RECORD OF DECISION
AMENDMENT – OPERABLE UNIT 1
INTERIM – OPERABLE UNIT 2
COMBE FILL SOUTH LANDFILL SUPERFUND SITE
CHESTER, MORRIS COUNTY, NEW JERSEY

Prepared by:
U.S. Environmental Protection Agency
Region 2
New York, New York

September 2018

550182

DECLARATION STATEMENT

Record of Decision Amendment for Operable Unit 1 (OU1)
Record of Decision for an Interim Action for Operable Unit 2 (OU2)

SITE NAME AND LOCATION

Combe Fill South Superfund Site (EPA ID# NJD094966611)
Chester Township, Morris County, New Jersey

STATEMENT OF BASIS AND PURPOSE

This decision document amends the remedy for the Combe Fill South Landfill Superfund Site (Site) which was documented in the September 29, 1986 Record of Decision (ROD). It presents modifications to the OU1 remedy to address contaminated groundwater directly underlying the landfill and to remove a contaminated source area. This decision document also selects an interim remedy for OU2 to address both the overburden and bedrock aquifers located downgradient of the landfill property boundary.

The amended remedy for OU1 and the interim remedy for OU2 were selected in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§9601-9675, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300.

The New Jersey Department of Environmental Protection (NJDEP) was consulted on the selected remedies in accordance with CERCLA Section 121(f), 42 U.S.C § 9621(f). As per its September 28, 2018 letter, NJDEP defers concurrence on the selected remedies until treatment technologies are further evaluated for 1,4 dioxane contamination in groundwater at the Site during Remedial Design, and a specific method and cost for the Remedial Action is developed.

ASSESSMENT OF THE SITE

The remedies are necessary to protect public health, welfare, or the environment from actual or threatened releases of hazardous substances from the Site into the environment.

DESCRIPTION OF THE SELECTED REMEDY

Details regarding the 1986 selected remedy for the Site are described in the September 29, 1986 ROD. The major components of the 1986 selected remedy included:

- Construction of a cap over the 65-acre landfill in accordance with Resource Conservation and Recovery Act requirements;
- An active collection and treatment system for landfill gases;
- Pumping and on-site treatment of shallow groundwater and leachate, with discharge to Trout Brook;
- Surface water controls to accommodate seasonal precipitation and storm runoff;
- An alternate water supply for affected residences;
- Security fencing to restrict Site access;
- Appropriate environmental monitoring to ensure the effectiveness of the remedial action; and
- A supplemental feasibility study to evaluate the need for remediation of the deep aquifer.

This OU1 selected remedy has been implemented. This ROD amendment amends the1986 OU1 remedy by providing for additional remediation required to address a source area and deeper groundwater within the OU1 area of the Site. The major components of the OU1 ROD amendment consist of:

- Upgrading the existing groundwater conveyance system to handle an increased volume of contaminated groundwater;
- Installation of bedrock extraction wells to increase hydraulic control of contaminated groundwater in OU1;
- Upgrading the current OU1groundwater treatment system to include treatment for 1,4-dioxane;
- Excavation and off-site disposal of source material in the North Waste Cell area:
- Long-term monitoring; and
- Establishment of institutional controls.

The major components of the interim remedy for OU2 consist of:

- Long-term monitoring; and
- Establishment of institutional controls.

The OU1 remedy, as amended, is expected to be the final remedy for the OU1 portion of the Site. These actions will improve the response actions previously implemented at the Site by upgrading the existing groundwater extraction and treatment system and conveyance lines, installing additional deep bedrock extraction wells to extract and treat more contaminated groundwater below the landfill property, providing additional treatment in the groundwater treatment plant to address 1,4- dioxane, and excavation and off-site disposal of principal threat waste in the North Waste Cell area. In addition, long-term monitoring will be implemented and institutional controls will be established for OU1 and OU2 to prevent exposure and insure protection of human health. The selected amended and interim remedies are expected to work together. Following an evaluation of the effectiveness of the OU1 remedy in controlling migration to OU2, a final remedy for OU2 will be selected.

The environmental benefits of the selected remedies may be enhanced by consideration, during

remedy design or implementation, of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy.

The estimated 30-year present worth cost of the OU1 amended remedy, with a seven percent discount factor, is $21,933,592. The 10-year present worth cost of the OU2 interim remedy is $781,100.

DECLARATION OF STATUTORY DETERMINATIONS

Part 1: Statutory Requirements

The selected remedies meet the requirements for remedial actions set forth in Section 121 of CERCLA, 42 U.S.C. § 9621, because: 1) they are protective of human health and the environment; 2) they meets a level or standard of control of the hazardous substances, pollutants, and contaminants that at least attains the legally applicable or relevant and appropriate requirements under federal and state laws unless a statutory waiver is justified; 3) they are cost-effective; and 4) they utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable.

Part 2: Statutory Preference for Treatment

The selected remedy for OU1 meets the statutory preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances as a principal element because contaminated groundwater will be treated before discharge to Trout Brook. The remedy for OU2 is an interim remedy, and does not include treatment. However, a permanent remedy will be selected at a later time which will further evaluate the preference for treatment.

Part 3: Five-Year Review Requirements

Because the OU1 and OU2 remedies will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory five-year review of the remedy will be conducted.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD Amendment and Interim Action ROD. Additional information can be found in the Administrative Record file for this Site.

- Chemicals of concern (COCs) and their respective concentrations and a discussion of source materials constituting principal threats may be found in the "Site Characteristics" section.
- Baseline human health risks and screening level ecological risks posed by the COCs may be found in the "Summary of Site Risks" section.
- Remediation Goals for groundwater can be found in the "Remedial Action Objectives"

section.

- A discussion of principal threat waste is contained in the "Principal Threat Wastes" section.
- Current and reasonably anticipated future land use assumptions and current and potential future uses of groundwater used in the baseline risk assessment and ROD can be found in the "Current and Potential Uses" section.
- Estimated capital, and total present worth costs, and the number of years over which the remedy cost estimates are projected can be found in the "Description of Remedial Alternatives" section.
- Key factors that led to selecting the remedies may be found in the "Comparative Analysis" and "Statutory Determinations" sections.

A. Carpenter

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9.28.18

Date

DECISION SUMMARY

Combe Fill South Landfill Site
Chester Township, New Jersey

U.S. Environmental Protection Agency
Region 2
September 2018

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SITE NAME, LOCATION, AND DESCRIPTION

The Combe Fill South Landfill Site (Site), U.S. Environmental Protection Agency (EPA) Superfund Site Identification Number NJD94966611, is located at 98 Parker Road, Chester Township, Morris County, New Jersey. EPA is the lead agency and the New Jersey Department of Environmental Protection (NJDEP) is the support agency.

The Site consists of three separate fill areas covering about 65 acres of the 115-acre parcel that was owned by the Combe Fill Corporation (CFC).

The Site is situated on a hill with surface waters draining radially from the Site. Groundwater and surface water runoff from the southern portion of the Site constitute the headwaters of Trout Brook, which flows southeast toward the Lamington (Black) River. Southwest of the Site, near the headwaters of the west branch of Trout Brook, is a hardwood wetland. Much of the original wetlands were cleared to construct the landfill. The Site is located in an area that is currently zoned for residential and limited commercial use.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Starting in the 1940s, the landfill was operated as a municipal refuse and solid waste landfill. From 1948 to 1978, Chester Hills, Inc. owned and operated the landfill. The landfill was originally approved for the disposal of municipal and non-hazardous industrial wastes, sewage sludge, septic tank wastes, chemicals, and waste oils, as stated in its certificate of registration. In 1978, Chester Hills, Inc. transferred ownership and operations to CFC. From 1973 to 1981, there were numerous operating violations including the absence of an initial layer of residual soil on the bedrock prior to waste placement. In 1981, NJDEP issued an order for CFC to discontinue waste disposal operations upon completion of the existing trench. CFC ceased landfill operations and filed for bankruptcy protection. On September 1, 1983, the CFS Landfill Site was listed on the National Priorities List.

According to NJDEP files, wastes accepted at the landfill during its 40 years of operation included typical household wastes, personal care products, pharmaceutical products, calcium oxide, crushed containers of paints and dyes, aerosol product canisters, industrial wastes, dead animals, sewage sludge, septic tank wastes, chemicals, waste oils, and possibly asbestos. Numerous empty 55-gallon drums were scattered across the landfill surface. Most of the wastes that were encountered during field reconnaissance, drilling operations, and test pit excavations included typical household wastes (garbage bags, paper, appliances, etc.). Refuse encountered during the drilling of a well that permeated the center of the landfill appeared to be highly decomposed rubbish. Hazardous materials were not found at the surface of the landfill during field operations.

Based on the original landfill design drawings and records of waste volumes received on-site, approximately five million cubic yards of waste material are buried in the CFS Landfill. No evidence has been found of disposal of hazardous materials outside of the Site boundaries.

Enforcement History

The State of New Jersey and EPA identified numerous potentially responsible parties (PRPs), including CFC and its parent company, Combustion Equipment Associates. CFC declared bankruptcy in October 1981, one month before the landfill was officially closed.

On October 5, 1983, 87 notice letters were sent to PRPs regarding a proposed remedial investigation/feasibility study (RI/FS) at the Site. None of the acknowledged recipients offered to undertake the RI/FS.

In 1985, EPA filed an application in bankruptcy court seeking reimbursement of Superfund monies spent at the Site to date. Because limited funds remained in the bankruptcy estate, EPA and CFC reached a settlement in which CFC paid $50,000 in May 1986 to resolve EPA's Superfund claims.

In October 1998, EPA and the State of New Jersey filed a complaint seeking the recovery of past and future response costs incurred and to be incurred in connection with the clean-up of the Site. An initial settlement reached in 2005 resulted in a consent decree with former owner/operators that required payment of $12,500,000 in costs to the State and EPA. A second consent decree entered in 2009 settled claims against approximately 300 private parties and municipalities. The consent decree required payment of $69 million in past costs, approximately $3.2 million in natural resource damages, and a $27 million annuity to fund future work at the Site.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan and supporting documentation for the proposed remedies for OU1 and OU2 were released to the public for comment on August 12, 2018. These documents were made available to the public at the EPA Administrative Record File Room, 290 Broadway, 18th Floor, New York, New York; and the Chester Library, Chester, New Jersey.

On August 12, 2018, EPA published a notice in the *Daily Record* newspaper which contained information relevant to the public comment period for the Site, including the duration of the comment period, the date of the public meeting and availability of the administrative record. Information regarding the public meeting was posted on EPA's webpage for the Site. The public comment period began on August 12, 2018 and ended on September 11, 2018.

EPA held a public meeting on August 22, 2018 to explain EPA's preferred groundwater remedies. The purpose of this meeting was to inform local officials and community members about the Superfund process, to discuss the Proposed Plan and receive comments on the Proposed Plan, as well as respond to questions from area residents and other interested parties.

SCOPE AND ROLE OF THIS OPERABLE UNIT

The CFS Site is being addressed as two operable units. OU1 consists of the landfill property and groundwater directly underlying the landfill, and OU2 is defined as groundwater, both overburden and bedrock, surface water and sediment near and downgradient of the landfill

property boundary that are outside the OU1 area, (see Appendix 1, Figure 1).

The 1986 ROD addressed the remediation of the landfill and overburden groundwater underlying the landfill. Subsequent studies have been conducted to investigate the deeper aquifer underlying the landfill and the plume emanating from the Site.

This ROD selects a modification to the OU1 ROD that will upgrade the existing OU1 groundwater conveyance, extraction and treatment systems at the landfill property. This ROD also identifies EPA's selected interim remedy for OU2 to address Site related contamination in groundwater located outside of the landfill property boundary in order to protect human health and the environment.

SUMMARY OF SITE CHARACTERISTICS

Geology and Hydrology

The Site lies in the Piedmont Physiographic Province, known as "The Highlands" and consists of a 20-mile wide series of northeast-to-southwest trending ridges and valleys extending from the Hudson Highlands of New York to the Reading Prong Region of Pennsylvania. In the area, natural unconsolidated deposits of local soils and granite saprolite overlie highly fractured granite bedrock. A shallow aquifer, also referred to as the overburden groundwater, exists in the saprolite layer, saturating much of the waste, with a deeper aquifer in the fractured bedrock.

The deep aquifer is the major source of potable water near the landfill. Prior to installation of a public waterline in 2015, numerous residential wells within one mile of the Site drew water from this aquifer. NJDEP records indicate that there are six public wells within two miles of the landfill, all of which tap the deep aquifer. The nearest municipal well is about one mile southwest of the Site and is not impacted by Site contamination. In localized areas, the soils and saprolite overlying the bedrock are of sufficient thickness to provide domestic water supplies.

Natural (non-fill) overburden material contains unconsolidated sand, silt, clay, and gravel derived from the underlying bedrock. In most areas (except for the ridgelines), the overburden includes saprolite. Overburden thickness ranges from about four feet on the ridges to 100 feet in the low-lying areas. Overburden depths on the northeast trending ridges and at the adjacent horse farm property are shallow, only about five to 10 feet thick, whereas overburden depths in the low-lying area between the northeast trending ridges and to the south of the landfill vary between 40 and 100 feet thick. Very permeable soil and saprolite account for most of the infiltration from precipitation to the bedrock aquifer.

OU1 Remedial Investigation

A RI for the Site was performed by NJDEP from 1984 to 1985. Major contaminants of concern (COCs) found during the RI include: benzene; chlorobenzene; ethylbenzene; toluene; trichloroethylene (TCE); 1,2-dichloroethane; chloroethane; methylene chloride; and tetrachoroethylene. These hazardous substances and contaminants were consistent with known past usage of the Site and the variety of wastes accepted, and they persisted in groundwater and

surface water. Volatile organic compounds (VOCs) were identified within both the unconsolidated and consolidated aquifers at the Site.

Groundwater contamination predominantly migrates northeast and southwest from the landfill. The RI identified residents living on Schoolhouse Lane, less than one-half mile from the landfill, and pupils of the day-care facility located on Parker Road as being potentially at risk because groundwater was the primary source of potable water in the immediate area surrounding the Site.

Record of Decision (1986)

EPA issued a ROD on September 29, 1986. The major components of the selected remedy included:

- An alternate water supply for affected residences;
- Capping of the 65-acre landfill in accordance with Resource Conservation and Recovery Act requirements;
- An active collection and treatment system for landfill gases;
- Pumping and on-Site treatment of shallow groundwater and leachate, with discharge to Trout Brook;
- Surface water controls to accommodate seasonal precipitation and storm runoff;
- Security fencing to restrict Site access;
- Appropriate environmental monitoring to ensure the effectiveness of the remedial action; and
- A supplemental feasibility study to evaluate the need for remediation of the deep aquifer.

Post-ROD Actions

An engineering design was performed to develop the details of implementing the remedy. The 1993 Final Design Report provided the design specifications for the cover system, landfill gas collection and treatment system, the shallow groundwater extraction system and the groundwater treatment system, as well as a groundwater extraction system effectiveness monitoring plan and a preliminary operations and maintenance (O&M) plan.

Construction activities began in January 1993 and were completed in September 1997. Initial activities included, installing temporary utilities, clearing and grubbing, conducting some work on the Site access road, and installing perimeter fencing. Buried drums were discovered in three separate areas along the eastern perimeter of the Site and they were either disposed of off-site or placed underneath the cap. Other major Site work included refuse relocation, conducting landfill cap construction, constructing the perimeter road, installation of wells, constructing the groundwater extraction system, and installing underground piping and electrical conduit. These activities are described in more detail in NJDEP's closeout report dated June 30, 2011.

In 2006, EPA issued an Explanation of Significant Differences (ESD) to revise one of the components of the 1986 ROD. The ESD modified the provisions for an active landfill gas and condensate collection and treatment system to a passive landfill gas venting system. The change to the passive system was made based on test results from studies completed after the 1986 ROD.

In 2001, non-native fill was encountered outside the cap limits along the northern property boundary during the installation of landfill gas probes. This area of non-native fill, which became known as the North Waste Cell (see Appendix 1, Figure 2) was investigated and delineated by NJDEP through borings, test pits and trenches. From 2006 to 2009, NJDEP excavated a major portion of the North Waste Cell area, disposed of the waste off-site, and installed an impermeable cap over the area. A smaller portion of the North Waste Cell remains on site.

Public Water Supply Extension

The deep aquifer is the major source of potable water in the vicinity of the landfill. At one time, numerous residential wells within one mile of the Site drew water from this aquifer. In the early 1980s, NJDEP collected water samples from several private wells near the landfill. The results of the water samples found that there were a few private wells contaminated by VOCs. Based on limited information available from sampling results, NJDEP estimated that an area of approximately 62 affected residences on Schoolhouse Lane, Parker Road, and part of Old Farmers Road might be in need of an alternate water supply. The area was later expanded in 1989 to include about 325 homes.

Based on the 1986 ROD, water supply alternatives were evaluated for the affected residences and businesses around the Site. The extension of the Washington Township Municipal Utilities Authority (MUA) Hager Water Distribution System was selected as the water supply solution.

In the early 1990s, additional sampling revealed fewer impacted drinking water supplies than originally projected. NJDEP installed point of entry treatment (POET) systems in 32 residences in the area of the Site. Initially, the POET systems were intended to be an interim measure pending the design and construction of a public water supply system. The POET systems were proven effective in removing contamination from the potable water supplies and the construction of the public water supply extension was deferred.

During the RI, and in sampling undertaken during the remedy design, 1,4-dioxane was not initially sampled for at the Site because it was an emerging contaminant at the time and analytical methods were not reliable at detecting low levels. In 2008, 1,4-dioxane was first detected in the potable water supply of the residences with POET systems. An investigation conducted by NJDEP indicated that the POET systems were ineffective in treating the 1,4-dioxane contamination. Experiments with various types of treatment media and treatment processes failed to produce results showing a reduction of the contaminant to the guidance level, since at the time there were no state or federal drinking water standards for 1,4-dioxane.

The discovery of 1,4-dioxane in the private drinking water supplies reinforced the need for an alternate water supply for the properties surrounding the Site. In 2010, EPA performed additional studies that were conducted to thoroughly evaluate current Site conditions and the appropriateness of the selected remedy.

In January 2011, EPA initiated a residential well investigation within the area of concern. As

part of the investigation, 213 potable water samples were collected from 160 residential properties located in Chester and Washington Townships, NJ. In June 2011, EPA collected an additional 75 potable water samples from 52 residential properties and from the landfill treatment plant. The analytical results of EPA's residential well investigation indicated that 13 residences located north and east of the Site contained concentrations of 1,4-dioxane in their potable water supply above 3.0 micrograms per liter (µg/L), the Site-specific Action Level established at the time (2011).

In April 2011, EPA initiated a 1,4-dioxane treatability study to determine if the design and potential installation of systems to treat the 1,4-dioxane contamination was a feasible interim measure that could be implemented in the area of concern until the extension of the water main was completed. EPA evaluated treatment of 1,4-dioxane in private supply wells using a combination of ozone addition and ultraviolet radiation.

The study indicated that the newly-developed system was able to reduce 1,4-dioxane concentrations in the tested water supply by more than 50% but would require multiple passes to achieve 99% removal. Based on this finding, the design for the waterline extension project began in 2011. The design was completed in late 2012 and permits to construct were obtained in the spring of 2013.

From July 2013 to July 2015, construction of the water main extension project was implemented to address the existing and threatened groundwater contamination in private wells that originated at the Site. The waterline extension joins the existing Washington Township MUA system at the intersection of Flintlock Drive and Parker Road and was turned over to Washington Township in July 2015.

EPA connected 73 residences and businesses to the waterline (79 total connections) along Parker Road, Schoolhouse Lane, and a small portion of Route 513 that were threatened by contaminated groundwater from the landfill.

SUMMARY OF OU1 AND OU2 REMEDIAL INVESTIGATION ACTIVITIES

In February 2010, EPA initiated RI/FS activities for the deep bedrock aquifer underlying the landfill and areas outside the landfill property boundary. The RI conducted between 2010 and 2015 included the following field activities:

- Installation of 19 bedrock monitoring wells;
- Installation of nine pairs of piezometers and stream gauges;
- Collection of samples from five soil borings;
- Collection of approximately 200 groundwater samples, 22 soil samples, 24 surface water samples, 53 potable well water samples, and 24 sediment samples;
- Collection of short- and long-term water level monitoring data;
- Geophysical surveys including resistivity, Willowstick® electromagnetic, magnetic gradient and electromagnetic terrain conductivity to locate preferential flow pathways in bedrock and also possible buried drums in two locations at the landfill;

- Downhole investigations incorporating FLUTe™ hydraulic profiling, packer testing, and downhole geophysical surveys including single-point resistivity, long normal resistivity and short normal resistivity; fluid temperature; fluid resistivity; caliper; natural gamma; heat pulse flow meter; and acoustic televiewer; and
- Wetland delineation, wildlife surveys, well condition surveys and land surveys (topographic, boundary, stream cross sections and well/piezometer horizontal and vertical locations).

A long-term aquifer pump test and adsorption pilot test were conducted in 2017 in support of the FS, along with background surface water and sediment sampling in support of the Final Screening Level Ecological Risk Assessment (SLERA).

Multiple lines of evidence indicated that the landfill, including the North Waste Cell area, is a continuing source of groundwater contamination. These lines of evidence include:

- The historic waste burial practice of direct placement on fractured rock;
- Historic and recent groundwater analytical data for the landfill and surrounding area indicating COC concentrations above standards and criteria;
- Concentrations of three COCs - 1,4-dioxane, benzene, and TCE - were higher within the landfill property than in the surrounding area;
- The highest 1,4-dioxane concentrations were detected at a bedrock monitoring well located immediately downgradient of the North Waste Cell, and the highest concentrations of benzene and TCE originated near the northeastern corner of the landfill based on RI data collected between 2010 and 2015;
- Direction of groundwater flow is nearly radial and flows in line with the topographic high of the landfill to lower elevations in the surrounding area. Vertical groundwater flow in the bedrock aquifer has shown an upward gradient as well as artesian conditions in some areas;
- Detections of 1,4-dioxane in surface water; and
- Both the North Waste Cell and the northeastern corner of the landfill towards Schoolhouse Lane are along the three preferential groundwater flow paths in bedrock.

A summary of the RI results by media is as follows:

Groundwater

Groundwater flow in the overburden aquifer has three major components: 1) Horizontal flow outward from the landfill generally follows topography towards surface water bodies. The horizontal flow direction is nearly radial from higher elevations at and near the landfill. 2) Groundwater also flows along the bedrock surface from higher to lower top of bedrock surface elevations at the overburden/bedrock interface. Two bedrock surface highs beneath the northwest and southeast portions of the landfill frame the sides of a bedrock surface low that developed at the contact between two rock types and crosses the Site from southwest to northeast. The bedrock interface along this low slope to the northeast and southwest forms a divide along the landfill's northern perimeter and marks a major fracture zone. From the divide, groundwater at the overburden-bedrock interface predominantly flows either northeast (towards

Schoolhouse Lane and the Lamington River unnamed tributary (UNT)) or southwest (towards Trout Brook). 3) Vertical flow is towards the bedrock interface into mostly steeply dipping bedrock fractures. Downward flow from the overburden to the bedrock aquifer occurs at the landfill and in the immediate vicinity, whereas upward flow occurs near the streams.

Eight target contaminants - 1,4-dioxane, benzene, TCE, di(2-ethylhexyl) phthalate (DEHP), alpha-benzene-hexachloride (alpha- BHC), lead, arsenic, and chromium - exceeded their respective groundwater quality standards (GWQS) in both OU1 and OU2 monitoring wells. 1,4-dioxane and benzene were the most significant organic groundwater contaminants with 1,4-dioxane exceeding the 0.4 µg/l GWQS at 20 locations in 95 samples with concentrations up to 350 µg/l in the aquifers. (see Appendix 2, Table 1)

The horizontal extent of 1,4-dioxane-contaminated groundwater is roughly three times longer than it is wide, and is oriented in a northeast-southwest direction, with the North Waste Cell as the "hot spot". The contamination extends from the overhead transmission lines that run perpendicular to Parker Road southwest of the landfill, to County Route 513 aka Washington Turnpike to the northeast. To the west, the contamination extends to the southeastern portion of the horse farm, and to the east, it extends to Parker Road.

