and compliance monitoring would be conducted to determine residual contaminant concentrations and assess the need for additional treatment.

The ex-situ-remediated soils would be reused on-Site, along with imported, certified clean soil, meeting applicable state regulations, to backfill excavated areas and construct an engineered soil cover in the Active Process Area, Inactive Process Area and the Tank Farm/Train Loading Area to reduce infiltration of surface water to the groundwater, and control surface water runoff/drainage. Vegetation would be placed in areas disturbed during excavation activities to stabilize the soil and maintenance of the soil cover would be performed.

The remedy would also include hydraulic dredging to remove a mixture of contaminated sediment and water (referred to as slurry) from the bottom surfaces of the Stormwater Catchment Basin and Clonmell Creek. It is estimated that 8,500 CY of contaminated sediment would be removed; 1,225 CY from the Stormwater Catchment Basin and 7,275 CY from Clonmell Creek. These volumes represent the removal of 100 percent of the cumene mass in the Stormwater Catchment Basin and approximately 99 percent of the cumene mass within the Clonmell Creek sediment and include all the sediment posing a risk to ecological receptors.

The work area would be enclosed with silt curtains to prevent downstream migration of contaminated sediment during dredging activities. Also, the surface water outside the work area would be monitored to ensure that contaminated sediments are not being resuspended in the water column and transported downstream.

The slurry would be transferred via pipeline into geotextile tubes (located in a treatment cell within the Stormwater Catchment Basin exposure area) for dewatering. The staging area would be designed with proper controls, including but not limited to an impermeable liner, to prevent any impacts to the surrounding soil and groundwater and

[11] Approximately 500 CY of the soils in the Active Process Area and Inactive Process Area exceeding the PRGs would be treated using enhanced in-situ biodegradation rather than being excavated.

maintain containment of the dredged sediments and effluent water from the geotextile tubes. The effluent water would be sampled and, if necessary, treated on-Site before being discharged to the Stormwater Catchment Basin in accordance with substantive NJPDES discharge to groundwater permit requirements. The details of the effluent treatment system would be finalized during the remedial design. Monitoring of groundwater wells around the Stormwater Catchment Basin would be conducted to ensure compliance with permit requirements.

Plants would be planted in the cumene-contaminated sediment within geotextile tubes for a pre-determined growth period.[12] The treated sediments would be reused on-Site as part of an engineered soil cover to reduce infiltration of surface water to the groundwater, and control surface water runoff/drainage, and the plant residuals would be harvested and composted on-Site.

Under the groundwater component of this remedy, a new treatment unit would be built to replace/upgrade the existing one and a small building would be constructed in the Stormwater Catchment Basin exposure area to house the new treatment unit. The existing extraction wells and subsurface pipelines would to be used to capture and carry contaminated groundwater to the new treatment unit.

The extracted groundwater would be pumped into an equalization tank within the treatment building and then treated with a polymer. The polymer would be combined with pH adjustment, if necessary, to promote flocculation of iron and other solids in the groundwater. The groundwater would then be pumped through conventional geotextile tubes followed by GAC-impregnated geotextile tubes, if necessary, to remove iron, solids, and treat COCs. The solids, flocculated iron and other metals, would be captured in the geotextile tubes. The COCs would partition to the solids in the geotextile tubes where they would biodegrade. The spent tubes would be transported off-Site to a permitted disposal facility.

The new system would have an approximate treatment capacity of 125 gallons per minute. Treated water would be discharged to the groundwater in compliance with substantive NJPDES discharge to groundwater permit requirements (using the Stormwater Catchment Basin as an infiltration point). Long-term groundwater monitoring would be continued until the PRGs are met.

ICs would be put in place at the Site, including the establishment of a CEA to prevent groundwater use and the placement of a deed notice on the property, restricting the land use to commercial/industrial and requiring that future buildings on the Site either be subject to a vapor intrusion evaluation or be built with vapor intrusion mitigation systems until the PRGs are met.

Because the proposed remedy would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the site be reviewed at least once every five years.

Basis for the Remedy Preference

Both Alternative S-2 and Alternative S-3 would address principal threat wastes through excavation and treatment and effectively achieve the soil the PRGs. Alternative S-2 would meet the PRGs in the soils from 0-4 ft. bgs more quickly by removing the excavated soils from the property. However, Alternative S-3 would achieve the PRGs in these soils through treatment within a reasonable timeframe (12 months) and would provide a greater environmental benefit than Alternative S-2 because it would allow for on-Site reuse of the treated soils. Alternative S-2 would be considerably more expensive to implement than Alternative S-3 because of the significantly larger volumes of contaminated soil that would need to be transported off-Site for treatment and/or disposal and clean fill that would need to be imported to backfill the excavated areas and construct an engineered soil cap under Alternative S-2. Therefore, EPA believes that Alternative S-3 would effectively address the soil contamination at the Site while providing the best balance of tradeoffs with respect to the evaluating criteria.