The highest concentrations of 1,4-dioxane were detected at the northeast edge of the landfill, at and downgradient of the North Waste Cell and in the area between the landfill and Schoolhouse Lane. Samples collected from monitoring wells in all directions from the landfill and from the shallowest to the deepest depth intervals exceeded the GWQS of 0.4 µg/L. The samples with the deepest detections of Site related groundwater contaminants, including 1,4-dioxane above 0.4 µg/L were from approximately 700 feet bgs.

The benzene plume is roughly half the size of the 1,4-dioxane plume, but has the same general shape. Unlike the 1,4-dioxane plume, the benzene plume appears to originate near the northeast corner of the landfill. Most exceedances for benzene were in the shallower depth intervals.

Surface Water

No exceedances of VOCs, semi-volatile organic compounds (SVOCs), or pesticide COCs criteria were identified in the four investigated streams (Trout Brook, Lamington River UNT and Tanner's Brook UNT, and East Trout Brook). Copper, lead, silver, and cadmium concentrations exceed surface water quality standards (SWQS). Maximum surface water concentrations for each of these four metals were less than an order of magnitude above the respective SWQS: copper (6.7 J µg/l vs. 2.2 µg/l SWQS), lead (9 J µg/l vs. 5.4 µg/l SWQS), silver (0.54 J µg/l vs. 0.12 µg/l SWQS), and cadmium (0.19 µg/l vs. 0.056 µg/l SWQS). Though widespread in surface water near CFS, 1,4-dioxane did not exceed the comparison criterion value (22,000 µg/L). Its presence in streams and seeps indicates that contaminated groundwater originating at the landfill is upwelling into the streams and seeps, but not at levels that would be of ecological concern. (see Appendix 2, Tables 2 and 3)

Sediment

In sediment, concentrations of the polycyclic aromatic hydrocarbons (PAHs) anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene, along with benzyl butyl phthalate, exceeded the freshwater ecological screening criteria (lowest effects levels, or LELs) at two locations on the Lamington River UNT and at one location on the Tanners Brook UNT. These PAHs were not detected at intervening sediment sample locations between the landfill and the stream headwaters. (see Appendix 2, Tables 4 and 5)

Soils

Five soils borings were installed along the landfill perimeter road to determine if remaining source areas within the landfill, such as possible buried drums and the un-remediated portion of the North Waste Cell, impacted soil. Collection of soil samples did not occur outside the landfill property boundary. Concentrations of nine metals - aluminum, arsenic, beryllium, cadmium, cobalt, manganese, nickel, silver and vanadium - exceeded criteria in various combinations at all five soil boring locations. Arsenic was the only metal in soil that is also a groundwater COC. 1,4-dioxane was not detected in any soil samples. (see Appendix 2, Table 6)

CURRENT AND POTENTIAL LAND AND RESOURCE USES

Area land use is primarily low-density residential (lot sizes are generally more than two acres) amidst large parcels of cleared or forested rolling hills. Although some horse husbandry and vegetable, grain, and orchard farming persist in the area, most former farmlands are now fallow. Immediately northeast of the landfill is the 45-acre Parker Road Preserve, a low-impact recreation park owned by Chester Township. This area was the site of a proposed residential development known as Millstone Crossing that never came to fruition. The park covers the area between the two northeast trending ridges and extends north towards the residential properties along Schoolhouse Lane. To the northwest is a horse farm. Residential homes and several commercial establishments, including construction and landscaping companies, automotive repair and a small heating oil distributor, are located on Parker Road to the east. Remnants of the once-viable iron ore mining industry in the area are in evidence at the Hacklebarney Mines just to the south and east of CFS. Locally high iron concentrations are also distinctive characteristics of the area soils, surface waters, and groundwater.

A series of county and state parks, including the Black River County Park and Hacklebarney State Park, lie to the east and south along the Lamington River. These parks border both sides of the Lamington River from approximately the crossing of East Mill Road (County Route 513) to the border with Hunterdon County to the south. An approximately 3,000-foot section of Trout Brook, upstream of its confluence with the Lamington River, borders or lies within Hacklebarney State Park.

SUMMARY OF SITE RISKS

As part of the CERCLA remedy selection process, EPA conducted a baseline risk assessment using samples collected during the OU2 remedial investigation and the latest risk assessment methodology, exposure factors and toxicity values to estimate current and future effects of contaminants on human health and the environment. The baseline risk assessment includes a human health risk assessment (BHHRA) and SLERA. A BHHRA is an analysis of the potential adverse human health effects of releases of hazardous substances from a site or OU in the absence of any actions or controls to mitigate such releases, under current and future land and resource uses. The baseline risk assessment provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed if remedial action is determined to be necessary.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario:

Hazard Identification – uses the analytical data collected to identify the contaminants of potential concern at the Site for each medium, with consideration of a number of factors explained below;

Exposure Assessment - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well-water) by which humans are potentially exposed;

Toxicity Assessment - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and

Risk Characterization - summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks. The risk characterization also identifies contamination with concentrations which exceed acceptable levels, defined by the National Contingency Plan (NCP) as an excess lifetime cancer risk greater than 1×10^{-6} to 1×10^{-4}, an excess of lifetime cancer risk greater than 1×10^{-6} (i.e., point of departure) combined with site-specific circumstances, or a Hazard Index greater than 1.0; contaminants at these concentrations are considered chemicals of concern (COCs) and are typically those that will require remediation at the Site. Also included in this section is a discussion of the uncertainties associated with these risks.

Hazard Identification

In this step, the chemicals of potential concern (COPCs) in each medium were identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations, mobility, persistence, and bioaccumulation. The risk assessment for OU2 focused on groundwater and media impacted by contaminated groundwater which may pose significant risk to human health. Analytical information that was collected to determine the

nature and extent of contamination revealed the presence of 1,4-dioxane, VOCs, and metals in groundwater at concentrations of potential concern.

Although residents and businesses in the area are now served by a municipal water line, the aquifer at the Site is designated as a potable water source that could be used for drinking in the future. Based on the current zoning and anticipated future use, the risk assessment focused on future residential exposure to groundwater in the most contaminated portion of the plume. The potential for vapor intrusion into nearby homes due to contaminated groundwater was also assessed. Recreational exposure to surface water bodies affected by contaminated groundwater (Trout Brook, Lamington River UNT, and Tanners Brook UNT) was evaluated, however, sediment in these water bodies was not addressed in the risk assessment due to the anticipated infrequent contact with the medium by recreators, review of the analytical data, Site use and conditions, and the limited potential for bioaccumulation. Soil was also not evaluated in the BHHRA since it was capped as part of the OU1 remedy.

A comprehensive list of all COPCs can be found in the BHHRA in the Administrative Record. Only the COCs, or the chemicals requiring remediation at the Site, are listed in Appendix 2 – Table 7.

Exposure Assessment

Consistent with Superfund policy and guidance, the BHHRA is a baseline human health risk assessment and therefore assumes no remediation or institutional controls to mitigate or remove hazardous substance releases. Cancer risks and noncancer hazard indices were calculated based on an estimate of the reasonable maximum exposure (RME) expected to occur under current and future conditions at the Site. The RME is defined as the highest exposure that is reasonably expected to occur at a site.

Exposure pathways were identified for each potentially exposed population and each potential exposure scenario for exposure to groundwater and surface water. Exposure pathways assessed in the BHHRA are presented in Appendix 2 – Table 8 and include exposure of residents to the most contaminated portion of the groundwater plume through the ingestion of, dermal contact with, and inhalation of volatile contaminants during daily activities and while showering/bathing. Risks and hazards were also evaluated for ingestion of and dermal contact with contaminated surface water from Trout Brook, Lamington River UNT, and Tanners Brook UNT, as well as consumption of fish from these water bodies. Subslab soil gas and indoor air samples were collected from nearby residences during the early part of the RI to assess the potential for vapor intrusion from Site contaminants; these samples were qualitatively evaluated in the BHHRA.

Typically, exposures are evaluated using a statistical estimate of the exposure point concentration, which is usually an upper-bound estimate of the average concentration for each contaminant, but in some cases, may be the maximum detected concentration. For lead exposures, the arithmetic mean of all samples included in the risk assessment for each medium was used as the exposure point concentration. A summary of the exposure point concentrations for the COCs can be found in Appendix 2 - Table 7, while a comprehensive list of the exposure point concentrations for all COPCs can be found in the OU2 BHHRA.

Toxicity Assessment

In this step, the types of adverse health effects associated with contaminant exposures and the relationship between magnitude of exposure and severity of adverse health effects were determined. Potential health effects are contaminant-specific and may include the risk of developing cancer over a lifetime or other noncancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some contaminants are capable of causing both cancer and noncancer health effects.

Under current EPA guidelines, the likelihood of carcinogenic risks and noncarcinogenic hazards because of exposure to site chemicals are considered separately. Consistent with current EPA policy, it was assumed that the toxic effects of the Site-related chemicals would be additive. Thus, cancer and noncancer risks associated with exposures to individual COPCs were summed to indicate the potential risks and hazards associated with mixtures of potential carcinogens and non-carcinogens, respectively.

Toxicity data for the human health risk assessment are provided in the Integrated Risk Information System (IRIS) database, the Provisional Peer Reviewed Toxicity Database (PPRTV), or another source that is identified as an appropriate reference for toxicity values consistent with EPA's directive on toxicity values. This information is presented in Appendix 2 - Table 9 (Noncarcinogenic Toxicity Data Summary) and Appendix 2 - Table 10 (Cancer Toxicity Data Summary).

Risk Characterization

Noncarcinogenic risks were assessed using a hazard index (HI) approach, based on a comparison of expected contaminant intakes and benchmark comparison levels of intake (reference doses, reference concentrations). Reference doses (RfDs) and reference concentrations (RfCs) are estimates of daily exposure levels for humans (including sensitive individuals) that are thought to be safe over a lifetime of exposure. The estimated intake of chemicals identified in environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) is compared to the RfD or the RfC to derive the hazard quotient (HQ) for the contaminant in the particular medium. The HI is obtained by adding the HQs for all compounds within a particular medium that impacts a particular receptor population.

The HQ for oral and dermal exposures is calculated as below. The HQ for inhalation exposures is calculated using a similar model that incorporates the RfC, rather than the RfD.

HQ = Intake/RfD

Where: HQ = hazard quotient
Intake = estimated intake for a chemical (mg/kg-day)
RfD = reference dose (mg/kg-day)

The intake and the RfD will represent the same exposure period (i.e., chronic, sub chronic, or

acute).

As previously stated, the HI is calculated by summing the HQs for all chemicals for likely exposure scenarios for a specific population. An HI greater than 1 indicates that the potential exists for noncarcinogenic health effects to occur as a result of site-related exposures, with the potential for health effects increasing as the HI increases. When the HI calculated for all chemicals for a specific population exceeds 1, separate HI values are then calculated for those chemicals which are known to act on the same target organ. These discrete HI values are then compared to the acceptable limit of 1 to evaluate the potential for noncancer health effects on a specific target organ. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. A summary of the noncarcinogenic hazards associated with these chemicals for each exposure pathway is contained in Appendix 2 - Table 11.

Appendix 2 Table 11 shows that the HI for noncancer effects is 13 for the future adult resident and 15 for the future child resident for exposure to 1,4-dioxane, TCE, benzene, DEHP, arsenic, and chromium in groundwater in the most contaminated portion of the plume. The HI for noncancer effects for recreational exposure to site surface water, including fish ingestion, is below 1.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen, using the cancer slope factor (SF) for oral and dermal exposures and the inhalation unit risk (IUR) for inhalation exposures. Excess lifetime cancer risk for oral and dermal exposures is calculated from the following equation, while the equation for inhalation exposures uses the IUR, rather than the SF:

Risk = LADD x SF

Where: Risk = a unitless probability (1×10^{-6}) of an individual developing cancer
LADD = lifetime average daily dose averaged over 70 years (mg/kg-day)
SF = cancer slope factor, expressed as [1/(mg/kg-day)]

These risks are probabilities that are usually expressed in scientific notation (such as 1×10^{-4}). An excess lifetime cancer risk of 1×10^{-4} indicates that one additional incidence of cancer may occur in a population of 10,000 people who are exposed under the conditions identified in the assessment. Again, as stated in the NCP, the acceptable risk range for site-related exposure is 1×10^{-6} (i.e., one additional incidence of a cancer may occur in a population of 1,000,000 who are exposed under the conditions) to 1×10^{-4}.

A summary of the estimated cancer risks is presented in Appendix 2, Table 12. The results indicated that the cancer risk exceeded the acceptable risk range at 7×10^{-3} for future residential exposure to 1,4-dioxane, TCE, benzene, DEHP, arsenic, and chromium in groundwater from the most contaminated portion of the plume. The cancer risk to current and future recreators from exposure to surface water, including fish ingestion, was within the acceptable risk range.

Lead was detected in site groundwater at elevated concentrations. Because there are no

published quantitative toxicity values for lead, it is not possible to evaluate risks from lead exposure using the same methodology as for the other COCs. However, since the toxicokinetics (the absorption, distribution, metabolism, and excretion of toxins in the body) of lead are well understood, risks from lead are evaluated based on blood lead levels (BLL). In lieu of evaluating risk using typical intake calculations and toxicity criteria, EPA developed models which are used to predict BLL and the probability of a child's BLL exceeding a target threshold concentration. In the BHHRA, lead risks for child residents were evaluated using EPA's Integrated Exposure Uptake Biokinetic (IEUBK) model. EPA's regional risk reduction goal considered in the BHHRA was to limit the probability of a child's (or that of a group of similarly exposed individuals) BLL exceeding 5µg/dL to 5% or less. The results of the lead risk evaluation are summarized in Appendix 2 - Table 13. For a child resident, exposure to lead in groundwater in the most contaminated portion of the plume resulted in a calculated probability of 68%, exceeding the target BLL.

Subslab soil gas, indoor air, and groundwater sample results were compared to vapor intrusion screening levels to determine the potential for unacceptable risk or hazards due to the migration of vapors from contaminated groundwater into nearby buildings. The conclusion of the qualitative analysis was that residents are currently unlikely to be exposed to Site contaminants through the vapor intrusion pathway, though this could change if the groundwater plume migrated over time.

NJDEP conducted a baseline human health risk assessment in 1986 (1986 HHRA) to evaluate the human health impacts associated with OU1. The 1986 HHRA evaluated a hypothetical resident and recreational user's exposure to contaminants from the landfill using analytical chemistry data from groundwater, soil, air, sediment and surface water samples. A child's potential exposure to the contaminated groundwater at a nearby daycare center was also evaluated.

The results of the 1986 HHRA assessment indicated that noncancer hazards are within acceptable limits. However, migration of contaminated groundwater posed a risk to downgradient well users. Although the water line has been installed as part of the OU1 remedy to eliminate this risk, groundwater in OU1 and OU2 continues to be contaminated above drinking water standards and additional efforts to control migration are necessary to protect human health and the environment.

Uncertainties in the Risk Assessment

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis;
- environmental parameter measurement;
- fate and transport modeling;
- exposure parameter estimation; and
- toxicological data.

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper-bound estimates of the risks to populations near the Site, and is highly unlikely to underestimate actual risks related to the Site.

Ecological Risk Assessment

The SLERA was prepared to evaluate potential hazards for aquatic biota, benthic invertebrates, amphibians, and plants as well as wildlife exposure to contaminants present in surface water, seep/spring water, and sediment. Plant exposure to contaminants is via uptake and root absorption while wildlife is exposed via ingestion of water, plants, and invertebrates and incidental ingestion of sediment.

The evaluation of surface water and sediment exposure pathways from local streams and seep/spring pathways indicates that aquatic biota, benthic invertebrates, amphibians, and plants may potentially be adversely impacted by inorganics, PAHs, 2,3,4,6-tetrachlorophenol, and alpha-chlordane. Inorganics, PAHs, and 2,3,4,6-tetrachlorophenol exceeded conservative screening levels for sediment. Conservative surface water screening levels were exceeded for inorganics. There were also some VOCs and one pesticide (alpha chlordane) identified as COPCs because no screening criteria are available. Though widespread in surface water near CFS, 1,4-dioxane did not exceed the comparison criterion value of 22,000 μg/L. Its presence in streams and seeps indicates that contaminated groundwater originating at the landfill is upwelling into the streams and seeps, but not at levels that would be of ecological concern.

For wildlife exposure via bioaccumulation of COPCs in the food chain, the evaluation of surface water and sediment exposure pathways from the four local streams (Trout Brook, Lamington River UNT, Tanners Brook UNT, and East Trout Brook) have lowest-observed-adverse-effect-level (LOAEL)-based hazard quotients (HQs) less than 1 for all receptor groups, except for spotted sandpipers, representing avian invertivores. Exposure to vanadium in East Trout Brook for this receptor resulted in a HQ of 1.7, which is just above the acceptable limit of 1. However, vanadium was not found at significant levels in the groundwater plume and therefore the landfill is unlikely to be the source.

Detailed information regarding the ecological risk assessment can be found in the 2018 Final RI

report.

In summary, future residential exposure to the most contaminated portion of the groundwater plume results in cancer risk and hazards that exceed EPA's threshold criteria. Additionally, groundwater in OU1 exceeds drinking water standards and is a source to OU2. The wildlife food chain modeling HQs are less than 1, except for the spotted sandpiper which has an HQ of 1.7 for exposure to vanadium in sediment from East Trout Brook. This risk estimate, as well as other exceedances of conservative surface water and sediment screening values are not from compounds that are considered to be site-related. Although 1,4-dioxane is impacting the surface water, it is not at levels of ecological concern. Further remediating the groundwater will reduce any site-related impacts to surface water.

The response actions selected in this decision document are necessary to protect the public health, welfare or the environment from actual or threatened releases of contaminants into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are defined as media-specific goals for protecting human health and the environment. RAOs are developed through an evaluation of data generated during the RI, including: the identified contaminants of concern, impacted media of interest, fate and transport processes, receptors at risk, and the associated pathways of exposure included in the conceptual site model. RAOs also consider preliminary remediation goals (PRGs), identified via an evaluation of applicable or relevant and appropriate requirements (ARARs) and advisories, criteria or guidance to be considered, and other technical and policy considerations that may be applicable to the Site.

The following RAOs were developed for the OU1 ROD amendment:

- Limit migration of contaminated groundwater and leachate from OU1 to OU2;
- Enhance the groundwater extraction and treatment (GWET) system to reduce concentrations of 1,4-dioxane being discharged to surface water;
- Reduce the toxicity, mobility and volume of contamination in the North Waste Cell to reduce impact on groundwater; and
- Prevent exposure to contaminated groundwater.

The following RAO was developed for the OU2 interim remedy:

- Prevent current and future exposure to human receptors (via ingestion, dermal contact and inhalation) to Site-related contaminants in groundwater and surface water at concentrations in excess of federal and state standards.

Remediation Goals

The ultimate goal for OU2 is to achieve restoration of the groundwater in order for it to be used as a drinking water source by controlling groundwater at the boundary of OU1. EPA and NJDEP have promulgated maximum contaminant limits (MCLs) and NJDEP has promulgated GWQSs, which are enforceable, health-based, protective standards for various drinking water

contaminants. In the Proposed Plan, EPA identified the more stringent of the MCLs and GWQSs as the preliminary remediation goals for the COCs in the OU2 groundwater. The OU2 preliminary remediation goals are presented in Appendix 2, Table 17. The remediation goals will be identified in the final ROD for OU2.

BASIS FOR OU1 REMEDY MODIFICATION

The 1986 OU1 remedy does not fully capture the leachate and groundwater contamination emanating from the landfill, and remaining source material in the North Waste Cell is impacting the groundwater. Improvements to the OU1 remedy are necessary to more effectively limit migration of contaminants and reduce impacts to groundwater in OU2.

DESCRIPTION OF REMEDIAL ALTERNATIVES

The August 2018 FS Report identifies and evaluates remedial action alternatives. RAOs were developed for the Site, and then technologies were identified and screened based on overall implementability, effectiveness, and cost. Remedial alternatives consisting of one or more technologies were assembled and analyzed in detail with respect to seven of the nine criteria for remedy selection under CERCLA. The remaining two criteria, state acceptance and community acceptance, are addressed below.

Remedial Alternatives

CERCLA Section 121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions be protective of human health and the environment, be cost effective, and use permanent solutions and, alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which use, 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. The NCP establishes an expectation that treatment will be used to address the principal threats posed by a Site wherever practicable (40 C.F.R. Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. The groundwater contamination at the CFS Site is not considered principal threat waste. However, the waste material in the North Waste Cell is source material, and is considered principal threat waste. CERCLA Section 121(d), 42 U.S.C. §9621(d), specifies that a remedial action must require 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).

Remedial alternatives for the Site are summarized below. Capital costs are those expenditures that are required to construct a remedial alternative. O&M costs are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial alternative and are estimated on an annual basis. Present worth is the amount of money which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project, calculated using a discount rate of seven percent and up to a 30-year time interval. Construction time is the time required to construct and implement the alternative and does not include the time required to design the remedy, or procure contracts for design and construction.

Common Elements

The alternatives for each OU include a "No Action" alternative (OU1-G1 and OU2-G1 for OU1 and OU2, respectively). The No Action alternatives provide a baseline for comparison with other active remedial alternatives. Because no remedial activities will be implemented under the No Action alternatives, long-term human health and environmental risks would remain the same as those identified in the BHHRA and SLERA, with the exception of any changes due to incidental natural attenuation. There are no capital, operations/maintenance, or monitoring costs, no permitting or institutional legal restrictions.

Long-Term Monitoring (LTM) and Institutional Controls (ICs) will be implemented with all the alternatives except the No Action alternatives. ICs include establishing a classification exception area well restriction area (CEA/WRA) to limit future use of Site groundwater and placing a deed notice to limit future land use and protect the integrity of the cap. Current LTM involves collecting samples at groundwater monitoring wells to assess groundwater conditions over time.

For OU1, 1,4 dioxane treatment, North Waste Cell removal and upgrading the GWET are common components of alternatives OU1-G2 and OU1-G3. The active OU2 alternatives are contingent upon the implementation of either OU1-G2 or OU1-G3. Additionally, because alternatives OU1-G2 and OU1-G3 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.

The alternatives for OU1 and OU2 are summarized below.

Alternative OU1-G1: No Action

Estimated Capital Cost - $0
Estimated Annual O&M Cost - $0
Estimated Present Worth Cost - $0
Estimated Construction Time Frame – 0 months

The NCP requires EPA to consider the No-Action alternative. Under this alternative, no additional actions would be taken to improve the existing OU1 GWET system and operations. This alternative would also not involve ICs. Contaminants present in overburden and bedrock groundwater that are not being captured by the existing OU1 GWET system would remain in groundwater.

Alternative OU1-G2: Upgrade OU1 GWET system, source area removal, LTM/ICs

Estimated Capital Cost - $9,828,414
Estimated Annual O&M Cost - $890,660
Estimated Present Worth Cost - $20,936,217
Estimated Construction Time Frame – 12 months

Under its current configuration, the OU1 GWET system is not fully capturing the leachate or shallow groundwater underlying the landfill.

Primary components of Alternative OU1-G2 consist of upgrading the groundwater conveyance system to increase the volume of contaminated groundwater that can be captured and to provide treatment for 1,4-dioxane as part of the GWET system. The components of this alternative are as follows:

The conveyance system around the northeast landfill perimeter would be upgraded to accommodate additional groundwater flow from the overburden extraction wells and RW-T to allow for continuous operation and achieve the intended capture. This alternative includes upgrading piping from a 2-inch diameter line to a larger line which will allow for additional capacity. The one existing bedrock extraction well will be operated at a continuous rate rather than in cycles as is the current practice. The continuous pumping of the bedrock extraction well, RW-T, would increase hydraulic influence up to 1,800 feet or more to the northeast of the landfill.

The OU1 GWET was originally designed to treat approximately 120 gallons per minute (gpm) of contaminated groundwater; however, it currently treats on average only 45 to 70 gpm of groundwater flow due to poor extraction well performance and limitations in the diameter of extraction well conveyance piping and reduced yield due to seasonal variations. Under this alternative, the OU1 GWET would be upgraded to operate at a minimum of 120 gpm, from the current operating flow rate of 45 to 70 gpm. An evaluation of the existing system and treatment requirements would be conducted during the remedial design (RD) phase to develop the details of the necessary improvements to upgrade the treatment capacity. The existing system operates in batch-flow and utilizes a sequencing batch reactor (SBR) to remove the ammonia concentrations that are typically found in landfill leachate. The necessity of SBR under the new pumping scenario will be evaluated in RD.

Since surface water impacts groundwater in some areas of the Site, the OU1 GWET upgrade includes adding treatment for reducing 1,4-dioxane concentrations to or below the current GWQS of 0.4 µg/l. Various treatment technologies, such as adsorption and advanced oxidation processes, have been evaluated and pilot tested for use at the Site and adsorption results were positive. Recent studies into the potential efficacy of biological treatment are also being considered. A final ex-situ treatment option would be selected in the RD phase.

With reduced impact from contamination in the overburden aquifer, the conditions in the bedrock groundwater within OU1 would be assessed over time with LTM. Establishment of a CEA/WRA would limit future groundwater use and restrict installation of wells other than for

monitoring within the extent of the landfill property. Because the landfill contents will continue to leach for many years, this alternative is expected to take longer than 30 years to complete. A deed notice would limit future land use and protect the integrity of the cap.

As part of this alternative, remaining source material, including soil contamination and solid waste (buried drums and containers) located in the North Waste Cell would be excavated and disposed of off-site at a permitted facility. After the removal of this source material, the impermeable cap will be replaced over this area.

Alternative OU1-G3: Addition of new bedrock extraction wells, upgrade OU1 GWET system, source area removal, and LTM/ICs

Estimated Capital Cost - $10,457,289
Estimated Annual O&M Cost - $920,360
Estimated Present Worth Cost - $21,933,592
Estimated Construction Time Frame – 12 months

Alternative OU1-G3 utilizes the OU1 existing GWET overburden extraction well network, as well as the addition of new bedrock extraction wells to establish hydraulic control in the bedrock aquifer at the OU1/OU2 boundary. The OU1 GWET would be upgraded as described in Alternative OU1-G2, new bedrock extraction wells would be installed that would allow treatment of added volume, for a total treatment capacity of approximately 200 gpm. The new extraction wells would be installed within preferential flow paths identified via geophysical methods or other means during RD and previous investigations. It is estimated that three bedrock extraction wells would be installed within OU1 or near the OU1/OU2 boundary. Bedrock extraction wells would be installed to target groundwater contamination located approximately 100 to 350 feet bgs.

It is likely that pumping from the proposed bedrock extraction wells would establish hydraulic control at the OU1/OU2 border. Pumping from the bedrock aquifer in this area, especially within a preferential flow path, could influence groundwater far downgradient. This hydraulic control would limit the migration of contaminants from OU1 to OU2. LTM of OU1 monitoring wells would be expected to show reduced contaminant concentrations and monitor the impact of the increased extraction over time. Establishment of a CEA/WRA would limit future groundwater use and prevent installation of wells other than for monitoring within the extent of the landfill property boundary. Because the landfill contents will continue to leach for many years, this alternative is expected to take longer than 30 years to complete. Deed restrictions would limit future land use and protect the integrity of the cap.

As with the OU1-G2 Alternative, the source area material in the North Waste Cell area would be excavated and disposed of off-site.

Alternative OU2-G1: No Action

Estimated Capital Cost - $0
Estimated Annual O&M Cost - $0

Estimated Present Worth Cost - $0
Estimated Construction Time Frame – 0 months

Under this alternative, no actions would be taken in OU2 to address groundwater contamination. This alternative would also not include ICs or monitoring. Contaminants present in overburden and bedrock groundwater and surface water in OU2 would remain unaddressed and unmonitored.

Alternative OU2-G2: Long-term monitoring/institutional controls

Estimated Capital Cost - $0
Estimated Annual O&M Cost - $111,200
Estimated Present Worth Cost - $781,100
Estimated Construction Time Frame – 0 months

Alternative OU2-G2 consists of long-term groundwater and surface water monitoring and institutional controls. Alternative OU2-G2 assumes an active groundwater remedy would be selected to amend the OU1 remedy. Alternative OU2-G2 includes multiple rounds of groundwater and surface water sampling to be collected from the existing or expanded monitoring well network located within OU2. LTM is expected to take place over a period of ten years or less, at which point a decision would be made about a permanent remedy for OU2 groundwater in a final OU2 decision document.

The effectiveness of LTM/ICs would be assessed over time in conjunction with the OU1 amended remedy.

This alternative assumes land and groundwater use in the OU2 area would remain the same over the foreseeable future.

Establishment of a CEA/WRA would limit future groundwater use and restrict installation of wells other than for monitoring within the known extent of the OU2 threatened and impacted area.

Alternative OU2-G3: Installation of extraction wells and groundwater treatment with LTMs/ICs

Estimated Capital Cost - $9,056,339
Estimated Annual O&M Cost - $246,060
Estimated Present Worth Cost - $10,784,639
Estimated Construction Time Frame – 24 months

Alternative OU2-G3 consists of pumping groundwater from approximately three bedrock extraction wells located in the northeast and west-southwest portions of the OU2 area within the most predominant groundwater flow directions. This would establish some hydraulic control of the OU2 plume. The three bedrock extraction wells would be constructed to a depth of approximately 100 to 350 feet bgs.

The three bedrock extraction wells in this alternative would be in addition to the three bedrock extraction wells in OU1-G3, should that alternative be selected for OU1. If OU1-G2 is selected, these would be the only bedrock extraction wells at the Site with the exception of existing RW-T. The recovered groundwater would be pumped to and treated at the OU1 GWET. The OU1 GWET would be upgraded and expanded as described in Alternative OU1-G2 or OU1-G3 to handle the additional groundwater volume from this alternative, which is estimated to be approximately 100 gpm. The treated groundwater effluent would either be discharged to East Trout Brook at the existing OU1 GWET effluent location, at a new infiltration/detention basin, returned to the streams nearest the extraction wells, or discharged to a combination of discharge locations to maintain the hydrology of the streams and avoid adverse impacts to open water and wetlands. These determinations would be made in the RD phase.

This alternative is contingent on the remedy selected to address the OU1 groundwater. It is assumed that the OU1 GWET system will be upgraded to accept the additional volume from Alternative OU1-G2 or OU1-G3. LTM and a CEA/WRA as described previously are also components of this alternative.

This alternative also includes: multiple rounds of groundwater sampling to be collected from the existing or expanded OU2 monitoring well network as well as surface water sampling; statistical analysis and groundwater modeling to predict the timeframe for groundwater restoration; and ICs to assure the interim remedy remains protective. It is likely that this alternative would be implemented for up to 10 years, at which point a decision would be made regarding a permanent remedy for OU2 in a final OU2 decision document.

Comparative Analysis of Alternatives

This section includes a comparative analysis of the three alternatives developed for both OU1 and OU2. In selecting the remedies, EPA considered the factors set out in CERCLA Section 121 42 U.S.C.§9621, by conducting a detailed analysis of the viable remedial response measures pursuant to the NCP, 40 CFR 300.430(e)(9), and EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, OSWER Directive 9355.3-01, and EPA's *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, OSWER 9200.1-23. P. The detailed analysis consisted of an assessment of the individual response measures against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each response measure against the criteria. A comparative analysis of these alternatives, based upon the nine evaluation criteria noted below, follows.

Threshold Criteria - The first two remedy selection criteria are known as "threshold criteria"

because they are the minimum requirements that each response measure must meet in order to be eligible for selection as a remedy.

Overall Protection of Human Health and the Environment

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

Alternatives OU1-G1 and OU2-G1 would not meet the RAOs and would not be protective of human health and the environment since no actions would be taken. For OU1, the existing treatment plant would remain, but it primarily treats leachate and some shallow groundwater, and deeper bedrock groundwater would continue to migrate from the landfill to downgradient areas uncontrolled. OU2 contamination would remain in groundwater for a long time in the future, while no mechanisms would be implemented to prevent exposure to contaminated groundwater, or to reduce the toxicity, mobility, or volume of contamination except through natural processes, which would not be monitored.

For Alternatives OU1-G2 and OU1-G3, RAOs would be met over time and would provide protection to human health and the environment through treatment processes, ICs, and LTM. The implementation of a deed notice restricting future use would provide a greater degree of overall protection of human health and the environment by providing limited use of the Site.

Alternative OU1-G3 would be more protective compared to Alternative OU1-G2 as it would provide a more comprehensive hydraulic control remedy with the addition of bedrock extraction wells for OU1 and would capture both overburden and bedrock contaminated groundwater underlying the landfill property to a depth of approximately 350 feet bgs.

Additional protection would occur based on the excavation and off-site disposal of source material in the North Waste Cell as part of both Alternatives OU1-G2 and OU1-G3.
For OU2, Alternatives OU2-G2 and OU2-G3 would meet RAOs and would provide protection to human health and the environment through the implementation of either long-term monitoring (OU1-G2) or groundwater extraction and treatment (OU1-G3). Alternative OU2-G3 would actively treat contaminated groundwater in the OU2 area of the Site, which may be more protective than the LTM called for in OU2-G2. However, the bedrock extraction wells which are part of Alternative OU1-G3, are expected to capture a portion of the OU2 bedrock plume, which depending on the success of the OU1 remedy, may provide similar protectiveness compared with OU2-G3. Further, streams and wetlands in the OU2 area could be negatively impacted by extraction and discharge of treated OU2 groundwater that would occur as part of OU2-G3.

Compliance with applicable or relevant and appropriate requirements (ARARs)

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4).

EPA and NJDEP have promulgated MCLs and GWQS (40 CFR Part 141 and N.J.A.C. 7:9C, respectively), which are enforceable standards for various drinking water contaminants (and are chemical-specific ARARs). If any state standard is more stringent than the federal standard, then compliance with the more stringent ARAR is required. As groundwater within Site boundaries is a source of drinking water, the more stringent of the federal MCLs and GWQS for COCs in the groundwater are chemical-specific ARARs.

Alternatives OU1-G1 and OU2-G1 would not achieve drinking water standards for the aquifer. Action-specific ARARs do not apply to these No Action alternatives since no remedial action would be conducted.

Alternatives OU1-G2 and OU1-G3 could meet the RAOs within the active treatment areas over the long term. Compliance with ARARs will be achieved at the boundary of the landfill property.

Alternatives OU2-G2 and OU2-G3 would meet the RAO for OU2 over the long term, provided that an active remedy for OU1 is effective. OU2-G2 would likely take longer than OU2-G3 to achieve compliance with ARARs, TBCs, and Other Guidance within OU2. Because the OU2 action is only an interim action, remediation goals resulting in compliance with chemical-specific ARARs will be addressed in the final ROD for OU2.

Alternatives OU1-G2, OU1-G3, and OU2-G3 would meet action-specific and location-specific ARARs for example, by complying with substantive New Jersey Pollution Discharge Elimination System requirements for discharge of the treatment plant effluent to surface water and/or groundwater, implementing Resource Conservation Recovery Act requirements, and the Clean Water Act requirements. Locating extraction wells and conveyance piping within regulated areas, such as freshwater wetlands, would be avoided to the extent practicable.

Alternative construction techniques such as directional drilling vs. open trenching of conveyance piping would be evaluated for greater compliance with location-specific ARARs for Alternative OU2-G3.

Primary Balancing Criteria – The next five criteria are known as "primary balancing criteria." These criteria are factors by which tradeoffs between response measures are assessed so that the best options will be chosen, given site-specific data and conditions.

Long-Term Effectiveness and Permanence

A similar degree of long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain on site following remediation and the adequacy and reliability of controls.

Alternatives OU1-G1 and OU2-G1 would not be effective or permanent since there would be no mechanisms to prevent or monitor migration and exposure to contaminated groundwater.

Alternatives OU1-G2 and OU1-G3 would provide long-term effectiveness and permanence by hydraulically containing the contaminant mass within the overburden in the case of OU1-G2 and, in the case of OU1-G3, overburden and bedrock aquifers within OU1 and treating the contaminated groundwater ex-situ. Alternative OU1-G3 would provide more hydraulic control in the overburden and the bedrock aquifer, as compared to OU1-G2. Additionally, ICs including a deed notice and a CEA/WRA would ensure continued protection of human health receptors in the long-term under both Alternative OU1-G2 and OU1-G3 by providing protection against potential exposures to low-level threat buried landfill materials is maintained.

Eliminating the source material remaining in the North Waste Cell area would help achieve long-term effectiveness and permanence as part of both Alternatives OU1-G2 and OU1-G3.

Alternatives OU2-G2 and OU2-G3 are both contingent on the successful implementation of an active OU1 amended remedy. Alternative OU2-G2 would rely on the implementation of either OU1-G2 or OU1-G3, for long-term effectiveness. Alternative OU2-G3 will use extraction from OU2 extraction wells and treatment at the OU1 plant to restore the OU2 aquifer. The bedrock OU2 extraction wells in alternative OU2-G3 may expedite removal of contaminant mass from OU2. Both OU2 alternatives are expected to improve groundwater quality outside the landfill and bring the Site closer to the long-term goal of restoration. The final remedy for OU2 would be selected later based on the effectiveness of the OU1 amended remedy and OU2 selected interim remedy.

Reduction of Toxicity, Mobility, or Volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternatives OU1-G1 and OU2-G1 would not provide any reduction of toxicity, mobility or volume of contaminants since no remedial action would be conducted.

Alternatives OU1-G2 and OU1-G3 would provide reduction of toxicity, mobility, and volume through treatment and removal of contaminants in OU1. Alternative OU1-G3 would be more effective compared to OU1-G2 in reducing toxicity, mobility and volume of contamination in groundwater by hydraulically controlling and treating more contaminated groundwater, from both the overburden and bedrock zones underlying the landfill. Both OU1-G2 and OU1-G3 would reduce the toxicity, mobility, and volume of 1,4-dioxane by addition of treatment elements to the existing GWET system to address this contaminant, which is not currently being treated by the GWET.

The reduction of toxicity, mobility, and volume of source material, though not by treatment, would be achieved by the removal of the remaining source material from the North Waste Cell area under both Alternatives OU1-G2 and OU1-G3.

Alternatives OU2-G2 and OU2-G3 would both see the reduction of contaminant toxicity, mobility, and volume through the successful implementation of an active OU1 remedy which would improve hydraulic control of contamination in the OU1 area and therefore limit migration

of contaminants to the OU2 area. Alternative OU2-G3 would be effective in reducing toxicity, mobility and volume of contamination in groundwater through extraction and treatment at the furthest downgradient portions of the OU2 plume.

Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternatives OU1-G1 and OU2-G1 would not have short-term impacts since no action would be implemented.

There would be minimal short-term impacts to the local community and workers for Alternatives OU1-G2 and OU1-G3 due to the fact that associated construction, operation and treatment activities would occur within the OU1 property boundary. In addition, there would be minimal short-term impacts related to the removal of the source material in the North Waste Cell area. Alternative OU2-G2 could be performed with limited impact to Site workers or the community. Coordination and access would be required for construction of the OU2 extraction wells and pumping in Alternative OU2-G3.

For Alternatives OU1-G2, OU1-G3, and OU2-G3, Site workers would undergo required training and would wear appropriate personal protective equipment to minimize exposure to contamination and as a protection from physical hazards. Best construction practices to control dust, noise and vibration related to construction would be used. These precautions would provide effective protection to the Site workers and the community from the impacts related to construction.

Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

All groundwater alternatives developed for OU1 and OU2 are implementable. Alternatives OU1-G1 and OU2-G1 would be the easiest to implement as no work would be performed. For OU1, Alternatives OU1-G2 and OU1-G3 would be similarly implementable. Services, materials and experienced vendors are readily available. During remedial design site-specific design parameters for Alternatives OU1-G2 and OU1-G3 and substantive requirements of otherwise required state and local laws would be met for on-site work. The North Waste Cell source area removal is implementable by using standard practices for excavating waste material.

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.

For OU1, ICs, including establishment of a deed notice and a CEA/WRA, as well as the performance of five-year reviews, and continued monitoring and maintenance, are easily implementable.

For OU2 groundwater, Alternative OU2-G2 would be technically and administratively easier to implement than Alternative OU2-G3 as it only includes sampling, while OU2-G3 involves construction of extraction wells and extensive piping from the OU2 area back to the OU1 plant. While implementable, this work would be more difficult to implement compared to OU2-G2.

For OU2-G3, it is possible that groundwater extraction from these proposed locations would have a negative hydraulic impact on (i.e. dewater) the nearby streams and wetlands. Since these water bodies are headwaters to trout streams, it is likely that this alternative would include returning the treated water to those streams to mitigate any hydraulic disturbances. This would involve constructing two miles of conveyance lines. Getting the hydraulic balance right would be challenging and would require significant modeling in the design phase.

Cost

Includes estimated capital and operation and maintenance costs, and net present-worth values.

A summary of the cost estimates for each alternative is presented in Appendix A of the FS. In summary, alternatives OU1-G1 and OU2-G1 are No Action alternatives and have no cost. For OU1, alternative OU1-G2 is approximately $1,000,000 less than Alternative OU1-G3 with total present values estimated at $20,936,217 and $21,933,592, respectively. The added costs for Alternative OU1-G3 are a result of the drilling (capital cost) and operation (O&M cost) of the bedrock extraction wells.

For OU2, Alternative OU2-G2 is substantially less expensive than Alternative OU2-G3 with a total present value of $781,100 (OU2-G2) compared to $10,784,639 (OU2-G3). The major costs associated with Alternative OU2-G3 are from the extraction well installation and the groundwater conveyance lines to and from the GWET system. As noted above, EPA assumes that groundwater extraction from these proposed locations would have a negative hydraulic impact on (i.e. dewater) the nearby streams and tributaries. Since these water bodies are headwaters to trout streams, it is assumed that this remedy would have to include returning the treated water to those streams to mitigate any hydraulic disturbances. The water conveyance line is approximately two miles long and direct discharge to surface water for Alternative OU2-G3 represents a significant cost.

Modifying Criteria - The final two evaluation criteria are called “modifying criteria” because new information or comments from the state or the community on the Proposed Plan may modify the preferred response measure or cause another response measure to be considered.

State Acceptance

Indicates whether based on its review of the RI/FS reports and the Proposed Plan, the state

supports, opposes, and/or has identified any reservations with the selected response measure.

NJDEP defers concurrence on the selected remedies until treatment technologies are further evaluated for 1,4 dioxane contamination in groundwater at the Site during Remedial Design, and a specific method and cost for the Remedial Action is developed.

Community Acceptance

Summarizes the public's general response to the response measures described in the Proposed Plan and the RI/FS reports. This assessment includes determining which of the response measure the community supports, opposes, and/or has reservations about.

EPA solicited input from the community on the alternatives developed and proposed for the Site. The Proposed Plan for the Site was released for public comment on August 12, 2018. The comment period closed on September 11, 2018. EPA held a public meeting on August 22, 2018 to present the preferred alternatives discussed in the Proposed Plan. Oral comments were recorded from attendees at the public meeting. Written comments were received during the public comment period. The Responsiveness Summary located in Appendix 3 addresses all comments received during the public comment period. The community was generally supportive of EPA's the preferred alternatives.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site, wherever practicable (NCP Section 300.430 (a)(1)(iii)(A)). The principal threat concept is applied to the characterization of source materials at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or will present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of alternatives, using those remedy-selection criteria that are described above. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element. The groundwater contamination at the CFS Site is not considered principal threat waste. However, the waste material in the North Waste Cell is source material, and is considered principal threat waste.

SELECTED REMEDIES

Based upon consideration of the results of Site investigations, the requirements of CERCLA, the detailed analysis of the remedial alternatives and public comments, EPA has determined that OU1-G3 and OU2-G2 alternatives are the appropriate remedies for the Site. These remedies best satisfy the requirements of CERCLA Section 121 and the NCP's nine evaluation criteria for remedial alternatives, 40 CFR § 300.430(e)(9). These remedies include the following components:

OU1-G3

- Upgrading the existing groundwater conveyance system to handle an increased volume of contaminated groundwater;
- Installation of bedrock extraction wells near the OU1/OU2 border to increase hydraulic control of contaminated groundwater in OU1;
- Upgrading the OU1 GWET treatment system to include treatment for 1,4-dioxane;
- Excavation and off-site disposal of source material in the North Waste Cell area; and,
- LTM/ICs

OU2-G2

- LTM/ICs

These two selected remedies work well together, are protective of human health and the environment, meet the RAOs established for the CFS Site, and are generally accepted by the community.

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

STATUTORY DETERMINATIONS

As previously noted, CERCLA Section 121(b)(1) mandates that a remedial action must be protective of human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. CERCLA Section 121(b)(1) also establishes a preference for remedial actions that employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at a site. CERCLA Section 121(d) further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA Section 121(d)(4). For the reasons discussed below, EPA has determined that the selected remedies meet the requirements of CERCLA Section 121.

Protection of Human Health and the Environment

The selected remedies will adequately protect human health and the environment. The selected remedies will monitor and treat contaminated groundwater and remove a contaminated source area, which includes principal threat waste. Implementation of the selected remedies will not pose unacceptable short-term risks or adverse cross-media impacts. The selected amended remedy for OU1 together with the interim remedy for OU2 will provide adequate protection until a final ROD is issued.

Compliance with ARARs

The amended remedy for OU1 will comply with all ARARs. The selected remedy for OU2, as in interim remedy, may not achieve chemical-specific ARARs. Remediation goals resulting in

compliance with chemical-specific ARARs will be addressed in the final ROD for OU2. A comprehensive ARAR discussion is included in the FS, and a listing of ARARs is included in Appendix 2, Tables 14 to16 of this ROD.

Cost-Effectiveness

The selected remedies are cost-effective and represent reasonable value for the money to be spent. Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. EPA has determined that the overall effectiveness of the selected remedies is proportional to the costs, and the selected remedies, therefore, represent reasonable value for the money to be spent. The estimated present net worth cost of the selected remedies is $21,933,592 for OU1 and $781,100 for OU2.

Five-Year Review Requirements

Because the OU1 and OU2 selected remedies will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory reviews will be conducted every five years after remedial action initiation. Five-year reviews will ensure that the selected remedies are, or will be, protective of human health and the environment.

DOCUMENTATION OF NO SIGNIFICANT CHANGES

The Proposed Plan for the Site was released for public comment on August 12, 2018. The comment period closed on September 11, 2018.

Upon review of all comments submitted, EPA determined that no significant changes to the selected remedies, as they were presented in the Proposed Plan, are warranted.