Both Alternative SED-2 and Alternative SED-3 would effectively and permanently eliminate the risk posed to environmental receptors by removing the contaminated sediments from the Stormwater Catchment Basin and Clonmell Creek. Alternative SED-2 would require less time and infrastructure construction to implement than Alternative SED-3, however, Alternative SED-2 would be considerably more expensive to implement than Alternative SED-3 because it would involve transporting the contaminated sediments off-Site for treatment and/or disposal and would require a larger volume of clean fill to be imported onto the Site. Alternative SED-3 would provide a greater environmental benefit than Alternative SED-2 because it would allow for on-Site treatment and reuse of the treated sediments as part of an engineered soil cover. EPA believes Alternative SED-3 would effectively mitigate the threat to ecological receptors from the Site while providing the best balance of tradeoffs with respect to the evaluating criteria.

For more than 30 years, a groundwater extraction and treatment system has been operated at the Site as an interim action. This system has successfully reduced contaminant concentrations in the groundwater and

[12] Additional studies would be conducted during the remedial design to refine plant species selection and determine the optimal growth period.

prevented contaminated groundwater from migrating off-property. Because of the effectiveness of the existing system and the anticipated removal of the contaminant source under the preferred soil alternative, EPA has identified Alternative GW-2 as its preferred groundwater alternative.

The preferred remedy is believed to provide the greatest protection of human health and the environment and long-term effectiveness; will be able to achieve the ARARs more quickly, or as quickly, as the other alternatives; upon completion, will allow for commercial/industrial use of the property; and, is cost effective. Therefore, the preferred remedy will provide the best balance of tradeoffs among alternatives with respect to the evaluating criteria. EPA and NJDEP believe that the preferred remedy will address principal threat wastes, be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The preferred remedy also will meet the statutory preference for the use of treatment as a principal element, as well as include consideration of EPA Region 2's Clean and Green Energy Policy.[13]

[13] See http://epa.gov/region2/superfund/green_remediation and http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf.