APPENDIX 1
Figures

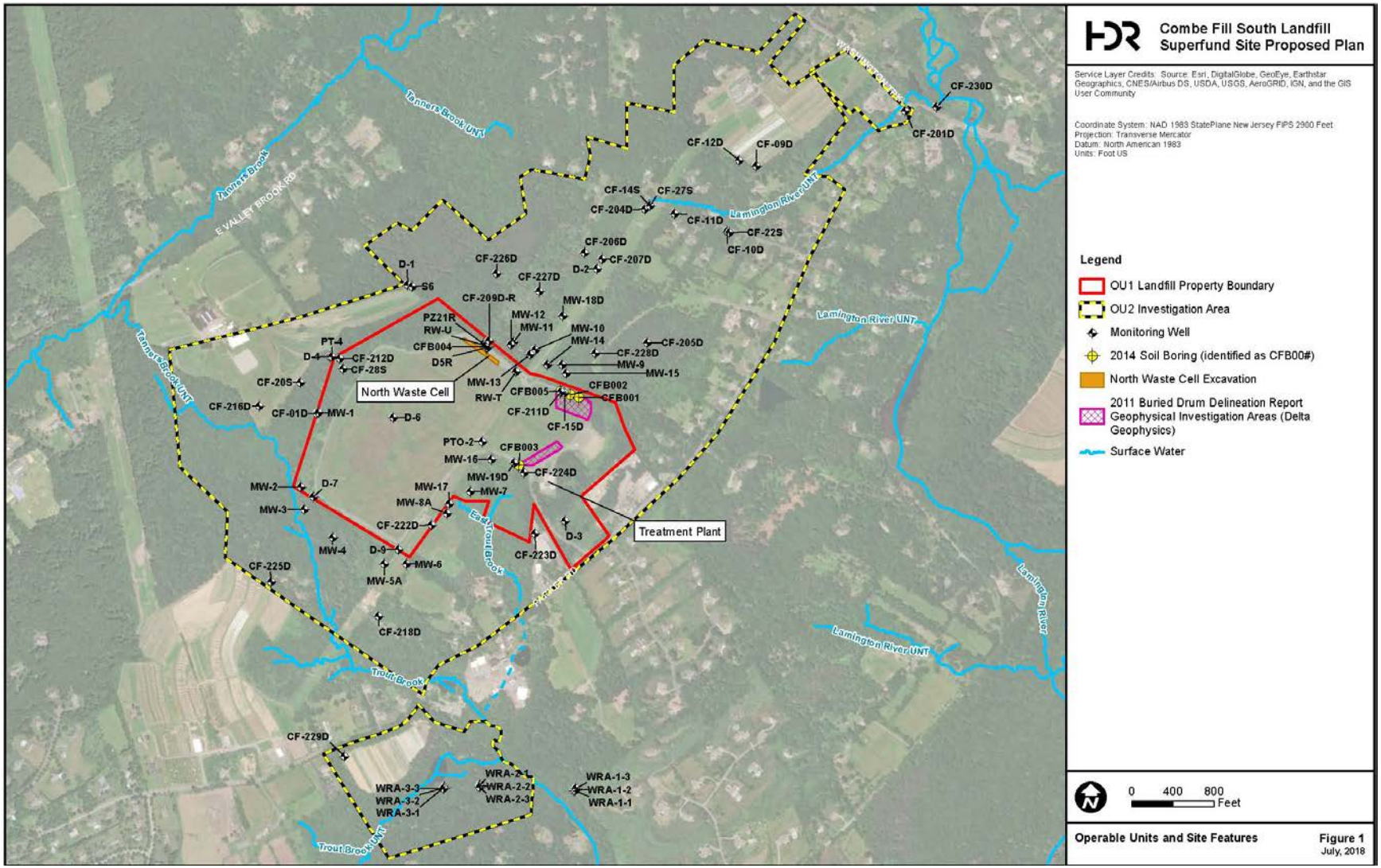
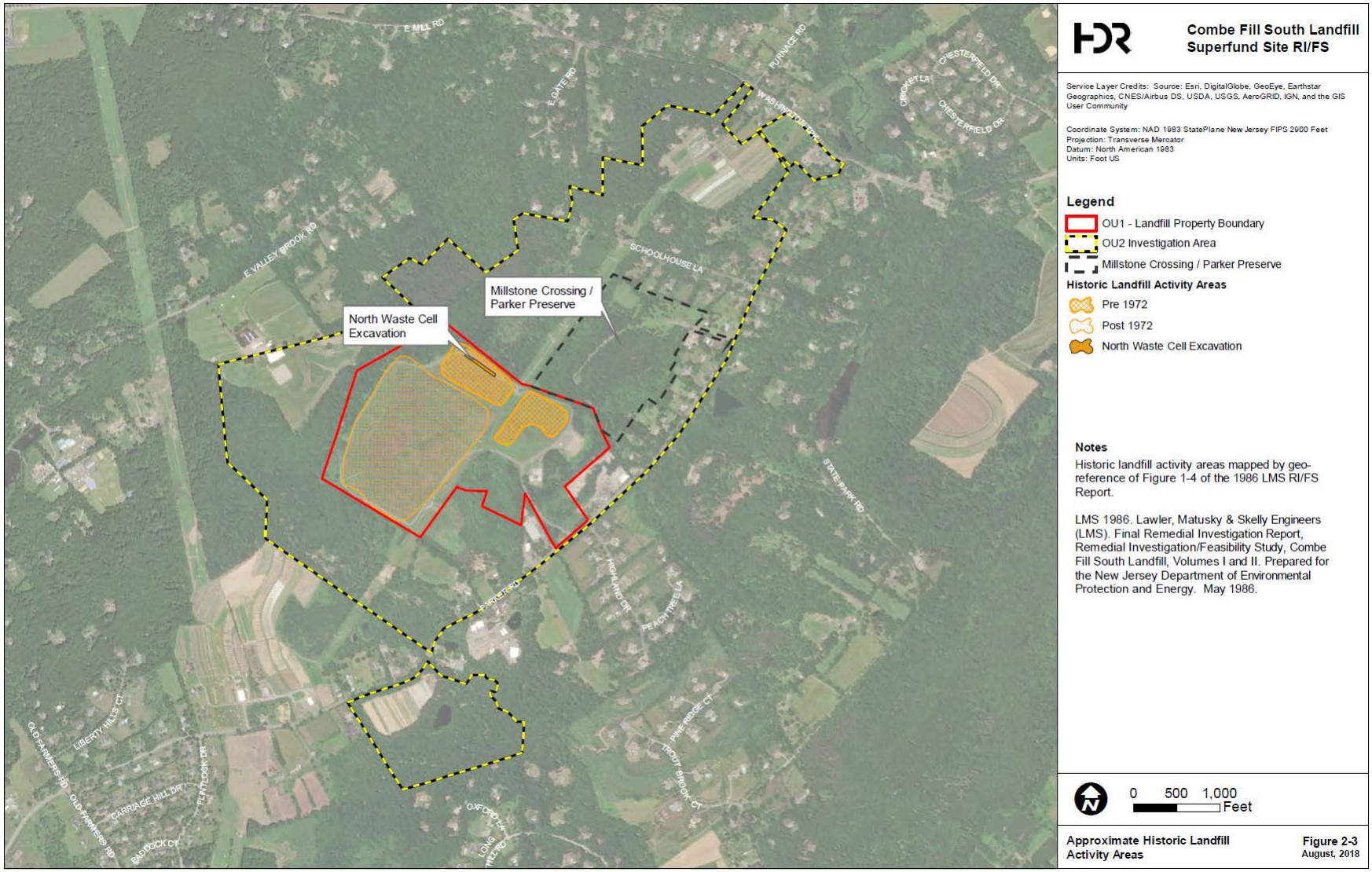

Combe Fill South Landfill
Superfund Site Proposed Plan
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Coordinate System: NAD 1983 StatePlane New Jersey FIPS 2900 Feet
Projection: Transverse Mercator
Datum: North American 1983
Units: Foot US
Legend
OU1 Landfill Property Boundary
OU2 Investigation Area
Monitoring Well
2014 Soil Boring (identified as CFB00#)
North Waste Cell Excavation
2011 Buried Drum Delineation Report Geophysical Investigation Areas (Delta Geophysics)
Surface Water
North Waste Cell
Treatment Plant
Tanners Brook
Tanners Brook UNT
E VALLEY BROOK RD
Lamington River UNT
Lamington River
East Trout Brook
Trout Brook
Trout Brook UNT
0 400 800 Feet
Operable Units and Site Features
Figure 1
July, 2018

Figure 1



Combe Fill South Landfill Superfund Site RI/FS

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane New Jersey FIPS 2900 Feet
Projection: Transverse Mercator
Datum: North American 1983
Units: Foot US

Legend

- OU1 - Landfill Property Boundary
- OU2 Investigation Area
- Millstone Crossing / Parker Preserve

Historic Landfill Activity Areas

- Pre 1972
- Post 1972
- North Waste Cell Excavation

Notes

Historic landfill activity areas mapped by geo-reference of Figure 1-4 of the 1986 LMS RI/FS Report.

LMS 1986. Lawler, Matusky & Skelly Engineers (LMS). Final Remedial Investigation Report, Remedial Investigation/Feasibility Study, Combe Fill South Landfill, Volumes I and II. Prepared for the New Jersey Department of Environmental Protection and Energy. May 1986.

0 500 1,000 Feet

Approximate Historic Landfill Activity Areas

Figure 2-3
August, 2018

Figure 2

APPENDIX 2
Tables

TABLE 1

Analytical Data Summary – Groundwater COCs

Location		CF-10D	CF-10D	CF-11D	CF-201D	CF-201D	CF-201D	CF-201D	CF-201D	CF-201D	CF-201D	CF-201D
Collection Date		10/15/2012	11/17/2014	11/18/2014	10/11/2012	10/11/2012	10/11/2012	10/18/2012	12/3/2014	12/3/2014	12/3/2014	12/3/2014
Sample Depth (ft bgs)		145 - 170	145 - 170	145 - 170	240 - 245	311 - 316	518 - 523	114 - 119	114 - 119	240 - 245	311 - 316	518 - 523
Sample Type		N	N	N	N	N	N	N	N	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	**2.8**	**2.5**	**6.5**	**1.8**	0.5 U	0.5 U	**3.7**	**1.1**	**0.65**	0.5 U	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 R	0.5 R	0.5 R	0.5 U	0.5 R	0.5 R	0.5 R	0.5 R
Trichloroethene (TCE)	1	0.47 J	**1.1**	0.3 J	0.5 R	0.5 R	0.5 R	0.5 U	0.5 R	0.5 R	0.5 R	0.5 R
Bis(2-ethylhexyl)phthalate	3	5 U	**3.8 J**	5 U	2.4 J	2 J	2.2 J	5 U	5 U	5 U	5 U	5 U
alpha-BHC	0.02	0.005 UJ	0.005 U	0.005 U	0.005 UJ	0.005 UJ	0.005 UJ	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Arsenic	3	1 U	**4.5 J**	10 U	2.9	1.1	1.5	1 U	10 U	10 U	10 U	10 U
Chromium	70	2 U	8.3 J	1.3 J	2 U	2 U	2 U	0.53 J	53.6	**83.7**	66	29 J
Lead	5	1 U	**8.7 J**	3.2 J	1 U	1 U	1 U	**8.7**	2.9 J	3.8 J	2.1 J	2 J

Location		CF-201D	CF-201D	CF-201D	CF-201D	CF-204D	CF-204D	CF-204D	CF-204D	CF-204D	CF-204D	CF-205D
Collection Date		7/7/2015	7/7/2015	7/7/2015	7/7/2015	8/8/2013	8/8/2013	8/8/2013	9/11/2014	9/11/2014	9/11/2014	10/17/2012
Sample Depth (ft bgs)		114 - 119	240 - 245	311 - 316	518 - 523	155 - 160	195 - 200	433 - 438	155 - 160	195 - 200	433 - 438	150 - 160
Sample Type		N	N	N	N	N	N	N	N	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	NA	NA	NA	NA	**14**	**15**	0.5 U	**22**	**93**	**0.85**	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	**21**	**70**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.51	0.5 U	0.12 J	0.12 J	0.5 U	0.5 U

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ground Water Quality Standards N.J.A.C. 7:9C (January 2018)

- ft bgs: feet below ground surface

- Detected results exceeding criterion indicated by gray shading and bold font.

- All results and criteria displayed in micrograms per liter (ug/L).

- NA: Not applicable. (Note: some locations were resampled for volatile organics only.)

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

TABLE 1

Analytical Data Summary – Groundwater COCs

Bis(2-ethylhexyl)phthalate	3	NA	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U
alpha-BHC	0.02	NA	NA	NA	NA	0.005 U	0.005 U	0.005 U	0.005 UJ	0.005 UJ	0.005 UJ	0.005 U
Arsenic	3	NA	NA	NA	NA	10 U	2.8 J	10 U	10 U	10 U	10 U	0.47 J
Chromium	70	NA	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2.3
Lead	5	NA	NA	NA	NA	**63.8**	10 U	10 U	10 U	1.8 J	**20**	1 U

Location		**CF-205D**	**CF-205D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**
Collection Date		10/17/2012	11/19/2014	10/10/2012	10/10/2012	10/10/2012	10/10/2012	10/10/2012	12/4/2014	12/4/2014	12/4/2014	12/4/2014
Sample Depth (ft bgs)		150 - 160	150 - 160	86 - 91	147 - 152	271 - 276	278 - 283	553 - 558	86 - 91	147 - 152	271 - 276	278 - 283
Sample Type		FD	N	N	N	N	N	N	N	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	0.5 U	**14**	**14**	**24**	**3.8**	**7.4**	**5.1**	**30**	**35**	**2.1**	**5.2**
Benzene	1	0.5 U	0.5 R	**4.3 J**	**15 J**	**2.6 J**	**4.8 J**	**2.4 J**	**4.4 J**	**1.9 J**	0.5 R	0.5 R
Trichloroethene (TCE)	1	0.5 U	0.5 R	0.5 R	0.65 J	0.5 R	0.5 R	0.5 R	0.28 J	0.38 J	0.5 R	0.5 R
Bis(2-ethylhexyl)phthalate	3	5 U	5 U	**15**	5 U	2.5 J	5 U	**3.1 J**	5 U	5 U	5 U	5 U
alpha-BHC	0.02	0.005 U	0.005 U	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.005 U	0.005 U	0.005 U	0.005 U
Arsenic	3	0.46 J	10 U	1 U	1 U	1 U	1 U	1 U	10 U	10 U	10 U	10 U
Chromium	70	2.5	10 U	2 U	2 U	2 U	2 U	2 U	64.5	10 U	61.6	10 UJ
Lead	5	1 U	2.3 J	2.8	2.1	1 U	1 U	1 U	**8.7 J**	1.6 J	10 U	10 U

Location	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-206D**	**CF-207D**	**CF-207D**	**CF-207D**	**CF-207D**
Collection Date	12/4/2014	12/4/2014	7/6/2015	7/6/2015	7/6/2015	7/6/2015	7/6/2015	10/10/2012	10/10/2012	10/10/2012	8/5/2013

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ground Water Quality Standards N.J.A.C. 7:9C (January 2018)

- ft bgs: feet below ground surface

- Detected results exceeding criterion indicated by gray shading and bold font.

- All results and criteria displayed in micrograms per liter (ug/L).

- NA: Not applicable. (Note: some locations were resampled for volatile organics only.)

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

TABLE 1

Analytical Data Summary – Groundwater COCs

Sample Depth (ft bgs)		553 - 558	278 - 283	86 - 91	147 - 152	271 - 276	278 - 283	553 - 558	106 - 111	412 - 417	604 - 609	182 - 192
Sample Type		N	FD	N	N	N	N	N	N	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	**2.7**	**2.7**	NA	NA	NA	NA	NA	**38**	**8.1**	**2.4**	**3.9 J**
Benzene	1	0.5 R	0.5 R	**3.2**	**1.5**	0.36 J	0.5 U	**1.7**	**90 J**	**2.7 J**	0.8 J	**3 J**
Trichloroethene (TCE)	1	0.5 R	0.5 R	0.32 J	0.4 J	0.15 J	0.2 J	0.16 J	0.94 J	0.5 R	0.5 R	0.5 UJ
Bis(2-ethylhexyl)phthalate	3	5 U	5 U	NA	NA	NA	NA	NA	5 U	5 U	2.6 J	5 UJ
alpha-BHC	0.02	0.005 U	0.005 U	NA	NA	NA	NA	NA	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ
Arsenic	3	10 U	10 U	NA	NA	NA	NA	NA	1 U	1 U	1 U	10 U
Chromium	70	**91.8**	**262 J**	NA	NA	NA	NA	NA	2 U	2 U	2 U	10 U
Lead	5	10 U	10 U	NA	NA	NA	NA	NA	1 U	1 U	1 U	10 U

Location		**CF-207D**	**CF-207D**	**CF-207D**	**CF-207D**	**CF-207D**	**CF-207D**	**CF-207D**	**CF-207D**	**CF-209D**	**CF-209D**	**CF-209D**
Collection Date		12/3/2014	12/3/2014	12/3/2014	12/3/2014	7/6/2015	7/6/2015	7/6/2015	7/6/2015	6/9/2014	6/9/2014	6/9/2014
Sample Depth (ft bgs)		106 - 111	182 - 192	412 - 417	604 - 609	106 - 111	182 - 192	412 - 417	604 - 609	150 - 160	227 - 237	295 - 305
Sample Type		N	N	N	N	N	N	N	N	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	**31**	**0.72**	**7.4**	**2.5**	NA	NA	NA	NA	**55**	**88**	**34**
Benzene	1	0.5 R	0.5 R	0.5 R	0.8 J	**1.2**	**1.9**	**1.7**	**2.1**	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	1	0.5 R	0.5 R	0.5 R	0.5 R	0.5 U	0.5 U	0.2 J	0.12 J	0.5 U	0.5 U	0.5 U
Bis(2-ethylhexyl)phthalate	3	5 U	5 U	5 U	5 U	NA	NA	NA	NA	5 U	5 U	5 U
alpha-BHC	0.02	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA	NA	NA	**0.023**	**0.045**	**0.073**

Notes:

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- ft bgs: feet below ground surface

- Detected results exceeding criterion indicated by gray shading and bold font.

- All results and criteria displayed in micrograms per liter (ug/L).

- NA: Not applicable. (Note: some locations were resampled for volatile organics only.)

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TABLE 1

Analytical Data Summary – Groundwater COCs

Arsenic	3	**6.4 J**	**3.8 J**	10 U	10 U	NA	NA	NA	NA	1 U	1 U	1 U
Chromium	70	**71.2**	34.5	**94.2**	10 U	NA	NA	NA	NA	2 U	2 U	2 U
Lead	5	**175**	**163**	**13.9**	10 U	NA	NA	NA	NA	1 U	1 U	1 U

	Location	**CF-209D**	**CF-209D**	**CF-209D**	**CF-209D**	**CF-209D**	**CF-209D**	**CF-209D**	**CF-209D**	**CF-209D**	**CF-209D**	**CF-209D-R**
	Collection Date	6/9/2014	9/12/2014	9/12/2014	9/12/2014	9/12/2014	1/12/2017	1/12/2017	1/12/2017	1/12/2017	1/12/2017	3/24/2017
	Sample Depth (ft bgs)	335 - 345	150 - 160	227 - 237	295 - 305	335 - 345	150 -160	227 - 237	227 - 237	295 - 305	335 - 345	150 - 160
	Sample Type	N	N	N	N	N	N	N	FD	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	**43**	**290 J**	**250 J**	**280 J**	**140 J**	**350**	**130**	**120**	**130**	**40**	**29 D**
Benzene	1	0.5 U	0.4 J	0.5 UJ	0.5 UJ	0.5 UJ	0.37 J	0.43 J	0.47 J	0.59	0.35 J	**9.2**
Trichloroethene (TCE)	1	0.5 U	0.11 J	0.2 J	0.2 J	0.5 UJ	0.5 U	0.5 U	0.23 J	0.33 J	0.23 J	0.33 J
Bis(2-ethylhexyl)phthalate	3	5 U	5 UJ	5 UJ	5 UJ	5 UJ	2 U	2 U	2 U	2 U	2 U	5 U
alpha-BHC	0.02	**0.022 J**	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.091 U
Arsenic	3	1 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA	2.3
Chromium	70	2 U	10 U	10 U	10 U	10 U	NA	NA	NA	NA	NA	1 U
Lead	5	1.7	2.4 J	10 U	10 U	1.7 J	NA	NA	NA	NA	NA	1 U

Location	**CF-211D**	**CF-211D**	**CF-211D**	**CF-211D**	**CF-211D**	**CF-211D**	**CF-212D**	**CF-212D**	**CF-212D**	**CF-212D**	**CF-212D**
Collection Date	6/9/2014	6/9/2014	6/9/2014	9/12/2014	9/12/2014	9/12/2014	10/11/2012	10/11/2012	12/2/2014	12/2/2014	7/7/2015
Sample Depth (ft bgs)	124 - 131	215 - 220	360 - 365	124 - 131	215 - 220	360 - 365	98 - 103	153 - 158	98 - 103	153 - 158	98 - 103
Sample Type	N	N	N	N	N	N	N	N	N	N	N

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ground Water Quality Standards N.J.A.C. 7:9C (January 2018)

- ft bgs: feet below ground surface

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- All results and criteria displayed in micrograms per liter (ug/L).

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TABLE 1

Analytical Data Summary – Groundwater COCs

Parameter	Criterion											
1,4-Dioxane	0.4	**11**	**7.9**	**3.8**	**24 J**	**14 J**	**6.4 J**	**7**	**3.1**	**2.3**	**38**	NA
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 R	**5.8 J**	**1.9 J**	**5.6 J**	**2.2**
Trichloroethene (TCE)	1	**3.2**	**1.9**	0.88	**4 J**	**1.8 J**	0.64 J	0.9 J	0.5 R	0.76 J	0.5 R	0.78
Bis(2-ethylhexyl)phthalate	3	5 U	5 U	5 U	5 UJ	5 UJ	5 UJ	**3.8 J**	5 U	5 U	5 U	NA
alpha-BHC	0.02	0.02 J	**0.024 J**	**0.031 J**	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.005 U	NA
Arsenic	3	1 U	1 U	1 U	10 U	10 U	10 U	1 U	**4.9**	10 U	**3.8 J**	NA
Chromium	70	2.7	2 U	2 U	3.1 J	0.75 J	0.6 J	2 U	2 U	42	**70.5**	NA
Lead	5	1.4	1.1	1.5	3.7 J	3.5 J	1.9 J	1 U	1 U	2.7 J	10 U	NA

Location		**CF-212D**	**CF-216D**	**CF-216D**	**CF-216D**	**CF-216D**	**CF-216D**	**CF-216D**	**CF-216D**	**CF-216D**	**CF-216D**	**CF-218D**
Collection Date		7/7/2015	8/7/2013	8/7/2013	8/7/2013	8/7/2013	8/7/2013	6/11/2014	6/11/2014	6/11/2014	9/8/2014	10/12/2012
Sample Depth (ft bgs)		153 - 158	51 - 71	205 - 210	268 - 273	495 - 500	205 - 210	51 - 71	205 - 210	268 - 273	495 - 500	171 - 176
Sample Type		N	N	N	N	N	FD	N	N	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	NA	**1.5**	**0.86**	**1.1**	**1.2**	**1.2**	**20**	**44**	**35**	**1.1**	**22**
Benzene	1	**5.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R
Trichloroethene (TCE)	1	0.075 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R
Bis(2-ethylhexyl)phthalate	3	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
alpha-BHC	0.02	NA	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.014 J	0.014	**0.051 J**	0.005 UJ	0.005 UJ
Arsenic	3	NA	10 U	10 U	10 U	10 U	10 U	**4.8**	1 U	1 U	10 U	1 U
Chromium	70	NA	10 U	10 U	10 U	10 U	10 U	2 U	2 U	2 U	10 U	2 U

Notes:

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TABLE 1

Analytical Data Summary – Groundwater COCs

Lead	5	NA	10 U	10 U	10 U	10 U	10 U	1	1 U	1 U	1.8 J	1 U

Location		**CF-218D**	**CF-218D**	**CF-218D**	**CF-218D**	**CF-218D**	**CF-218D**	**CF-218D**	**CF-218D**	**CF-218D**	**CF-218D**	**CF-222D**
Collection Date		10/12/2012	10/12/2012	10/12/2012	11/19/2014	11/19/2014	11/19/2014	7/6/2015	7/6/2015	7/6/2015	7/6/2015	10/9/2012
Sample Depth (ft bgs)		292 - 297	688 - 693	688 - 693	171 - 176	292 - 297	688 - 693	171 - 176	292 - 297	688 - 693	688 - 693	134 - 139
Sample Type		N	N	FD	N	N	N	N	N	N	FD	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	**28**	**24**	**40**	**0.58**	0.5 U	**0.44 J**	NA	NA	NA	NA	**21**
Benzene	1	0.5 R	0.5 R	0.5 R	0.5 R	0.5 R	0.5 R	0.36 J	0.56	0.85	0.85	0.5 R
Trichloroethene (TCE)	1	0.5 R	0.5 R	0.5 R	0.5 R	0.5 R	0.5 R	0.5 U	0.5 U	0.11 J	0.11 J	0.72 J
Bis(2-ethylhexyl)phthalate	3	5 U	2.1 J	5 U	5 U	5 U	5 U	NA	NA	NA	NA	**15**
alpha-BHC	0.02	0.005 UJ	0.005 UJ	0.005 UJ	0.005 U	0.005 U	0.005 U	NA	NA	NA	NA	0.005 UJ
Arsenic	3	1 U	1 U	1 U	10 U	10 U	10 U	NA	NA	NA	NA	1 U
Chromium	70	2 U	2 U	2 U	10 U	49.2	0.58 J	NA	NA	NA	NA	2 U
Lead	5	1 U	1.4	1 U	3 J	4.6 J	4.3 J	NA	NA	NA	NA	1 U

Location		**CF-222D**	**CF-222D**	**CF-222D**	**CF-222D**	**CF-222D**	**CF-222D**	**CF-222D**	**CF-222D**	**CF-222D**	**CF-222D**	**CF-223D**
Collection Date		10/9/2012	10/9/2012	6/11/2014	11/17/2014	11/17/2014	12/4/2014	7/7/2015	7/7/2015	7/7/2015	7/7/2015	10/16/2012
Sample Depth (ft bgs)		165 - 170	134 - 139	92 - 96	92 - 96	134 - 139	165 - 170	92 - 96	92 - 96	134 - 139	165 - 170	145 - 160
Sample Type		N	FD	N	N	N	N	N	FD	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	**30**	**39**	**11**	**6.6**	**3.8**	**6.7**	NA	NA	NA	NA	**0.94**

Notes:

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TABLE 1

Analytical Data Summary – Groundwater COCs

Benzene	1	0.5 R	0.5 R	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.15 J	0.2 J	0.5 U
Trichloroethene (TCE)	1	0.28 J	0.64 J	0.43 J	**1.5**	0.27 J	0.46 J	0.81	0.78	0.77	0.7	0.5 U
Bis(2-ethylhexyl)phthalate	3	**4.2 J**	**5.5**	5 U	5 U	5 U	5 U	NA	NA	NA	NA	5 U
alpha-BHC	0.02	0.005 UJ	0.005 UJ	0.005 U	0.005 U	0.005 U	0.005 U	NA	NA	NA	NA	0.005 UJ
Arsenic	3	1 U	1 U	1 U	10 U	10 U	10 U	NA	NA	NA	NA	2.1
Chromium	70	2 U	2 U	2 U	10 U	6.9 J	25.3	NA	NA	NA	NA	2 U
Lead	5	1.3	1 U	1 U	3.5 J	3.8 J	10 U	NA	NA	NA	NA	1 U

Location		**CF-223D**	**CF-224D**	**CF-224D**	**CF-225D**	**CF-225D**	**CF-225D**	**CF-225D**	**CF-225D**	**CF-225D**	**CF-225D**	**CF-226D**
Collection Date		11/19/2014	10/17/2012	11/20/2014	10/11/2012	10/11/2012	10/11/2012	11/18/2014	11/18/2014	11/18/2014	11/18/2014	6/13/2014
Sample Depth (ft bgs)		145 - 160	145 - 160	145 - 160	76 - 81	106 - 111	357 - 362	76 - 81	76 - 81	106 - 111	357 - 362	105 - 200
Sample Type		N	N	N	N	N	N	N	FD	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	**6.3**	**29**	**19**	**0.49 J**	**6.4**	**8.7**	0.5 U	**0.54**	**23**	**14 J+**	0.5 U
Benzene	1	0.5 R	**3.9**	**3.2 J**	0.5 R	0.5 R	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	1	0.5 R	**1.7**	**1.6 J**	0.5 R	0.5 R	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bis(2-ethylhexyl)phthalate	3	5 U	2.4 J	5 U	5 U	**4.3 J**	**5.4**	5 U	5 U	5 U	5 U	5 U
alpha-BHC	0.02	0.005 U	0.005 U	0.005 U	0.005 UJ	0.005 UJ	0.005 UJ	0.005 U	0.005 U	0.005 U	0.005 U	0.0092
Arsenic	3	10 U	**3.1**	10 U	1 U	1 U	**3.1**	10 U	10 U	10 U	10 U	1 U
Chromium	70	10 U	**127**	54.9	2 U	2 U	2 U	0.85 J	10 U	5.1 J	10 U	2 U
Lead	5	**6.1 J**	1 U	3.1 J	1 U	1.2	1 U	3.4 J	**5.2 J**	**5.9 J**	3.2 J	1 U

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TABLE 1

Analytical Data Summary – Groundwater COCs

Location		CF-226D	CF-227D	CF-227D	CF-227D	CF-227D	CF-227D	CF-227D	CF-227D	CF-227D	CF-227D	CF-228D
Collection Date		9/9/2014	6/10/2014	6/10/2014	6/10/2014	6/10/2014	6/10/2014	9/10/2014	9/10/2014	9/10/2014	9/10/2014	6/10/2014
Sample Depth (ft bgs)		105 - 200	110 - 120	150 - 160	408 - 413	475 - 482	150 - 160	110 - 120	150 - 160	408 - 413	475 - 482	58 - 63
Sample Type		N	N	N	N	N	FD	N	N	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	0.5 U	**16**	**6.9**	**0.78**	**7.5**	**8.4**	**42**	**25**	**1.2**	**34**	**4.1**
Benzene	1	0.26 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	1	0.5 U	0.32 J	0.29 J	0.5 U	0.5 U	0.3 J	0.29 J	0.41 J	0.5 U	0.5 U	0.4 J
Bis(2-ethylhexyl)phthalate	3	5 U	**11**	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
alpha-BHC	0.02	0.005 UJ	**0.023**	0.02	0.018	0.014	**0.041**	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.0025 J
Arsenic	3	10 U	1 U	1 U	1 U	1 U	1 U	10 U	10 U	10 U	10 U	1 U
Chromium	70	10 U	2 U	2 U	2 U	2 U	2 U	10 U	10 U	10 U	10 U	7.4
Lead	5	10 U	1 U	1 U	1 U	1 U	1 U	2.1 J	10 U	10 U	10 U	1.1

Location		CF-228D	CF-228D	CF-228D	CF-228D	CF-228D	CF-228D	CF-229D	CF-229D	CF-22S	CF-22S	CF-230D
Collection Date		6/10/2014	6/10/2014	9/11/2014	9/11/2014	9/11/2014	9/11/2014	6/13/2014	9/9/2014	10/15/2012	11/17/2014	12/23/2013
Sample Depth (ft bgs)		220 - 230	409 - 419	58 - 63	220 - 230	409 - 419	409 - 419	182 - 197	182 - 197	40 - 50	40 - 50	120 - 135
Sample Type		N	N	N	N	N	FD	N	N	N	N	N
Parameter	**Criterion**											
1,4-Dioxane	0.4	**7.2**	**9.4**	**6.8**	**7.6**	**16**	**18**	0.5 U	0.5 U	**2.9**	**1.3**	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U
Trichloroethene (TCE)	1	1	0.58	0.29 J	0.73	0.81	**1.1**	0.5 U	0.5 U	0.36 J	0.32 J	0.5 U

Notes:

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Analytical Data Summary – Groundwater COCs

Bis(2-ethylhexyl)phthalate	3	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
alpha-BHC	0.02	0.0051 R	0.016 NJ	0.005 UJ	0.005 UJ	0.005 UJ	0.005 UJ	0.011 J	0.005 UJ	0.005 UJ	0.005 U	0.005 U
Arsenic	3	1 U	1 U	10 U	10 U	10 U	10 U	1 U	2.3 J	1 U	10 U	1 U
Chromium	70	2 U	2 U	10 U	10 U	10 U	10 U	2 U	10 U	2 U	10 U	5
Lead	5	2.3	2	3.1 J	10 U	10 U	1.9 J	1 U	10 U	1.1	10 U	1.4

Location		**CF-230D**	**CF-230D**	**WRA-2-1**	**WRA-3-2**	**WRA-3-3**
Collection Date		6/12/2014	6/12/2014	10/18/2012	10/18/2012	10/18/2012
Sample Depth (ft bgs)		120 - 135	120 - 135	196 - 221	190 - 220	80 - 103
Sample Type		FD	N	N	N	N
Parameter	**Criterion**					
1,4-Dioxane	0.4	0.5 U	0.5 U	0.5 U	**0.44 J**	0.5 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	1	0.5 U	0.5 U	0.5 U	0.27 J	0.5 U
Bis(2-ethylhexyl)phthalate	3	5 U	**8**	5 U	5 U	5 U
alpha-BHC	0.02	0.0097	0.005 U	0.005 U	0.005 U	0.005 U
Arsenic	3	1 U	1 U	1 U	1 U	1 U
Chromium	70	2 U	2 U	0.57 J	0.57 J	0.89 J
Lead	5	1 U	1 U	1 U	1 U	1 U

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ground Water Quality Standards N.J.A.C. 7:9C (January 2018)

- ft bgs: feet below ground surface

- Detected results exceeding criterion indicated by gray shading and bold font.

- All results and criteria displayed in micrograms per liter (ug/L).

- NA: Not applicable. (Note: some locations were resampled for volatile organics only.)

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

TABLE 2

Analytical Data Summary – Surface Water COCs

Trout Brook									
		Location	**TBSW0001**	**TBSW0001**	**TBSW0002**	**TBSW0002**		**TBSW0003**	**TBSW0003**
		Collection Date	11/11/2014	11/18/2014	11/12/2014	11/18/2014		11/12/2014	11/19/2014
		Sample Type	N	N	N	N	FD	N	N
Parameter	**Fraction**	**Criterion**							
1,4-Dioxane	--	22,000	9.6	4.3	4.2	1.7	0.5 U	0.5 U	0.5 U
Cadmium	Total	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U
	Dissolved	0.056	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Copper	Total	--	25 U	25 U	25 U	25 U	25 U	25 U	4.1 J
	Dissolved	2.2	25 U	25 U	25 U	**3.8 J**	25 U	25 U	25 U
Lead	Total	--	3.3 J	2.9 J	10 U	2 J	10 U	2.8 J	10 U
	Dissolved	5.4	2.3 J	10 U	2.6 J	2.1 J	10 U	3.3 J	10 U
Silver	Total	0.12	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Dissolved	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U

East Trout Brook								
		Location	**ETSW0001**	**ETSW0001**	**ETSW0002**	**ETSW0002**	**ETSW0003**	**ETSW0003**
		Collection Date	11/11/2014	11/18/2014	11/11/2014	11/18/2014	11/11/2014	11/18/2014
		Sample Type	N	N	N	N	N	N
Parameter	**Fraction**	**Criterion**						
1,4-Dioxane	--	22,000	40	21	61	22	35	35

Notes:

- UNT = Unnamed tributary

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Aquatic Chronic (FW2) Criteria.

- Detected results exceeding applicable criterion are indicated by gray shading and bold font.

- Results and criteria displayed in micrograms per liter (ug/L); equivalent to parts per billion (ppb).

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown).
  UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.
  J = Analyte positively detected; concentration is estimated.
  R = Result was rejected during evaluation of data by validator.

- Samples collected between 11/11/2014 and 11/13/2014 are dry weather (baseflow) samples.

- Samples collected between 11/18/2014 and 11/19/2014 are wet weather samples and obtained after more than 1 inch of rain fell in the area on 11/17/2014.

- Criteria for dissolved cadmium, dissolved copper, and dissolved lead are hardness dependent. Calculation is based on the most conservative value of the average hardness of each stream's samples resulting in the most stringent criterion. Calculation performed based on the Water Effect Ratio described in N.J.A.C. 7:9b.

TABLE 2

Analytical Data Summary – Surface Water COCs

Cadmium	Total	--	5 U	5 U	5 U	5 U	5 U	5 U
	Dissolved	0.056	5 U	5 U	**0.19 J**	5 U	5 U	5 U
Copper	Total	--	25 U	3.6 J	25 U	3.9 J	25 U	3.5 J
	Dissolved	2.2	25 U	**6.7 J**	25 U	**5 J**	25 U	**5.4 J**
Lead	Total	--	3.6 J	10 U	3.8 J	3 J	3.7 J	3.7 J
	Dissolved	5.4	5.4 J	2.3 J	3.2 J	10 U	4.7 J	10 U
Silver	Total	0.12	10 U	10 U	**0.54 J**	10 U	**0.46 J**	10 U
	Dissolved	--	10 U	10 U	10 U	10 U	10 U	0.38 J

Lamington River UNT									
		Location	**LUSW0001**		**LUSW0001**	**LUSW0002**	**LUSW0002**	**LUSW0003**	**LUSW0003**
		Collection Date	11/12/2014		11/18/2014	11/12/2014	11/18/2014	11/13/2014	11/18/2014
		Sample Type	N	FD	N	N	N	N	N
Parameter	**Fraction**	**Criterion**							
1,4-Dioxane	--	22,000	0.68	3.1	0.63	4.2	0.57	8.1	0.48 J
Cadmium	Total	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U
	Dissolved	0.056	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Copper	Total	--	25 U	25 U	25 U	25 U	25 U	25 U	6.4 J
	Dissolved	2.2	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Lead	Total	--	2.1 J	3.8 J	10 U	10 U	10 U	10 U	10.5
	Dissolved	5.4	2.6 J	2.5 J	10 U	4.4 J	10 U	**5.8 J**	10 U
Silver	Total	0.12	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:

- UNT = Unnamed tributary

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Aquatic Chronic (FW2) Criteria.

- Detected results exceeding applicable criterion are indicated by gray shading and bold font.

- Results and criteria displayed in micrograms per liter (ug/L); equivalent to parts per billion (ppb).

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown).
UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.
J = Analyte positively detected; concentration is estimated.
R = Result was rejected during evaluation of data by validator.

- Samples collected between 11/11/2014 and 11/13/2014 are dry weather (baseflow) samples.

- Samples collected between 11/18/2014 and 11/19/2014 are wet weather samples and obtained after more than 1 inch of rain fell in the area on 11/17/2014.

- Criteria for dissolved cadmium, dissolved copper, and dissolved lead are hardness dependent. Calculation is based on the most conservative value of the average hardness of each stream's samples resulting in the most stringent criterion. Calculation performed based on the Water Effect Ratio described in N.J.A.C. 7:9b.

TABLE 2

Analytical Data Summary – Surface Water COCs

	Dissolved	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Tanner's Brook UNT								
		Location	**TUSW0001**	**TUSW0001**	**TUSW0002**	**TUSW0002**	**TUSW0003**	**TUSW0003**
		Collection Date	11/13/2014	11/18/2014	11/13/2014	11/18/2014	11/13/2014	11/18/2014
		Sample Type	N	N	N	N	N	N
Parameter	**Fraction**	**Criterion**						
1,4-Dioxane	--	22,000	0.5 U	35	0.5 U	4.5	0.5 U	0.5 U
Cadmium	Total	--	5 U	5 U	5 U	5 U	0.28 J	5 U
	Dissolved	0.056	5 U	5 U	5 U	5 U	5 U	5 U
Copper	Total	--	25 U	25 U	25 U	25 U	8 J	25 U
	Dissolved	2.2	25 U	25 U	25 U	25 U	25 U	25 U
Lead	Total	--	3.4 J	10 U	4.2 J	10 U	26.6	13.6
	Dissolved	5.4	3.7 J	2.4 J	**6 J**	2.3 J	**9 J**	3.5 J
Silver	Total	0.12	10 U	10 U	10 U	10 U	10 U	10 U
	Dissolved	--	10 U	10 U	10 U	10 U	10 U	10 U

Notes:

- UNT = Unnamed tributary

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Aquatic Chronic (FW2) Criteria.

- Detected results exceeding applicable criterion are indicated by gray shading and bold font.

- Results and criteria displayed in micrograms per liter (ug/L); equivalent to parts per billion (ppb).

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown).
  UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.
  J = Analyte positively detected; concentration is estimated.
  R = Result was rejected during evaluation of data by validator.

- Samples collected between 11/11/2014 and 11/13/2014 are dry weather (baseflow) samples.

- Samples collected between 11/18/2014 and 11/19/2014 are wet weather samples and obtained after more than 1 inch of rain fell in the area on 11/17/2014.

- Criteria for dissolved cadmium, dissolved copper, and dissolved lead are hardness dependent. Calculation is based on the most conservative value of the average hardness of each stream's samples resulting in the most stringent criterion. Calculation performed based on the Water Effect Ratio described in N.J.A.C. 7:9b.

TABLE 3
Analytical Data Summary – Surface Water COCs
2017 Background Sampling

		Location	TUSW0004	TUSW0005	TUSW0006	TUSW0007	TUSW0008	TUSW0009	TUSW0010
		Collection Date	9/20/2017	9/20/2017	9/20/2017	9/20/2017	9/21/2017	9/25/2017	9/21/2017
		Sample Type	N	N	N	N	N	N	N
Parameter	**Fraction**	**Criterion**							
1,4-Dioxane	--	22,000	2 U	0.1 U	0.1 UJ	0.1 U	0.1 U	0.1 U	0.1 U
Cadmium	Total	--	1 U		1 U	1 U	1 U	1 U	1 U
	Dissolved	0.056	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Copper	Total	--	0.96 J	2 U	0.32 J	1.5 J	0.33 J	0.61 J	2 U
	Dissolved	2.2	0.5 J	2 U	0.32 J	2 U	2 U	0.32 J	2 U
Lead	Total	--	1.4	0.35 J	0.46 J	1.5	0.4 J	0.17 J	1 U
	Dissolved	5.4	1 U	1 U	0.55 J	1 U	1 U	1 U	1 U
Silver	Total	0.12	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	Dissolved	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U

		Location	TUSW0011	TUSW0012	TUSW0013
		Collection Date	9/21/2017	9/25/2017	9/25/2017
		Sample Type	N	N	N
Parameter	**Fraction**	**Criterion**			
1,4-Dioxane	--	22,000	0.1 U	0.1 UJ	0.1 U
Cadmium	Total	--	1 U	1 U	1 U
	Dissolved	0.056	1 U	1 U	1 U

Notes:

- UNT = Unnamed tributary

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Aquatic Chronic (FW2) Criteria.

- Detected results exceeding applicable criterion are indicated by gray shading and bold font.

- Results and criteria displayed in micrograms per liter (ug/L); equivalent to parts per billion (ppb).

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

- Samples collected between 11/11/2014 and 11/13/2014 are dry weather (baseflow) samples.

- Samples collected between 11/18/2014 and 11/19/2014 are wet weather samples and obtained after more than 1 inch of rain fell in the area on 11/17/2014.

- Criteria for dissolved cadmium, dissolved copper, and dissolved lead are hardness dependent. Calculation is based on the most conservative value of the average hardness of each stream's samples resulting in the most stringent criterion. Calculation performed based on the Water Effect Ratio described in N.J.A.C. 7:9b.

TABLE 3
Analytical Data Summary – Surface Water COCs
2017 Background Sampling

Copper	Total	--	3.7	0.55 J	0.41 J
	Dissolved	2.2	2 U	0.4 J	0.39 J
Lead	Total	--	4	1 U	1 U
	Dissolved	5.4	1 U	1 U	1 U
Silver	Total	0.12	1 U	1 U	1 U
	Dissolved	--	1 U	1 U	1 U

		Location	**SEEP_A1**	**SEEP_A1**	**SEEP_A2**	**SEEP_B1**	**SEEP_B2**	**SPRING_A1**	**SPRING_A2**
		Collection Date	9/22/2017	9/22/2017	9/22/2017	9/26/2017	9/26/2017	9/22/2017	9/25/2017
		Sample Type	N	FD	N	N	N	N	N
Parameter	**Fraction**	**Criterion**							
1,4-Dioxane	--	22,000	0.1 U	0.1 U	0.1 U	5.9 D	3.5 D	0.1 U	0.1 U
Cadmium	Total	--	1 U	1 U	1 U	1 U	0.88 J	1 U	0.18 J
	Dissolved	0.056	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Copper	Total	--	0.57 J	0.52 J	0.44 J	0.43 J	18.5	0.46 J	3.3
	Dissolved	2.2	0.48 J	0.46 J	0.45 J	2 U	2 U	0.38 J	0.33 J
Lead	Total	--	0.21 J	0.21 J	0.35 J	0.9 J	29	0.26 J	4.8
	Dissolved	5.4	1 U	1 U	1 U	1 U	1 U	1 U	0.2 J
Silver	Total	0.12	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	Dissolved	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Notes:

- UNT = Unnamed tributary

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Aquatic Chronic (FW2) Criteria.

- Detected results exceeding applicable criterion are indicated by gray shading and bold font.

- Results and criteria displayed in micrograms per liter (ug/L); equivalent to parts per billion (ppb).

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

- Samples collected between 11/11/2014 and 11/13/2014 are dry weather (baseflow) samples.

- Samples collected between 11/18/2014 and 11/19/2014 are wet weather samples and obtained after more than 1 inch of rain fell in the area on 11/17/2014.

- Criteria for dissolved cadmium, dissolved copper, and dissolved lead are hardness dependent. Calculation is based on the most conservative value of the average hardness of each stream's samples resulting in the most stringent criterion. Calculation performed based on the Water Effect Ratio described in N.J.A.C. 7:9b.

TABLE 3
Analytical Data Summary – Surface Water COCs
2017 Background Sampling

Notes:

- UNT = Unnamed tributary

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Aquatic Chronic (FW2) Criteria.

- Detected results exceeding applicable criterion are indicated by gray shading and bold font.

- Results and criteria displayed in micrograms per liter (ug/L); equivalent to parts per billion (ppb).

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

- Samples collected between 11/11/2014 and 11/13/2014 are dry weather (baseflow) samples.

- Samples collected between 11/18/2014 and 11/19/2014 are wet weather samples and obtained after more than 1 inch of rain fell in the area on 11/17/2014.

- Criteria for dissolved cadmium, dissolved copper, and dissolved lead are hardness dependent. Calculation is based on the most conservative value of the average hardness of each stream's samples resulting in the most stringent criterion. Calculation performed based on the Water Effect Ratio described in N.J.A.C. 7:9b.

TABLE 4

Analytical Data Summary – Sediment

Trout Brook							
	Location	**TBSD0001**	**TBSD0002**	**TBSD0003**	**TBSD0004**	**TBSD0005**	**TBSD0006**
	Collection Date	11/11/2014	11/11/2014	11/12/2014	11/12/2014	11/12/2014	11/12/2014
	Sample Type	N	N	N	N	N	N
Parameter	**Criterion**						
PAHs and Semi-Volatile Organics							
Anthracene	0.0572	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Benzo(a)anthracene	0.108	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Benzo(a)pyrene	0.15	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Benzo(g,h,i)perylene	0.17	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Benzo(k)fluoranthene	0.24	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Benzyl Butyl Phthalate	1.97	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Chrysene	0.166	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Dibenz(a,h)anthracene	0.033	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Fluoranthene	0.423	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Indeno(1,2,3-c,d)pyrene	0.2	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Phenanthrene	0.204	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Pyrene	0.195	0.2 U	0.2 U	0.23 U	0.19 U	0.2 U	0.21 U
Inorganics							
Arsenic	6	2	4.3	2.6	2.9	2.1	1.6
Cadmium	0.6	0.45 U	0.57	0.56 U	0.59	0.45 U	0.39 J
Copper	16	2.2 J	6.5	6.2	8	5.2	2.9
Lead	31	5.6	8.2	10.1	4.7 J	5.7	6.8
Manganese	630	181	176	138	393 J	62.6	78.4

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Lowest Effects Level (LEL).

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- Samples were collected from the top 6 inches of sediment.