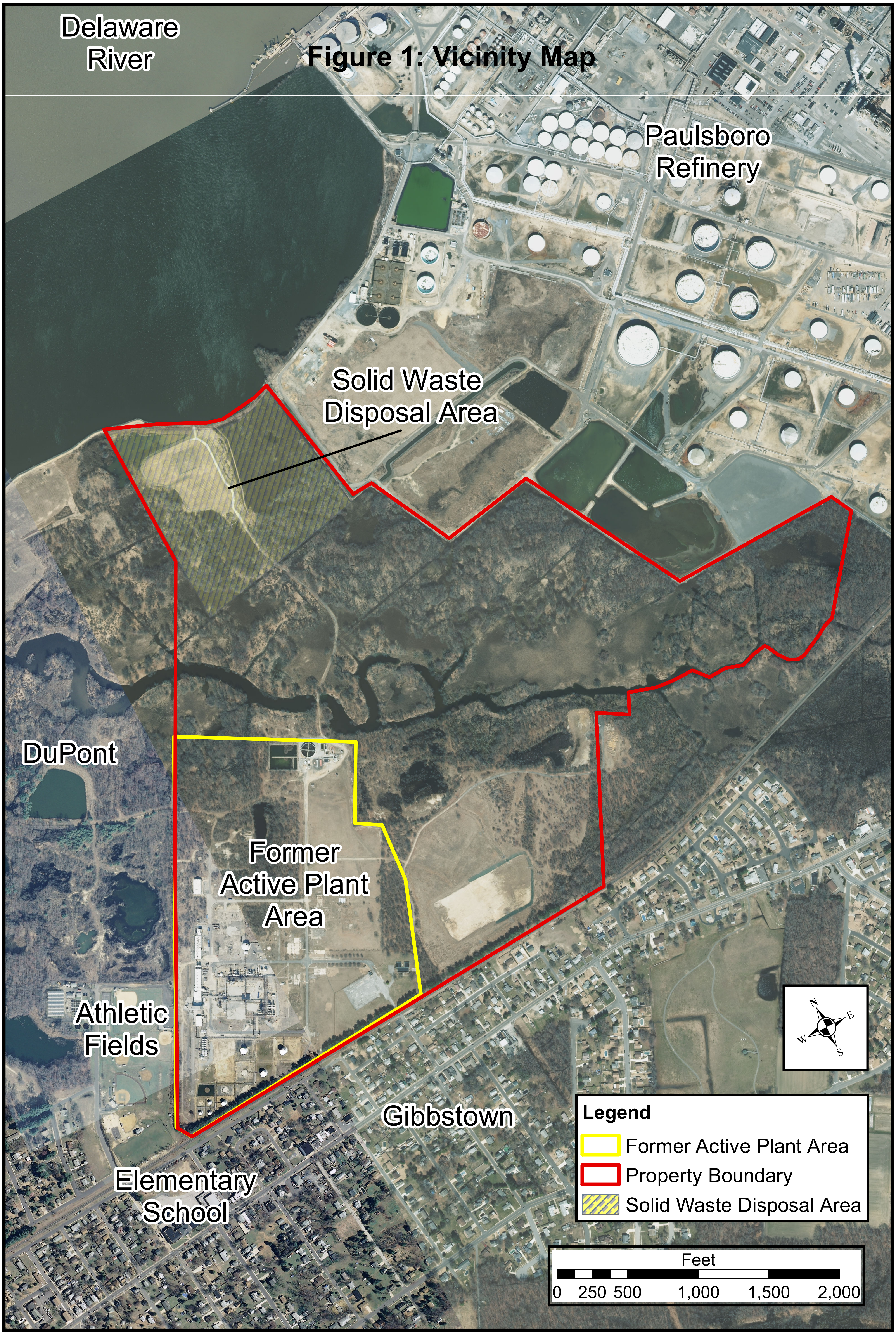

Figure 1: Vicinity Map

Figure 2: Exposure Areas

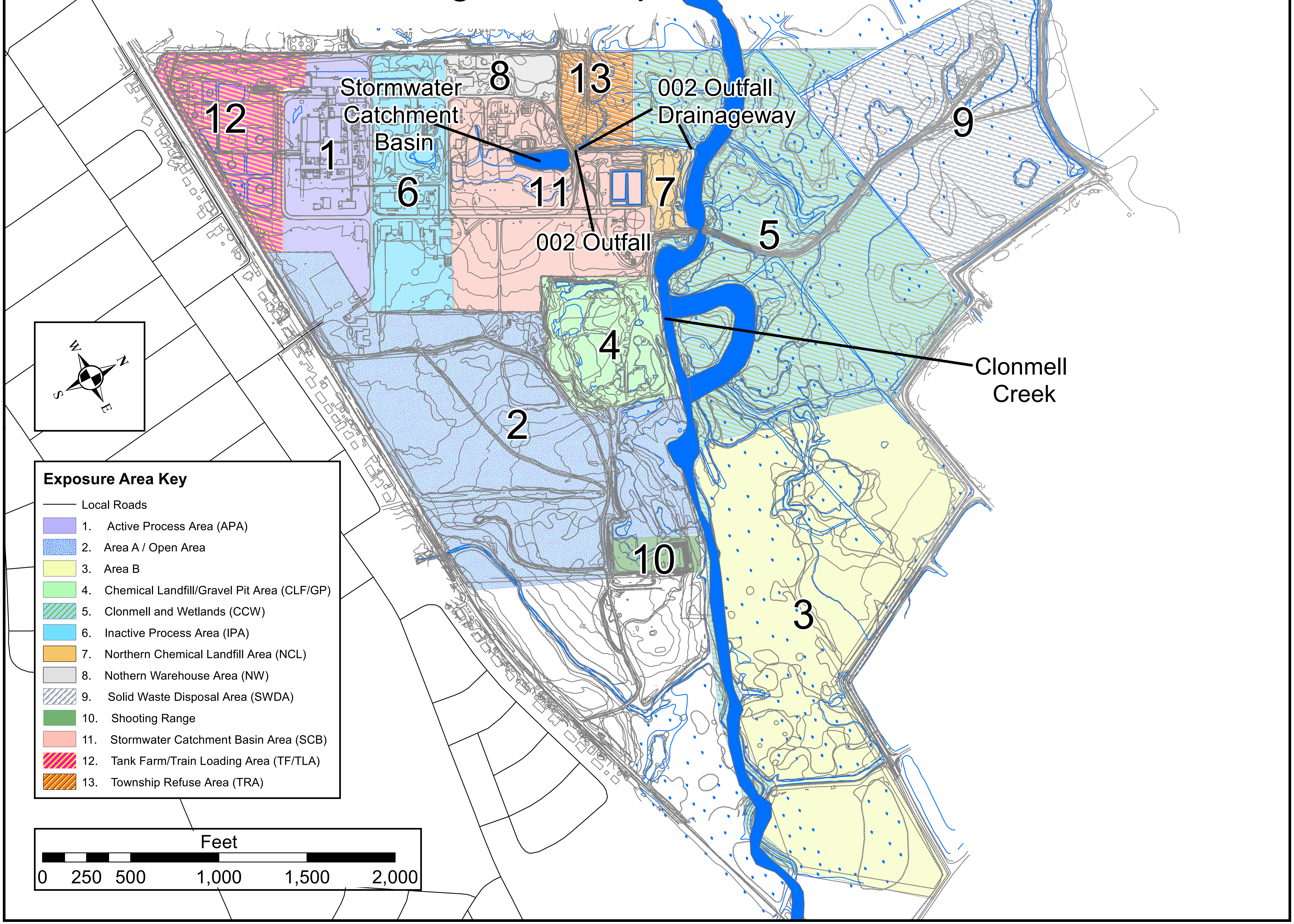

Figure 3: Proposed Soil & Sediment Remediation Areas