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

TABLE 4

Analytical Data Summary – Sediment

Silver	0.5	0.9 U	0.94 U	1.1 U	0.9 UJ	0.9 U	0.87 U
Mercury	0.174	0.11 U	0.11 U	**0.27**	0.11 U	0.11 U	0.11 U
Cyanide	0.0001	0.61 U	0.56 U	0.71 U	0.58 U	0.59 U	0.62 U
East Trout Brook							
	Location	**ETSD0001**	**ETSD0002**	**ETSD0003**	**ETSD0004**	**ETSD0005**	**ETSD0006**
	Collection Date	11/11/2014	11/11/2014	11/11/2014	11/11/2014	11/11/2014	11/11/2014
	Sample Type	N	N	N	N	N	N
Parameter	**Criterion**						
PAHs and Semi-Volatile Organics							
Anthracene	0.0572	0.22 U	0.21 U	0.21 U	0.27 U	0.24 U	0.23 U
Benzo(a)anthracene	0.108	0.22 U	0.092 J	0.21 U	0.27 U	0.24 U	0.23 U
Benzo(a)pyrene	0.15	0.22 U	0.1 J	0.21 U	0.27 U	0.24 U	0.23 U
Benzo(g,h,i)perylene	0.17	0.22 U	0.21 U	0.21 U	0.27 U	0.24 U	0.23 U
Benzo(k)fluoranthene	0.24	0.22 U	0.11 J	0.21 U	0.27 U	0.24 U	0.23 U
Benzyl Butyl Phthalate	1.97	0.22 U	0.21 U	0.21 U	0.27 U	0.24 U	0.23 U
Chrysene	0.166	0.22 U	0.12 J	0.21 U	0.27 U	0.24 U	0.23 U
Dibenz(a,h)anthracene	0.033	0.22 U	0.21 U	0.21 U	0.27 U	0.24 U	0.23 U
Fluoranthene	0.423	0.11 J	0.33	0.21 U	0.27 U	0.24 U	0.23 U
Indeno(1,2,3-c,d)pyrene	0.2	0.22 U	0.21 U	0.21 U	0.27 U	0.24 U	0.23 U
Phenanthrene	0.204	0.22 U	0.13 J	0.21 U	0.27 U	0.24 U	0.23 U
Pyrene	0.195	0.087 J	0.17 J	0.21 U	0.27 U	0.24 U	0.23 U
Inorganics							
Arsenic	6	**8.3**	4.9	**6.6**	4.4	2.5	5.7
Cadmium	0.6	**2.6**	**2.2**	**1.2**	**2.5**	0.52 U	**0.95**

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Lowest Effects Level (LEL).

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- Samples were collected from the top 6 inches of sediment.

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

TABLE 4

Analytical Data Summary – Sediment

Copper	16	12.8	9.4	5.5	9.5	2.3 J	6.8
Lead	31	16	12.7	7.1	14.6	5.4	9.5
Manganese	630	**1400**	**785**	562	448	489	104
Silver	0.5	0.99 U	0.93 U	0.9 U	1.1 U	1 U	1 U
Mercury	0.174	0.13 U	0.12 U	0.12 U	0.16 U	0.13 U	0.13 U
Cyanide	0.0001	0.66 U	0.59 U	0.65 U	0.77 U	0.65 U	0.66 U

Lamington River UNT								
	Location	**LUSD0001**	**LUSD0002**	**LUSD0003**	**LUSD0004**		**LUSD0005**	**LUSD0006**
	Collection Date	11/12/2014	11/12/2014	11/12/2014	11/12/2014		11/13/2014	11/13/2014
	Sample Type	N	N	N	N	FD	N	N
Parameter	**Criterion**							
PAHs and Semi-Volatile Organics								
Anthracene	0.0572	**0.3 J**	0.35 U	0.2 U	**0.17 J**	0.43 U	0.25 U	0.22 U
Benzo(a)anthracene	0.108	**1.2**	0.35 U	0.2 U	**0.4 J**	**0.3 J**	0.25 U	0.22 U
Benzo(a)pyrene	0.15	**0.67**	0.35 U	0.2 U	**0.33 J**	**0.34 J**	0.25 U	0.22 U
Benzo(g,h,i)perylene	0.17	**0.32 J**	0.35 U	0.2 U	**0.21 J**	**0.26 J**	0.25 U	0.22 U
Benzo(k)fluoranthene	0.24	**0.73**	0.35 U	0.2 U	**0.32 J**	**0.35 J**	0.25 U	0.22 U
Benzyl Butyl Phthalate	1.97	**6.9**	0.35 U	0.2 U	0.4 U	0.43 U	0.25 U	0.22 U
Chrysene	0.166	**1.3**	0.35 U	0.2 U	**0.42**	**0.38 J**	0.25 U	0.22 U
Dibenz(a,h)anthracene	0.033	**0.15 J**	0.35 U	0.2 U	0.4 U	0.43 U	0.25 U	0.22 U
Fluoranthene	0.423	**3.4**	0.35 U	0.2 U	**1.4**	**0.66**	0.25 U	0.22 U
Indeno(1,2,3-c,d)pyrene	0.2	**0.34**	0.35 U	0.2 U	0.2 J	**0.23 J**	0.25 U	0.22 U
Phenanthrene	0.204	**0.88**	0.35 U	0.2 U	**0.83**	**0.25 J**	0.25 U	0.22 U

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Lowest Effects Level (LEL).

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- Samples were collected from the top 6 inches of sediment.

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

  J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

TABLE 4

Analytical Data Summary – Sediment

Pyrene	0.195	**1.7**	0.35 U	0.2 U	**0.7**	**0.57**	0.25 U	0.22 U
Inorganics								
Arsenic	6	**6.5 J**	5.2 J	2.3	**6.3 J**	**6.4 J**	5.3	2.4
Cadmium	0.6	**0.94 J**	1 UJ	0.49	**1.5 J**	**1.1 J**	0.25	0.15 J
Copper	16	14.3 J	**18.2 J**	4	**28.2 J**	**26.4 J**	11.6	7.2 J
Lead	31	**44.3 J**	**36.4 J**	7.7 J	**71.4 J**	**63.7 J**	10.9	9.1
Manganese	630	185 J	89.1 J	229 J	159 J	142 J	55.4	103
Silver	0.5	1.4 UJ	2.1 UJ	0.93 U	2 UJ	1.9 UJ	**0.56**	0.27
Mercury	0.174	0.19 UJ	0.24 UJ	0.12 U	0.25 UJ	0.26 UJ	0.14 U	0.14 U
Cyanide	0.0001	0.95 UJ	1.3 UJ	0.61 U	1.2 UJ	1.3 UJ	0.72 R	0.66 R

Tanner's Brook UNT								
	Location	**TUSD0001**	**TUSD0002**		**TUSD0003**	**TUSD0004**	**TUSD0005**	**TUSD0006**
	Collection Date	11/13/2014	11/13/2014		11/13/2014	11/13/2014	11/13/2014	11/13/2014
	Sample Type	N	N	FD	N	N	N	N
Parameter	**Criterion**							
PAHs and Semi-Volatile Organics								
Anthracene	0.0572	0.22 U	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Benzo(a)anthracene	0.108	**0.15 J**	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Benzo(a)pyrene	0.15	**0.16 J**	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Benzo(g,h,i)perylene	0.17	0.11 J	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Benzo(k)fluoranthene	0.24	0.14 J	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Benzyl Butyl Phthalate	1.97	0.22 U	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Chrysene	0.166	**0.17 J**	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Lowest Effects Level (LEL).

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- Samples were collected from the top 6 inches of sediment.

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

  J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

TABLE 4

Analytical Data Summary – Sediment

Dibenz(a,h)anthracene	0.033	0.22 U	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Fluoranthene	0.423	0.39	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Indeno(1,2,3-c,d)pyrene	0.2	0.099 J	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Phenanthrene	0.204	0.12 J	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Pyrene	0.195	**0.25**	0.22 U	0.22 U	0.18 U	0.2 U	0.2 U	0.21 U
Inorganics								
Arsenic	6	**9.5**	4.9	**20**	2.2	1.6	1.8	2
Cadmium	0.6	0.55	0.49	0.55	0.45 U	0.37 U	0.43 U	0.52
Copper	16	1.7 J	2.2 J	3	11	7.5	11.2	**19.5**
Lead	31	23	12.5	**59**	9.4	6.4	6.9	9.5
Manganese	630	334	79.3	45	43.8	12.7	20.7	28.9
Silver	0.5	0.89 U	0.94 U	1 U	0.9 U	0.74 U	0.86 U	0.94 U
Mercury	0.174	0.13 U	0.12 U	0.13 U	0.11 U	0.088 U	0.1 U	0.12 U
Cyanide	0.0001	0.64 U	0.63 U	0.65 U	0.6 U	0.5 U	0.58 U	0.62 U

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Lowest Effects Level (LEL).

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- Samples were collected from the top 6 inches of sediment.

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

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TABLE 5
Analytical Data Summary – Sediment
2017 Background Samples

Tanner's Brook UNT							
	Location	**TUSD0007**		**TUSD0008**	**TUSD0009**	**TUSD0010**	**TUSD0011**
	Collection Date	9/20/2017		9/20/2017	9/20/2017	9/20/2017	9/21/2017
	Sample Type	N	FD	N	N	N	N
Parameter	**Criterion**						
PAHs and Semi-Volatile Organics							
Anthracene	0.0572	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Benzo(a)anthracene	0.108	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Benzo(a)pyrene	0.15	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Benzo(g,h,i)perylene	0.17	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Benzo(k)fluoranthene	0.24	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Benzyl Butyl Phthalate	1.97	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Chrysene	0.166	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Dibenz(a,h)anthracene	0.033	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Fluoranthene	0.423	0.470 U	0.510 U	0.440 U	0.470 U	0.420 U	0.380 U
Indeno(1,2,3-c,d)pyrene	0.2	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Phenanthrene	0.204	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Pyrene	0.195	0.240 U	0.260 U	0.230 U	0.240 U	0.220 U	0.190 U
Inorganics							
Arsenic	6	1.8	1.9	1.2	2.8	1.1	1.3 J
Cadmium	0.6	0.11 J	0.11 J	0.21 J	0.17 J	0.099 J	0.17 J
Copper	16	5.8	6.2	5.6	4.8	9.3	6.2
Lead	31	7.6	7.5	13.1	6.8	4.9	8.2 J
Manganese	630	49.4	54.3	98.1	96.8	67.6	194 J
Silver	0.5	0.69 U	0.64 U	0.61 U	0.73 U	0.61 U	0.57 U

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Lowest Effects Level (LEL).

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- Samples were collected from the top 6 inches of sediment.

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

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TABLE 5
Analytical Data Summary – Sediment
2017 Background Samples

Mercury	0.174	0.14 U	0.13 U	0.12 U	0.14 U	0.11 U	0.12 U
Cyanide	0.0001	0.69 U	0.62 U	0.6 U	0.64 U	0.56 U	0.6 U

Tanner's Brook UNT						
	Location	**TUSD0012**	**TUSD0013**	**TUSD0014**	**TUSD0015**	**TUSD0016**
	Collection Date	9/25/2017	9/21/2017	9/21/2017	9/25/2017	9/25/2017
	Sample Type	N	N	N	N	N
Parameter	**Criterion**					
PAHs and Semi-Volatile Organics						
Anthracene	0.0572	0.230 UJ	0.230 U	1.200 U	0.430 UJ	0.220 UJ
Benzo(a)anthracene	0.108	0.230 UJ	0.230 U	1.200 U	**0.120 J**	**0.160 J**
Benzo(a)pyrene	0.15	0.230 UJ	0.230 U	1.200 U	**0.190 J**	0.140 J
Benzo(g,h,i)perylene	0.17	0.230 UJ	0.230 U	1.200 U	0.150 J	0.068 J
Benzo(k)fluoranthene	0.24	0.230 UJ	0.230 U	1.200 U	0.081 J	0.068 J
Benzyl Butyl Phthalate	1.97	0.230 UJ	0.230 U	1.200 U	0.430 UJ	0.220 UJ
Chrysene	0.166	0.230 UJ	0.230 U	1.200 U	0.160 J	0.160 J
Dibenz(a,h)anthracene	0.033	0.230 UJ	0.230 U	1.200 U	0.430 UJ	0.220 UJ
Fluoranthene	0.423	0.450 UJ	0.460 U	2.200 U	0.250 J	0.270 J
Indeno(1,2,3-c,d)pyrene	0.2	0.230 UJ	0.230 U	1.200 U	0.110 J	0.060 J
Phenanthrene	0.204	0.230 UJ	0.230 U	1.200 U	0.084 J	0.220 UJ
Pyrene	0.195	0.230 UJ	0.230 U	1.200 U	**0.210 J**	**0.230 J**
Inorganics						
Arsenic	6	0.82	0.89	2	1.3	0.81
Cadmium	0.6	0.66 U	0.14 J	0.58 U	0.56 U	0.089 J
Copper	16	0.98 J	1.3	1.6	3.6	1.1

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Lowest Effects Level (LEL).

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- Samples were collected from the top 6 inches of sediment.

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

J = Analyte positively detected; concentration is estimated. R = Result was rejected during evaluation of data by validator.

TABLE 5
Analytical Data Summary – Sediment
2017 Background Samples

Lead	31	2.7	4.5	3.7	4	7
Manganese	630	51.4	225	206	293	31.4
Silver	0.5	0.66 U	0.55 U	0.58 U	0.56 U	0.57 U
Mercury	0.174	0.12 U	0.11 U	0.12 U	0.11 U	0.11 U
Cyanide	0.0001	0.58 U	0.44 U	0.49 U	**0.13 J**	0.58 U

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion: New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria (10 March 2009) Freshwater Lowest Effects Level (LEL).

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- Samples were collected from the top 6 inches of sediment.

- Qualifiers: U = Analyzed for but not detected above the reporting limit (value shown). UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

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TABLE 6

Analytical Data Summary – Soil

			Boring	CFB001		CFB002					
			Collection Date	11/18/2014	11/18/2014	11/18/2014		11/18/2014	11/18/2014	11/19/2014	11/19/2014
			Sample Depth (ft bgs)	3.5 - 5.5	14 - 16	4 - 6		10 - 12	20 - 22	30 - 32	35 - 36
			Sample Type	N	N	N	FD	N	N	N	N
			Zone	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Saturated
Parameter	**RDCSRS**	**NRDCSRS**	**IGWSSL**								
Aluminum	78000	NS	6000	**16700**	**13700**	**6850 J**	**7110**	**19900**	**16600**	**30900**	Analysis Not
Arsenic	19	19	19	7.1	2.6	6.1	**326**	4.4	1.7	3.5	

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion:

- New Jersey Department of Environmental Protection Soil Remediation Standards - NJAC 7:26D (September 2017)

  RDCSRS - Residential Direct Contact Soil Remediation Standard

  NRDCSRS - Non-Residential Direct Contact Soil Remediation Standard

- New Jersey Department of Environmental Protection Default Impact to Groundwater Soil Screening Levels (November 2013)

  IGWSSL - Impact to Groundwater Soil Screening Level

- Zone: Identifies whether a sample was collected above (unsaturated) or below (saturated) the water table.

- For samples collected from the unsaturated zone, the most conservative criterion of RDCSRS, NRDCSRS, and IGWSSL is used for comparison.

- For samples collected from the saturated zone, the most conservative criterion between RDCSRS and NRDCSRS is used for comparison.

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- ft bgs = feet below ground surface

- Qualifiers:

  U = Analyzed for but not detected above the reporting limit (value shown).

  J = Analyte positively detected; concentration is estimated.

  UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

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TABLE 6

Analytical Data Summary – Soil

Beryllium	16	140	0.7	**1.1**	**1**	0.51 J-	0.59	**0.78**	**1.1**	**5.2**	Requested
Cadmium	78	78	2	0.64	0.14 J	1.1 J	1.4	1.6	0.74	0.96	
Cobalt	1600	590	90	13.5	7.2	8.3	13.8	9.7	8.5	30.4	
Manganese	11000	5900	65	**136**	**77.6**	**126 J**	**120**	**90.8**	**125**	**241**	
Nickel	1600	23000	48	5.7	2.6 J	10.1	13.5	7.3	1.9 J	20	
Silver	390	5700	1	0.28 J	0.84 U	0.88 UJ	0.86 U	0.8 U	0.87 U	**1.6**	
Vanadium	78	1100	NS	17.3	6.6	18.9	21.9	29.8	11	**97.7**	

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion:

- New Jersey Department of Environmental Protection Soil Remediation Standards - NJAC 7:26D (September 2017)

  RDCSRS - Residential Direct Contact Soil Remediation Standard

  NRDCSRS - Non-Residential Direct Contact Soil Remediation Standard

- New Jersey Department of Environmental Protection Default Impact to Groundwater Soil Screening Levels (November 2013)

  IGWSSL - Impact to Groundwater Soil Screening Level

- Zone: Identifies whether a sample was collected above (unsaturated) or below (saturated) the water table.

- For samples collected from the unsaturated zone, the most conservative criterion of RDCSRS, NRDCSRS, and IGWSSL is used for comparison.

- For samples collected from the saturated zone, the most conservative criterion between RDCSRS and NRDCSRS is used for comparison.

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- ft bgs = feet below ground surface

- Qualifiers:

  U = Analyzed for but not detected above the reporting limit (value shown).

  J = Analyte positively detected; concentration is estimated.

  UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

  R = Result was rejected during evaluation of data by validator.

TABLE 6

Analytical Data Summary – Soil

			Boring	**CFB003**			**CFB004**					
			Collection Date	11/17/2014	11/17/2014	11/17/2014	11/24/2014	11/24/2014	11/24/2014		11/24/2014	
			Sample Depth (ft bgs)	1.5 - 3.5	10 - 12	20 - 22	10 - 12	20 - 22	32 - 34		40 - 42	
			Sample Type	N	N	N	N	N	N	FD	N	
			Zone	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Unsaturated	
Parameter	**RDCSRS**	**NRDCSRS**	**IGWSSL**									
Aluminum	78000	NS	6000	**15300**	**26200**	**21100 J**	**11500**	**16100**	**11200**	**9600**	**7230 J**	
Arsenic	19	19	19	3.8	7.5	4.4 J-	5.4	1.1	0.88 U	0.81 U	1.1 J-	
Beryllium	16	140	0.7	**0.82**	**1.1**	**6.3 J-**	0.27 J	**1.2**	**0.83**	**0.72**	0.68 J-	

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion:

- New Jersey Department of Environmental Protection Soil Remediation Standards - NJAC 7:26D (September 2017)

  RDCSRS - Residential Direct Contact Soil Remediation Standard

  NRDCSRS - Non-Residential Direct Contact Soil Remediation Standard

- New Jersey Department of Environmental Protection Default Impact to Groundwater Soil Screening Levels (November 2013)

  IGWSSL - Impact to Groundwater Soil Screening Level

- Zone: Identifies whether a sample was collected above (unsaturated) or below (saturated) the water table.

- For samples collected from the unsaturated zone, the most conservative criterion of RDCSRS, NRDCSRS, and IGWSSL is used for comparison.

- For samples collected from the saturated zone, the most conservative criterion between RDCSRS and NRDCSRS is used for comparison.

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- ft bgs = feet below ground surface

- Qualifiers:

  U = Analyzed for but not detected above the reporting limit (value shown).

  J = Analyte positively detected; concentration is estimated.

  UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

  R = Result was rejected during evaluation of data by validator.

TABLE 6

Analytical Data Summary – Soil

Cadmium	78	78	2	0.99	1.5	**5.7 J**	**2.6**	1.4	0.26 J	0.24	0.69 J
Cobalt	1600	590	90	11.5	18.9	38.3	22.6	14.6	2.7 J	3.4 J	7.7
Manganese	11000	5900	65	**208**	**171**	**380 J-**	**397**	**145**	27.7	25.1	59.4 J
Nickel	1600	23000	48	10.3	9.1	0.94 J	26.4	23	4.4	4.5	7.8
Silver	390	5700	1	0.8	0.83	1 R	0.8 U	0.89 U	0.88 U	0.81 U	0.85 UJ
Vanadium	78	1100	NS	36	38.4	45.1 J-	72.7	27.7	5.8	4.6	7 J-

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion:

- New Jersey Department of Environmental Protection Soil Remediation Standards - NJAC 7:26D (September 2017)

  RDCSRS - Residential Direct Contact Soil Remediation Standard

  NRDCSRS - Non-Residential Direct Contact Soil Remediation Standard

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  IGWSSL - Impact to Groundwater Soil Screening Level

- Zone: Identifies whether a sample was collected above (unsaturated) or below (saturated) the water table.

- For samples collected from the unsaturated zone, the most conservative criterion of RDCSRS, NRDCSRS, and IGWSSL is used for comparison.

- For samples collected from the saturated zone, the most conservative criterion between RDCSRS and NRDCSRS is used for comparison.

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- ft bgs = feet below ground surface

- Qualifiers:

  U = Analyzed for but not detected above the reporting limit (value shown).

  J = Analyte positively detected; concentration is estimated.

  UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

  R = Result was rejected during evaluation of data by validator.

TABLE 6

Analytical Data Summary – Soil

				Boring	CFB005							
				Collection Date	11/19/2014	11/19/2014	11/19/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/21/2014
				Sample Depth (ft bgs)	3.5 - 5.5	10 - 12	20 - 22	30 - 32	40 - 42	50 - 52	60 - 62	70 - 72
				Sample Type	N	N	N	N	N	N	N	N
				Zone	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Unsaturated	Saturated	Saturated	Saturated
Parameter	**RDCSRS**	**NRDCSRS**	**IGWSSL**									
Aluminum	78000	NS	6000	4300	**11200**	**48200 J**	**30800**	**42300**	38100	25900	34900	
Arsenic	19	19	19	12.9	4.3	4.1	3	2.5 J	2.5	2.5 N	2.5	
Beryllium	16	140	0.7	0.65	**0.86**	**5.7 J**	**2.8**	**2.9**	3.8	1.8	2	

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion:

- New Jersey Department of Environmental Protection Soil Remediation Standards - NJAC 7:26D (September 2017)

  RDCSRS - Residential Direct Contact Soil Remediation Standard

  NRDCSRS - Non-Residential Direct Contact Soil Remediation Standard

- New Jersey Department of Environmental Protection Default Impact to Groundwater Soil Screening Levels (November 2013)

  IGWSSL - Impact to Groundwater Soil Screening Level

- Zone: Identifies whether a sample was collected above (unsaturated) or below (saturated) the water table.

- For samples collected from the unsaturated zone, the most conservative criterion of RDCSRS, NRDCSRS, and IGWSSL is used for comparison.

- For samples collected from the saturated zone, the most conservative criterion between RDCSRS and NRDCSRS is used for comparison.

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- ft bgs = feet below ground surface

- Qualifiers:

  U = Analyzed for but not detected above the reporting limit (value shown).

  J = Analyte positively detected; concentration is estimated.

  UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

  R = Result was rejected during evaluation of data by validator.

TABLE 6

Analytical Data Summary – Soil

Cadmium	78	78	2	0.46	0.37 J	1.6 J	**6.3**	**3.6 J**	6	3.6	4.4
Cobalt	1600	590	90	10.5	7.9	**113 J**	63.6	46.3 J	62.8	26.1	48.3
Manganese	11000	5900	65	**167**	**118**	**1320 J**	**758**	**861**	978	396	909
Nickel	1600	23000	48	12.7	9	**74.6**	**54**	29.8	33.4	26.3	47.2
Silver	390	5700	1	0.46 J	0.34 J	**2.9 J-**	1.1 U	1 UJ	1.1 U	1 U	1 U
Vanadium	78	1100	NS	18.1	20.2	**217 J**	**125**	**123**	**151**	**93.1**	**113**

Notes:

- Sample Type | N = normal field sample | FD = blind field duplicate

- Criterion:

- New Jersey Department of Environmental Protection Soil Remediation Standards - NJAC 7:26D (September 2017)

  RDCSRS - Residential Direct Contact Soil Remediation Standard

  NRDCSRS - Non-Residential Direct Contact Soil Remediation Standard

- New Jersey Department of Environmental Protection Default Impact to Groundwater Soil Screening Levels (November 2013)

  IGWSSL - Impact to Groundwater Soil Screening Level

- Zone: Identifies whether a sample was collected above (unsaturated) or below (saturated) the water table.

- For samples collected from the unsaturated zone, the most conservative criterion of RDCSRS, NRDCSRS, and IGWSSL is used for comparison.

- For samples collected from the saturated zone, the most conservative criterion between RDCSRS and NRDCSRS is used for comparison.

- Detected results exceeding applicable criterion indicated by gray shading and bold font.

- All results and criteria displayed in milligrams per kilograms (mg/kg).

- ft bgs = feet below ground surface

- Qualifiers:

  U = Analyzed for but not detected above the reporting limit (value shown).

  J = Analyte positively detected; concentration is estimated.

  UJ = Analyzed for but not detected above the reporting limit; reporting limit (value shown) is estimated.

  R = Result was rejected during evaluation of data by validator.

TABLE 7
Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater (Core of the Plume)

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Groundwater	1,4-Dioxane	42	290 J	ug/L	95/110	192	ug/L	95% Student's-t UCL
	Benzene	4.3 J	90 J	ug/L	37/102	23	ug/L	95% Chebyshev (Mean, Sd) UCL
	Trichloroethylene	1	4 J	ug/L	55/98	1.9	ug/L	95% Adjusted Gamma UCL
	Bis(2-ethylhexyl) phthalate (DEHP)	3.1 J	15	ug/L	17/110	7.4	ug/L	95% Student's-t UCL
	Arsenic	2.8 J	6.4 J	ug/L	15/110	4.0	ug/L	95% Student's-t UCL
	Chromium	61.6	262 J	ug/L	34/110	99	ug/L	95% Student's-t UCL
	Lead	5.9	175	ug/L	51/110	47	ug/L	Arithmetic mean

J – qualifier for estimated value

ug/L – micrograms per liter

UCL – upper confidence limit of mean

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

This table presents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for the COCs in groundwater. The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC and how it was derived.

TABLE 8 Selection of Exposure Scenarios

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis
Future	Groundwater (Core of Plume)	Tap Water	Tap Water/Shower Head	Resident	Adult and Child (birth to <6 years)	Ing/Der/Inh	Quantitative
Current/future	Surface Water	Surface water	Trout Brook/ Lamington River UNT/ Tanners Brook UNT	Recreator	Adult and Child (birth to <6 years)	Ing/Der/Fish Ing	Quantitative
Current/future	Groundwater	Vapor Intrusion	Subslab Soil Gas/ Indoor Air	Resident	Adult and Child (birth to <6 years	Inh	Qualitative

Ing – Ingestion
Der – Dermal
Inh – Inhalation

Summary of Selection of Exposure Pathways

This table describes the exposure pathways that were evaluated for the risk assessment. Exposure media, exposure points, and characteristics of receptor populations are included.

TABLE 9

Noncancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Absorp. Efficiency (Dermal)	Adjusted RfD (Dermal)	Adj. Dermal RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Date of RfD:
1,4-Dioxane	Chronic	3.0E-02	mg/kg-day	1	3.0E-02	mg/kg-day	Hepatic/Renal	300	IRIS	8/11/2010
Benzene	Chronic	4.0E-03	mg/kg-day	1	4.0E-03	mg/kg-day	Lymphatic	300	IRIS	4/17/2003
Trichloroethylene	Chronic	5.0E-04	mg/kg-day	1	5.0E-04	mg/kg-day	Developmental/ Hepatic/Renal/ Nervous/ Lymphatic/ Reproductive	10-1000	IRIS	9/28/2011
Bis(2-ethylhexyl) phthalate (DEHP)	Chronic	2.0E-02	mg/kg-day	1	2.0E-02	mg/kg-day	Hepatic	1000	IRIS	1/31/1987
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Cardiovascular/ Integumentary	3	IRIS	9/1/1991
Chromium	Chronic	3.0E-03	mg/kg-day	0.03	7.5E-05	mg/kg-day	No specific target organ system	3-300	IRIS	9/3/1998

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfC: Target Organ	Date of RfC:
1,4-Dioxane	Chronic	3.0E-02	mg/m^3	Nervous/ Respiratory	1000	IRIS	9/20/2013
Benzene	Chronic	3.0E-02	mg/m^3	Lymphatic	1-300	IRIS	4/17/2003
Trichloroethylene	Chronic	2.0E-03	mg/m^3	Developmental/ Hepatic/ Renal/ Nervous/ Lymphatic/ Reproductive	10-100	IRIS	9/28/2011

IRIS: Integrated Risk Information System
ATSDR: Agency for Toxic Substances and Disease Registry

Summary of Toxicity Assessment

This table provides noncarcinogenic risk information which is relevant to the contaminants of concern. When available, the chronic toxicity data have been used to develop oral reference doses (RfDs) and inhalation reference concentrations (RfCs).

TABLE 10

Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Oral Cancer Slope Factor	Units	Adjusted Cancer Slope Factor (for Dermal)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
1,4-Dioxane	1.0E-01	$(mg/kg\text{-}day)^{-1}$	1.0E-01	$(mg/kg\text{-}day)^{-1}$	Likely to be carcinogenic to humans	IRIS	9/20/2013
Benzene	5.5E-02	$(mg/kg\text{-}day)^{-1}$	5.5E-02	$(mg/kg\text{-}day)^{-1}$	A / Known human carcinogen	IRIS	1/9/2000
Trichloroethylene	4.6E-02	$(mg/kg\text{-}day)^{-1}$	4.6E-02	$(mg/kg\text{-}day)^{-1}$	Carcinogenic to humans	IRIS	9/28/2011
Bis(2-ethylhexyl) phthalate (DEHP)	1.4E-02	$(mg/kg\text{-}day)^{-1}$	1.4E-02	$(mg/kg\text{-}day)^{-1}$	B2 / Probable human carcinogen based on sufficient evidence of carcinogenicity in animals	IRIS	9/7/1988
Arsenic	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.5E+00	$(mg/kg\text{-}day)^{-1}$	Human carcinogen	IRIS	6/1/1995
Chromium	5.0E-01	$(mg/kg\text{-}day)^{-1}$	2.0E+01	$(mg/kg\text{-}day)^{-1}$	Likely to be carcinogenic (oral route)	NJDEP	4/8/2009

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
1,4-Dioxane	5.0E-06	$(ug/m^3)^{-1}$	Likely to be carcinogenic to humans	IRIS	9/20/2013
Benzene	7.8E-06	$(ug/m^3)^{-1}$	A / Known human carcinogen	IRIS	1/9/2000
Trichloroethylene	4.1E-06	$(ug/m^3)^{-1}$	Carcinogenic to humans	IRIS	9/28/2011

IRIS: Integrated Risk Information System
NJDEP: New Jersey Department of Environmental Protection

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern. Toxicity data are provided for both the oral and inhalation routes of exposure.

TABLE 11

Risk Characterization Summary – Noncarcinogens

Scenario Timeframe: Future
Receptor Population: Site Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Noncancer Hazard Quotient			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater (Core of the Plume)	Tap water/shower head	1,4-Dioxane	Hepatic/Renal	1.9E-01	6.7E-04	5.6E+00	5.8
			Benzene	Lymphatic	4.9E-01	7.4E-02	1.9E+00	2.5
			Trichloroethylene	Developmental/ Hepatic/Renal/ Nervous/ Lymphatic/ Reproductive	1.6E-01	2.6E-02	1.2E+00	1.4
			Bis(2-ethylhexyl) phthalate (DEHP)	Hepatic	1.5E-02	1.0E+00	-	1.0
			Arsenic	Cardiovascular/ Integumentary	4.7E-01	4.6E-03	-	0.47
			Chromium	No specific target organ system	1.3E+00	9.4E-01	-	2.3
							Hazard Index Total =	**13**

Scenario Timeframe: Future
Receptor Population: Site Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary/Target Organ	Noncancer Hazard Quotient			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater (Core of the Plume)	Tap water/shower head	1,4-Dioxane	Hepatic/Renal	3.2E-01	1.0E-03	4.7E+00	5.1
			Benzene	Lymphatic	8.2E-01	1.1E-01	1.6E+00	2.5
			Trichloroethylene	Developmental/ Hepatic/Renal/ Nervous/ Lymphatic/ Reproductive	2.7E-01	3.9E-02	9.9E-01	1.3
			Bis(2-ethylhexyl) phthalate (DEHP)	Hepatic	2.5E-02	1.5E+00	-	1.5
			Arsenic	Cardiovascular/ Integumentary	7.8E-01	6.8E-03	-	0.78
			Chromium	No specific target organ system	2.2E+00	1.4E+00	-	3.6
							Hazard Index Total =	**15**

Summary of Risk Characterization - Noncarcinogens

The table presents hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for exposure to groundwater containing site-related chemicals. The Risk Assessment Guidance for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects.

TABLE 12

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Site Resident
Receptor Age: Lifetime (Adult/child)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater (Core of the Plume)	Tap water/shower head	1,4-Dioxane	3.0E-04	9.1E-07	3.0E-04	6.0E-04
			Benzene	5.6E-05	7.3E-06	1.6E-04	2.2E-04
			Trichloroethylene	2.9E-06	3.9E-07	2.5E-07	3.6E-06
			Bis(2-ethylhexyl) phthalate (DEHP)	2.2E-06	1.3E-04	-	1.3E-04
			Arsenic	1.1E-04	9.4E-07	-	1.1E-04
			Chromium	3.8E-03	2.0E-03	-	5.8E-03
						Total Risk =	**7E-03**

Summary of Risk Characterization – Carcinogens

The table presents site-related cancer risks for groundwater exposure. As stated in the National Contingency Plan, the point of departure is 10^{-6} and the acceptable risk range for site-related exposure is 10^{-6} to 10^{-4}. A cancer risk that exceeds the acceptable risk range indicates an unacceptable risk from exposure to site groundwater.

TABLE 13

Risk Characterization Summary - Lead

Scenario Timeframe: Future
Receptor Population: Site Resident
Receptor Age: Child (12-72 months)

Medium	Exposure Medium	Exposure Point	Lead Exposure Point Concentration (EPC)[1]	Concentration Units	Geometric Mean Blood Lead Level	Blood Lead Level Units	Lead Risk[2]
Groundwater	Groundwater (Core of the Plume)	Tap water/shower head	47	ug/L	6.22	ug/dL	68%

[1] – The lead EPC is the arithmetic mean of all samples collected from the most contaminated portion of the groundwater plume.

[2] – Lead risks are expressed as the probability of having a blood lead level greater than 5 ug/dL; the current EPA Region 2 risk reduction goal is to limit this probability to 5% or less.

ug/L: micrograms per liter

ug/dL – micrograms per deciliter

Summary of Risk Characterization – Lead

The table presents the risk from lead due to exposure to the most contaminated portion of the site groundwater.

TABLE 14

ARARs, TBCs, and Other Guidance

CHEMICAL-SPECIFIC ARARS

Type of ARAR or TBC	Statute/Requirement	CITATION	Applicability/Relevance
Federal	Federal Safe Drinking Water Act National Primary Drinking Water Standards Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs)	40 C.F.R. Part 141	Establishes standards for drinking water quality (relevant and appropriate to remediation of groundwater).
	Federal Water Pollution Control Act (aka Clean Water Act)	33 U.S.C. § 1251 et seq.	EPA National Recommended Water Quality Criteria established under Section 304(a) of the Clean Water Act that are more stringent than state criteria may be relevant and appropriate standards for surface water.
State	New Jersey Safe Drinking Water Act Rules	N.J.A.C. 7:10	Drinking water standards which apply to specific contaminants and which are more stringent than federal standards (relevant to remediation of groundwater).
	New Jersey Groundwater Quality Standards	N.J.A.C. 7:9C	Standards for protection of groundwater quality (applicable to remediation of groundwater).
	New Jersey Site-Specific Impact to Groundwater Soil Remediation Standards	NJDEP Guidance Document for Development of Impact to Groundwater Soil Remediation Standards, November 2013	EPA adopted NJDEP's default impact to ground water screening level for arsenic (19 mg/kg) as a remediation goal for OU1.
	New Jersey Remediation Standards	N.J.A.C. 7:26D	Establishes minimum standards for the remediation of contaminated ground water and surface water, and by establishing the minimum residential direct contact and non-residential direct contact soil remediation standards.
	New Jersey Surface Water Quality Standards	N.J.A.C. 7:9B	Establishes surface water quality criteria for toxic substances for both freshwater and

TABLE 14 ARARs, TBCs, and Other Guidance			
CHEMICAL-SPECIFIC ARARS			
Type of ARAR or TBC	**Statute/Requirement**	**CITATION**	**Applicability/Relevance**
			saline water bodies. ARAR for various contaminants.
	NJDEP Ecological Screening Criteria	NJDEP Ecological Screening Criteria table, March 10, 2009	TBC screening criteria for surface water, sediment and soil relative to ecological resources.

TABLE 15 *LOCATION-SPECIFIC ARARS*			
Type of ARAR or TBC	**Statute/Requirement**	**CITATION**	**Applicability/Relevance**
Federal	Executive Order 11990 "Protection of Wetlands"		Statement of procedures on floodplain management and wetlands protection. TBC.
	Endangered Species Act	226, 16 U.S.C. §§ 1531-1544; 15 C.F.R. Part17, Subpart I; 50 C.F.R. Part 402	Standards for the protection of threatened and endangered species (wildlife, marine and anadromous species and plants).
State	Freshwater Wetlands Protection Act Rules	N.J.A.C. 7:7A,	Requirements governing regulated activities disturbing freshwater wetlands, wetland transition areas and open waters. Substantive standards are applicable to construction and implementation of remedial actions within wetlands, transition areas and open water.
	Flood Hazard Area Control Act Rules	N.J.A.C. 7:13	Requirements governing human disturbance to the land and vegetation in the flood hazard area of a regulated water and the riparian zone of a regulated water (relevant to construction and implementation of remedial actions within flood hazard areas and riparian zones).
	Endangered and Non-Game Species Conservation Act of 1973	N.J.S.A. 23:2A-1, et seq.	Regulation requiring a survey of endangered and non-game species in a project area to prevent impacts to these populations.

TABLE 16 *ACTION-SPECIFIC ARARS*			
Type of ARAR or TBC	**Statute/Requirement**	**CITATION**	**Applicability/Relevance**
Federal	Resource Conservation and Recovery Act (RCRA)	40 C.F.R. §§ 260-270; 42 USC § 6901 et. seq.	Establishes responsibilities and standards for the management of hazardous and non-hazardous waste.
	Clean Air Act	40 C.F.R. Part 50	Establishes particulate and fugitive dust emission requirements.
	Solid Waste Disposal Act, as amended	42 U.S.C §§ 6901-6992k; 40 C.F.R. Part 261	Regulated levels for toxic characteristic leaching procedure (TCLP) constituents. Specifies TCLP constituent levels for identifying wastes that exhibit toxicity characteristics.
	National Pollution Discharge Elimination System (NPDES) Permitting Requirements for Discharge of Treatment System Effluent	33 U.S.C. § 1251 et seq., 40 C.F.R. Parts 122-125	Provides guidelines for NPDES permitting requirements for discharge of treatment system effluent. On-site discharges would comply with substantive requirements of otherwise required permits.
	Identification and Listing of Specific Hazardous Waste	40 C.F.R. §§ 261.3, 261.6, 261.10	Defines those wastes which are subject to regulation as hazardous wastes, and lists specific chemical and industry-source wastes.
State	Well Construction and Maintenance	N.J.A.C. 7:9D	stablishes requirements for construction and decommissioning (sealing) of wells. Applicable to the installation of monitoring wells and extraction wells.
	New Jersey Soil Erosion and Sediment Control Act	N.J.S.A. 4:24-39 et seq.	Requires all construction activities disturbing greater than 5,000 square feet to be developed in accordance with a plan to control erosion during construction. The plan must also ensure that erosion will not occur once construction is completed.
	New Jersey Air Pollution Control Act	N.J.A.C. 7:27-8, 16	Establishes standards for discharge of pollutants to air. Potentially applicable to implementation of the remedial action.
	Noise Control Act	N.J.S.A. 13:1G-1 et seq. and N.J.A.C. 7:29-1.2	Regulations relating to the control and abatement of noise. Establishes acceptable noise levels for industrial, commercial, public service or community service facilities. Relevant and appropriate for performance of remedial activities at the Site.

TABLE 16 *ACTION-SPECIFIC ARARS*			
Type of ARAR or TBC	**Statute/Requirement**	**CITATION**	**Applicability/Relevance**
	Storm water Management	N.J.A.C. 7:8	Establishes design and performance standards for storm water management measures and establishes safety standards for storm water management basins. Relevant to construction, staging area, the excavation of the source area, and discharge.
	Pollutant Discharge Elimination System	N.J.A.C. 7:14A, et seq.	Regulates the discharge of pollutants to the surface and ground waters of the State. Substantive requirements are applicable to discharges to surface water.
	Water Supply Allocation Permits	N.J.A.C. 7:19	Governs the granting of privileges to divert water, the management of water quality and quantity and the response to water supply shortages, drought and other water emergencies. Relevant to pumping water to the ground during pilot testing.
	Solid Waste Regulations	N.J.A.C. 7:26	Establishes standards and requirements for the management of solid waste including registration, operation and maintenance of solid waste transport vehicles. Relevant to the waste excavated from the source area that will be transported for off-site disposal.

Note: While not an ARAR, all relevant sections of the Occupational Safety and Health Standards and Safety and Health Regulations for Construction (29 CFR 1910 and 1926) will be complied with.

Table 17

Preliminary Remediation Goals (PRGs)					
OU2 Groundwater					
(units µg/l) **Constituents**	**CAS No.**	**National Primary Drinking Water Standards[b] MCLs**	**NJGWQS[c]**	**Maximum Detected Concentration**	**PRG[d]**
Inorganics					
Arsenic	7440-38-2	10	3	6.4 J	3
Chromium, total	7440-47-3	100	70	262 J	70
Lead	7439-92-1	15*	5	175	5
Organics					
Alpha-BHC	319-84-6	NL	0.02	0.073	0.02
Benzene	71-43-2	5	1^{+}	90	1
Bis(2-ethylhexyl) Phthalate (DEHP)	117-81-7	6	3	15	3
1,4-Dioxane	123-91-1	NL	0.4	350	0.4
Trichloroethylene (TCE)	79-01-6	5	1^{+}	4 J	1
Acronyms:					
mg/kg - milligram per kilogram. µg/l - micrograms per liter. J - estimated value. NL – not listed					
NJGWQS - New Jersey Groundwater Quality Standards					
Notes:					
a - Based on natural background in NJ. *Federal action limit. $^{+}$Also state MCL. For arsenic, state MCL is 5 µg/l.					
b - EPA National Primary Drinking Water Standards (web page), http://www.epa.gov/safewater/consumer/pdf/mcl.pdf.					
c - Groundwater results comparison is to the NJ Ground Water Quality Standards N.J.A.C. 7:9C, last amended January 16, 2018.					
d - PRGs are the lowest of the EPA MCLs and NJGWQS					

APPENDIX 3
Responsiveness Summary

Responsiveness Summary
Record of Decision
Combe Fill South Landfill Site
Chester Township, Morris County, New Jersey

INTRODUCTION

This Responsiveness Summary provides a summary of the public's comments and concerns regarding the Proposed Plan for the Combe Fill South Landfill Superfund Site (Site) and the U.S. Environmental Protection Agency's (EPA's) responses to those comments and concerns. All comments summarized in this document have been considered in EPA's final selection of a remedial alternative for the Site.

This Responsiveness Summary is divided into the following sections:

Background of Community Involvement and Concerns - This section provides the history of community involvement and concerns regarding the Combe Fill South Landfill Site.

Comprehensive Summary of Major Questions, Comments, Concerns and Responses - This section contains summaries of oral and written comments received by EPA at the August 22, 2018 public meeting and during the public comment period, and EPA's responses to those comments.

The last section of this Responsiveness Summary includes attachments which document public participation in the remedy selection process for this Site. They are as follows:

Attachment A contains the Proposed Plan that was distributed for public comment;

Attachment B contains the public notice that was published in the *Daily Record*;

Attachment C contains the transcript of the public meeting; and

Attachment D contains the written comments received during the public comment period.

BACKGROUND OF COMMUNITY INVOLVEMENT AND CONCERNS

On August 12, 2018, EPA released a Proposed Plan and supporting documentation for the remedial alternatives to the public for comment. EPA made these documents available to the public in the administrative record repositories maintained at the EPA Region 2 office (290 Broadway, New York, New York) and the Chester Library, 250 West Main Street, Chester Township, New Jersey. EPA published a notice of availability regarding these supporting documents in the *Daily Record* on August 12, 2018. At, the same time, EPA opened a public comment period that ran from August 12, 2018 through September 11, 2018. On

August 22, 2018, EPA held a public meeting at the Chester Township Municipal Building to inform local residents, officials, and other interested parties about the Superfund process, to present the preferred remedial alternatives for the Site, solicit oral comments, and to respond to any questions.

This section summarizes comments received at the public meeting along with EPA's responses.

COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES

Part 1: Verbal Comments

A public meeting was held on August 22, 2018 at 7:00 pm at the Chester Township Municipal Building, 1 Parker Road, Chester, New Jersey. In addition to a brief presentation of the investigation findings, EPA presented the Proposed Plan and the preferred alternatives for the Site, received comments from meeting participants, and responded to questions regarding the investigation activities and remedial alternatives under consideration.

Based on the comments received, the public generally supports the selected remedies. The majority of comments received at the public meeting pertained to public health concerns and the determination of the extent of contamination. Two comment letters were received during the public comment period and were related to testing for 1,4-dioxane in the Washington Township Municipal Utilities Authority (MUA) public water supply, perimeter monitoring wells and private wells beyond the study area.

A summary of the comments and EPA's responses is provided below.

The verbal comments are organized by topic:

- Public Health Concerns
- Indoor Air Testing
- Nature and Extent of Contamination
- Remedial Actions
- Other Issues

Public Health Concerns

Comment #1: Several comments were related to the potable water supply: Does the Washington Township MUA have plans to test the public water supply for 1,4-dioxane? Will EPA evaluate the water system in Chester beyond the area of contamination to see if it was safe? Are any point-of-entry treatment systems (POETs) still in service for private wells, and if the private wells were tested along Parker Road before connection to the water line in 2015.

Response to Comment #1: The State of New Jersey regulates which contaminants are tested for in public water supplies under N.J.A.C. 7:10 Safe Drinking Water Act Rules, last amended

November 6, 2017. 1,4-dioxane testing is not currently required under the rules. Concerned consumers can contact NJDEP's Division of Water Supply and Geoscience or their local potable water providers for information on future plans to test for 1,4-dioxane. None of the former POET systems remain in service. Private wells along Parker Road were tested in 2011 prior to 73 connections being made to the public water line. Details of the residential testing can be found in the Remedial Action Waterline Report dated February 16, 2016, which is located in the administrative record for the Site.

Comment #2: There were comments that were related to use of groundwater for irrigation purposes: Is the groundwater safe for irrigation use? What is the difference between contaminants in drinking water and in irrigation water?

Response to Comment #2: When the water line extension was installed in 2015, property owners agreed to abandon their private wells. The municipality allowed a few exceptions for agricultural purposes. Use of a private well for agricultural purposes should be evaluated on a well-specific basis. The exposure to contamination in a drinking water scenario is greater than that of an agriculture irrigation scenario. The drinking water scenario considers a resident consuming 2.5 liters of tap water per day for 350 days per year and living in the same place for 26 years. It considers several activities, such as drinking the potentially contaminated water, cooking with it and showering with it. In comparison, an agriculture scenario involves the activity of spraying or distributing water mechanically for irrigation. An agriculture worker's exposure to the contaminated water through irrigation would be significantly lower than a resident's exposure.

Comment #3: A commenter asked whether EPA evaluated the health effects, e.g., cancer risks, for actual residents or performed health studies in the community based on exposure to the contaminated groundwater. The commenter was concerned about exposure to 1,4-dioxane that was not previously tested for and thought an actual study of the health risks from exposure to the contamination for residents in the community may be helpful. The commenter also asked if residents need to reach out to another federal agency regarding testing the health of residents or whether such an assessment be performed jointly with EPA.

Response to Comment #3: Rather than conducting public health assessments, EPA, under the Superfund program, performs statistical modeling in risk assessments using conservative inputs to predict what the potential risks would be from exposure to contamination. The risk assessments help determines whether or not a site needs to be cleaned up and also provide justification for using federal money to clean up the site.

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency of the U.S. Department of Health and Human Services that performs public health assessments and health consultations that evaluate a hazardous waste site for hazardous substances, health outcomes and community concerns. Residents can contact the Division of Community Health Investigations, ATSDR, to request a health assessment for a nearby hazardous site.

Additional information on requesting such an assessment and contact information can be found

on the ATSDR website at https://www.atsdr.cdc.gov/hac/index.html. ATSDR previously prepared a Health Assessment for this site in May 1988: https://www.state.nj.us/health/ceohs/documents/eohap/haz_sites/morris/chester_washington/combe_fill_south/combe_south_ha_5_88.pdf. The NJ Department of Health also provides health assessment data sets and statistics on the health status of residents; see https://www-doh.state.nj.us/doh-shad/.

Comment #4: Several comments were raised regarding surface water impacts from contaminated groundwater and the resultant surface water exposure: What is the sampling and potential risk of exposure in a local pond and stream to the south of Parker Road that eventually flows to the Black River? Was modeling conducted to determine groundwater/surface water interaction timing? Are 1,4-dioxane concentrations measured in the treatment plant effluent?

Response to Comment #4: The area south of Parker Road is located beyond the known extent of groundwater and surface water contamination. To be conservative in the evaluation of potential impacts to both people and wildlife, the surface water and sediment sampling performed focused on areas of known contamination. These conservative estimates of effects are reflected in both the human health and ecological risk assessments. The human health risk assessment determined that the excess lifetime cancer risks calculated for exposure to constituents of potential concern are within EPA's acceptable risk range for surface waters within Trout Brook, Lamington River UNT, Tanners Brook UNT, and East Trout Brook. The ecological risk assessment found that the wildlife food chain modeling HQs are less than 1, except for one instance, and even though there are exceedances of the ecological benchmarks for the evaluation of benthic invertebrates, biota, and plants, groundwater treatment is expected to address the surface water exceedances.

The remedial investigation included an evaluation of groundwater/surface water interaction consisting of the installation of eight pairs of stream gauges and shallow monitoring wells on land near the stream gauges. Water levels in both were measured using pressure transducers over a period of several months. The study confirmed an on-going groundwater to surface water discharge in some areas of the Site in the investigated streams.

NJDEP collects and analyzes samples of the treatment plant effluent monthly as part of its operating permit requirements; 1,4-dioxane concentrations in the effluent average around 20 to 30 parts per billion or "ppb".

Comment #5: A commenter requested clarification to how close to the landfill is considered safe exposure for the residents evaluated in the Baseline Human Health Risk Assessment (BHHRA).

Response to Comment #5: Residents and businesses with previously impacted wells or with the potential to be impacted in the future were connected to the water line in 2015, eliminating exposure to contaminated groundwater. The water line extends northeast along Parker Road from Flintlock Drive, includes Schoolhouse Lane, and also a portion of Route 513 west of the intersection with Parker Road. Those residents and businesses beyond the water line extension area are outside the exposure area. The BHHRA report evaluated a hypothetical scenario for residents living adjacent to the landfill, assuming contaminated groundwater potentially enters the home's private well and the residents drank the water or bathed in it. The BHHRA report

used a model that was conservative and applied hypothetical exposure factors in the scenario to be protective of public health.

INDOOR AIR TESTING

Comment #6: A commenter asked when the last time indoor air testing was performed for impacted residences and whether or not the radon systems were turned off during testing.

Response to Comment #6: Sub-slab vapor and indoor air testing were last performed by the EPA in 2010. EPA responded at the meeting that they would look up this information. What EPA found was that at least three residences had radon systems at the time of the testing according to the questionnaires filled out by talking with the residents in 2010, but the information did not include whether the radon systems were on or off during sampling. However, it is standard EPA protocol that radon systems be shut off before sub-slab or indoor air sampling is performed.

NATURE AND EXTENT OF CONTAMINATION

Comment #7: Multiple commenters inquired as to why potable well and surface water testing did not extend beyond the OU2 study area boundary, specifically State Park Road. Commenters also asked how the OU2 boundary was derived, if the perimeter monitoring wells were tested for 1,4-dioxane, and how residents could test their own wells for 1,4-dioxane.

Response to Comment #7: EPA did not test in areas beyond the extent of contamination because those wells are not impacted by Site groundwater contamination. The horizontal and vertical extents of contamination are determined by collecting and analyzing groundwater samples moving outward and downward from the landfill until clean samples are found. The OU2 study area boundary follows the horizontal extent of contamination and includes NJDEP's limit known as the Currently Known Extent or "CKE", which is the area where pollutant concentrations in ground water exceed an applicable standard such as the Department's Minimum Ground Water Remediation Standards, N.J.A.C. 7:26D-2. NJDEP performs testing of monitoring wells throughout the affected area twice per year (in the spring and fall) under its Post-Construction Environmental Monitoring Plan (PCEMP). NJDEP's testing includes 1,4-dioxane analysis. Homeowners outside of the OU2 study area boundary can send samples of their well water to laboratories certified to perform 1,4-dioxane analysis in drinking water. See the below list of certified testing laboratories requested during the meeting:

Lab No.	**Lab Name**	**Contact Name**	**Phone Number**	**Matrix Description**	**Approved 1,4-Dioxane Method**
CT003	Phoenix Environmental Laboratory	Kathy Cressia	860-645-1102	Drinking Water	EPA 522
IN598	Eurofins Eaton Analytical, LLC (South Bend)	Dale Piechocki	574-472-5523	Drinking Water	EPA 522
MA015	Alpha Analytical	Amy Rice	508-898-9220	Drinking Water	EPA 522
MA015	Alpha Analytical	James Todaro	508-898-9220	Drinking Water	EPA 522
NY158	Pace Analytical Services, LLC – Long	Diana Losito	631-694-3040	Drinking Water	EPA 522

	Island, NY				
PA010	ALS Environmental - Middletown	Susan Magness	717-944-5541	Drinking Water	EPA 522

Surface water samples from tributaries closest to the landfill did not have 1,4-dioxane concentrations above the EPA Region 5 Ecological Screening Level of 22,000 ppb. Therefore, EPA did not perform surface water sampling beyond the OU2 study area boundary.

Comment #8: A number of comments pertained to the direction of contaminated groundwater flow prior to and after connection to the water line, the influence of weather on groundwater flow, and the extent of the 1,4-dioxane plume at concentrations exceeding the drinking water standard.

Response to Comment #8: The predominant flow directions of the contaminated groundwater plume are to the northeast and southwest, but there is also lesser flow to the east and west. Flow direction is determined through depth to water measurements collected in multiple monitoring wells. There can be minor variations in flow that are seasonal, but these are of no consequence at the site. Eliminating pumping associated with the private potable wells did not measurably affect groundwater flow directions because the flow from each of the former potable wells was very small and intermittent in contrast to groundwater extraction wells which typically operate at orders of magnitude higher pumping rates and constantly.

Neither the EPA nor NJDEP has established a drinking water standard, also known as a maximum contaminant limit or MCL, for 1,4-dioxane. New Jersey has established a groundwater quality criterion for 1,4-dioxane of 0.4 ppb. The outermost line on the 1,4-dioxane plume figure shown at the meeting (refer to Final RI report Figure 8-1) represents 0.5 ppb, as the remedial investigation data collection was completed prior to the adoption of the 0.4 ppb groundwater quality standard in January 2018. The groundwater quality standard for 1,4-dioxane was 10 ppb at the time the samples were collected for the RI. The area beyond the outermost line on the 1,4-dioxane plume figure generally represents locations where groundwater concentrations are in compliance with the new groundwater standard.

REMEDIAL ACTION

Comment #9: A number of comments pertained to the remedial action:

- Commenters were concerned that the plant is not treating 1,4 dioxane and the untreated effluent is discharging to surface water.
- Other comments were related to the duration of the preferred remedial alternatives, the amount of solid waste and leachate expected to be removed, and the location of the pharmaceutical wastes.

Response to Comment #9: The treatment plant discharges its effluent to surface water and is in compliance with its operating permit. No standard currently exists for 1,4-dioxane in surface water. EPA intends to add treatment such that the effluent will meet the new 0.4 ppb groundwater quality criterion for 1,4-dioxane, even though the discharge is to surface water.

The 1,4-dioxane treatment and other upgrades associated with expansion of the existing treatment system must be designed and constructed, which could take four to six years. EPA will conduct reviews of the remedy and its effectiveness every 5 years and summarize the monitoring results conducted periodically over the 5-year timeframe. The timeframe for an active treatment remedy of this nature to achieve cleanup usually defaults to 30 years, which is what was used for the OU1 remedy. The interim remedy for OU2 will be revisited within ten years and revised as needed, depending on the success of the OU1 remedy.

The estimated volume of solid waste to be removed from the North Waste Cell is 3,800 cubic yards. All solid waste is currently beneath the landfill cap including pharmaceutical waste. When the North Waste Cell was first discovered, it was located outside of the landfill cap. The landfill cap was extended over the top of the North Waste Cell after a large portion of the North Waste Cell was excavated by NJDEP.

The landfill does not have a leachate collection system, but does have an overburden groundwater recovery system. It is apparent from the groundwater contamination data that not all of the leachate is being captured with the overburden groundwater. Upgrades and expansion of the treatment plant are intended to capture the contaminated overburden and bedrock groundwater near the OU1/OU2 boundary.

OTHER ISSUES

Comment # 10: Several comments pertained to public outreach activities. One commenter suggested on-going public outreach as to the status of groundwater and surface water contamination within OU2 during the interim monitoring period. A second commenter asked where they can access EPA's power point presentation after the meeting, and a third noted the town, Kearny, was incorrectly listed in the address of the Chester library.

Response to Comment #10: The final version of EPA's power point presentation is posted on the EPA Combe Fill South Landfill Superfund Site website at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0200489.

It is noted that Chester Library's correct address is 250 West Main Street, Chester, NJ 07930. This error has been addressed in the file.

As required by the Superfund law, EPA will review a site remedy every five years, if hazardous substances remain on site above levels that permit unrestricted use and unlimited exposure. The review team members will collect information about site cleanup activities including talking with people who have been working at the site over the past five years, as well as local officials, to see if changes in local policy or zoning might affect the original cleanup plan. A site inspection is performed to see if the cleanup equipment is working properly and monitoring data are reviewed. The review team uses the information collected to decide if the community and the environment are still protected from the contaminated material left at the site or from the remediation still in progress. When the team finishes the five-year review, it writes a report about the information that includes background on the site and cleanup activities, describes the review, and explains the results. The review team also writes a summary and announces that the

review is finished. EPA informs the community (via public notices, flyers, etc.) where the report is available to the public, including a central place called the site repository and on EPA's website.

Comment #11: A commenter asked if any studies have been done regarding the impact of the presence of this Superfund Site and proposed remedy on property values.

Response to Comment #11: EPA does not study impacts of Superfund sites on local property values.

Comment #12: A couple of commenters noted the presence of other contaminated sites in Chester that contribute to groundwater contamination and are currently undergoing investigation. One commenter asked if there is any interaction between another contaminated site on Parker Road and Combe Fill South.

Response to Comment #12: EPA is not aware of any interaction between the other site on Parker Road and the Combe Fill South Superfund Site.

Part 2: Written Comments

Comment #13: A commenter emailed a comment asking if there are any plans to test the water from the public supply well installed in 2015 for 1,4-dioxane. A recent sampling report was attached to the email.

Response to Comment #13: The 2015 public supply well is located in Long Valley. The State of New Jersey regulates which contaminants are tested for in public water supplies in N.J.A.C. 7:10 Safe Drinking Water Act Rules, last amended September 4, 2108. Currently, testing of 1,4-dioxane is not required under NJ regulations. Consumers can contact NJDEP's Division of Water Supply and Geoscience or their local water provider for further information.

Division of Water Supply and Geoscience, Mail Code 401-04Q, P.O. Box 420, Trenton, NJ 08625-0420, Fax: 609-633-1495; or Email: watersupply@dep.nj.gov. Please include "Water quality complaint" and the name of your water system in the subject line."

Comment #14: A commenter asked if the monitoring wells in the area are tested for 1,4 dioxane.

Response to Comment #14: NJDEP performs testing of monitoring wells throughout the affected area twice per year in the spring and fall under its Post-Construction Environmental Monitoring Plan. NJDEP's testing includes 1,4-dioxane analysis.

Comment #15: A commenter asked why are there no plans to extend the areas of testing to State Park Road, since the last time the water was tested was in the 1980s. The commenter requested that EPA should provide testing to homeowners that live outside of State Park Road to establish peace of mind. The commenter also stated that there are many local streams within the Parker Road perimeter that flow towards State Park Road and that homeowners are not able to easily have their water tested for 1,4 dioxane by local testing companies.

Response to Comment #15: EPA determined the extent of groundwater contamination through a comprehensive sampling event conducted in 2011. EPA designed and installed an extension of a public water supply to affected residences. EPA's investigation is limited to Site-related contamination. Testing is not conducted in areas beyond the extent of contamination. The eastern limit of the plume generally follows Parker Road. State Park Road is approximately one-quarter mile east of Parker Road. Homeowners can send samples of their well water to laboratories certified to perform 1,4-dioxane analysis in drinking water.

Comment #16: A commenter sent an email thanking EPA for its efforts to help protect the health and wellbeing of people living in Chester Township, New Jersey and for the opportunity to provide comments. This commenter was not able to attend the August 22, 2018; however, the commenter was able to review the proposed plan, the power point presentation and some of the study documents.

The commenter was not aware of the Combe Fill South Landfill Site and its impact on the community and is concerned about the increased cancer risks and elevated blood lead concentrations in young children. Based on the conclusions of the Human Health Risk Assessment, the commenter stated, "I unequivocally endorse the immediate adoption and implementation of this Superfund Proposal Plan".

The commenter requested that EPA continue to provide regular communications to the public regarding the status of additional supporting data obtained during the groundwater and surface water monitoring for OU2 and to provide an additional public comment prior to the selection of the final Record of Decision for OU2.

Response to comment#16: EPA appreciates the support and is pleased to learn this commenter was able to access and review the supporting documents for this project. EPA will continue to update the community through periodic Site updates and information sessions to provide status of current activities. When EPA proposes a final remedy for OU2, another public comment period will be established for that final remedy selection process.

Attachment A
Proposed Plan

Superfund Proposed Plan

U.S. Environmental Protection Agency

Combe Fill South Landfill Superfund Site

Chester Township, New Jersey

August 2018

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes the remedial alternatives considered for the first and second operable units (OU1 and OU2) of the Combe Fill South Landfill (CFS) Superfund Site and identifies the preferred remedial alternatives along with the rationale for the preferences.

The Proposed Plan was developed by the United States Environmental Protection Agency (EPA), the lead agency for the CFS Site, in consultation with the New Jersey Department of Environmental Protection (NJDEP), the support agency. EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9617(a) (CERCLA, commonly known as Superfund), and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The nature and extent of contamination at the CFS Site and the remedial alternatives summarized in this Proposed Plan, are described in detail in the Final Remedial Investigation (RI) and Feasibility Study (FS) Reports. EPA encourages the public to review these reports for a comprehensive understanding of the RI/FS conducted at the Site.

EPA's preferred alternatives build upon previously completed cleanup actions conducted at the CFS Site. EPA previously selected a remedial action for OU1 in a 1986 Record of Decision (ROD). Previously completed actions at the Site include capping of the 65-acre landfill; pumping and on-site treatment of shallow groundwater and leachate, with discharge to Trout Brook; installing surface water controls to accommodate seasonal precipitation and storm runoff; installing a passive landfill gas collection and treatment system; excavating and off-site disposal of source material from a portion of the North Waste Cell Area; and constructing a public water supply line to properties that were impacted or threatened by Site contamination.

This Proposed Plan describes the remedial alternatives considered for amending the remedial action selected in the 1986 ROD and identifies EPA's preferred amendment to the OU1 remedy. This Proposed Plan also describes the remedial alternatives considered for the OU2 interim remedy and the preferred alternatives for OU2.

The primary components of the preferred alternative for OU1 consist of upgrading and expanding the groundwater extraction conveyance and treatment system.

For OU2, the preferred alternative for the interim remedy addresses Site-related contamination in groundwater located outside of the landfill property boundary in order to protect human health and the environment.

MARK YOUR CALENDAR

Public Comment Period – August 12 to September 11, 2018

EPA will accept written comments on the Proposed Plan during the public comment period. Written comments should be addressed to:

Pamela J. Baxter, Ph.D., CHMM
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, NY 10007
Email: baxter.pamela@epa.gov

Public Meeting – August 22, 2018 at 7:00 PM

EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at:

Chester Township Municipal Building
1 Parker Road
Chester Township, NJ 07930

EPA's website for the CFS Site:
https://www.epa.gov/superfund/combe-fill-south

Community Role in the Selection Process

This Proposed Plan is being issued to inform the public of EPA's preferred alternatives and to solicit public comments pertaining to the remedial alternatives evaluated, including the preferred alternatives. Changes to the preferred alternatives, or a change from the preferred alternatives to another alternative(s), may be made if public comments or additional data indicate that such a change would result in a more appropriate remedial action. EPA is soliciting public comments on all of the alternatives considered in the Proposed Plan because EPA may select a remedy other than the preferred alternative. This Proposed Plan is available to the public for a public comment period that concludes on September 11, 2018.

A public meeting will be held during the public comment period to present the conclusions of the RI/FS, elaborate further on the basis for identifying the preferred alternatives, and receive public comments. The public meeting will include a presentation by EPA of the preferred alternatives and the other evaluated alternatives. Information on the public meeting and submitting written comments can be found in the "Mark Your Calendar" text box on page 1.

Comments received at the public meeting and during the comment period will be documented in the responsiveness summary section of a ROD in which EPA will select an amendment to the OU1 remedy and an interim remedy for OU2.

The OU1 ROD amendment will amend the 1986 ROD and will be the final decision document for OU1. The OU2 ROD will be an interim decision document. When the OU1 amended remedy is implemented and there is additional supporting data for the deep aquifer at the Site, a final OU2 ROD will be issued. EPA will issue the ROD to amend OU1 and select the interim OU2 remedy after taking into consideration the public comments on this Proposed Plan. The ROD will explain the cleanup remedies selected and the basis for the selection.

Scope and Role of the Action

The CFS Site is being addressed as two operable units. OU1 consists of the landfill property and groundwater directly underlying the landfill, and OU2 is defined as groundwater, both overburden and bedrock, surface water and sediment near and downgradient of the landfill property boundary, see Figure 1.

The 1986 ROD addressed the remediation of the landfill and overburden groundwater located directly below the landfill. Subsequent studies have been conducted to investigate the deeper aquifer underlying the landfill and the plume emanating from the Site.

This Proposed Plan proposes a modification to the OU1 ROD that would upgrade the groundwater conveyance system and the OU1 groundwater extraction and treatment system at the landfill property. This Proposed Plan also identifies EPA's preferred interim remedy for OU2 to address Site related contamination in groundwater located outside of the landfill property boundary in order to protect human health and the environment.

SITE BACKGROUND

Site Description

The Combe Fill South Landfill Site is located in Chester and Washington Townships, Morris County, New Jersey. This inactive municipal landfill is located off Parker Road about two miles southwest of the Borough of Chester. The Site consists of three separate fill areas covering about 65 acres of the 115-acre parcel that was owned by the Combe Fill Corporation (CFC).

The Site is situated on a hill with surface waters draining radially from the Site. Landfill leachate, groundwater, and surface water runoff from the southern portion of the Site constitute the headwaters of Trout Brook, which flows southeast toward the Lamington (Black) River. Southwest of the Site, near the headwaters of the west branch of Trout Brook, is a hardwood wetland. Much of the original wetlands were cleared to construct the landfill. The Site is located in an area that is currently zoned as residential and limited commercial.

OU1 Description

OU1 is defined as the landfill property consisting of four tax parcels, and overburden and bedrock groundwater directly underlying the landfill within the waste management boundary. Within OU1 are an approximately 65-acre multilayered cap, a passive landfill gas venting system, a shallow groundwater extraction and treatment system (GWET), security fencing, surface water runoff controls, and a perimeter access road. The shallow groundwater

extraction system consists of 18 extraction wells spaced around most of the landfill perimeter. All but one extraction well, RW-T, are screened at the bottom of the overburden material (approximately 20 to 60 feet below ground surface or "bgs"), at the saprolite/bedrock interface. RW-T is screened from 65 to 115 feet bgs (approximately 50 feet into competent bedrock). The individual extraction wells are currently being cycled on and off based on the water level measurements and limitations in pumping and conveyance piping. Extracted groundwater is pumped through a force main to the GWET operated by the NJDEP. A centralized system allows the operator to control the GWET from the control room or remotely.

The groundwater is treated by physical, chemical and biological processes before being discharged to surface water at East Trout Brook. The GWET has been in operation since 1997 and is permitted to operate at 120 gallons per minute (gpm). However, the GWET influent volume currently averages between 45 to 70 gpm, with the OU1 extraction wells cycling on and off due to poor extraction well performance, reduced yield due to seasonal variations, and limitations in the diameter of extraction well conveyance piping.

OU2 Description

OU2 is defined as groundwater, both overburden and bedrock, surface water and sediment near and downgradient of the landfill property boundary. As shown on Figure 1, the OU2 investigation area is based on the Currently Known Extent (CKE) of groundwater contamination. According to NJDEP, CKE areas are geographically defined areas within which the local groundwater resources are known to be compromised because the water quality exceeds drinking water and groundwater quality standards for specific contaminants. Historically, a number of the CKEs have also been identified as Well Restriction Areas (WRAs). The regulatory authority for developing CKEs is in N.J.A.C. 7:1J, entitled Processing of Damage Claims Pursuant to the Spill Compensation and Control Act. CKEs are used by NJDEP staff, water purveyors, and local officials to make decisions concerning appropriate treatment and/or replacement of contaminated drinking water supplies. In addition to the parcels within the CKE boundary, two additional parcels where landfill-related groundwater contamination was detected make up the OU2 investigation area.

Geology and Hydrology

The Site lies in the Piedmont Physiographic Province, known as "The Highlands" and consists of a 20-mile wide series of northeast-to-southwest trending ridges and valleys extending from the Hudson Highlands of New York to the Reading Prong Region of Pennsylvania. In the area, natural unconsolidated deposits of local soils and granite saprolite overlie highly fractured granite bedrock. A shallow aquifer, also referred to as the overburden groundwater, exists in the saprolite layer, saturating much of the waste, with a deeper aquifer in the fractured bedrock.

The deep aquifer is the major source of potable water near the landfill. Prior to installation of a public waterline in 2015, numerous residential wells within one mile of the Site drew water from this aquifer. NJDEP records indicate that there are six public wells within two miles of the landfill, all of which tap the deep aquifer. The nearest municipal well is about one mile southwest of the Site and is not impacted by Site contamination. In localized areas, the soils and saprolite overlying the bedrock are of sufficient thickness to provide domestic water supplies.

Natural (non-fill) overburden material contains unconsolidated sand, silt, clay, and gravel derived from the underlying bedrock. In most areas (except for the ridgelines), the overburden includes saprolite. Overburden thickness ranges from about four feet on the ridges to 100 feet in the low-lying areas. Overburden depths on the northeast trending ridges and at the adjacent horse farm property are shallow, only about five to 10 feet thick, whereas overburden depths in the low-lying area between the northeast trending ridges and to the south of the landfill vary between 40 and 100 feet thick. Very permeable soil and saprolite account for most of the infiltration from precipitation to the bedrock aquifer.

Site History

Starting in the 1940s, the landfill was operated as a municipal refuse and solid waste landfill. In 1972, ownership and operations changed to Chester Hills, Inc. The landfill was originally approved for the disposal of municipal and non-hazardous industrial wastes, sewage sludge, septic tank wastes, chemicals, and waste oils, as stated in its certificate of registration. In 1978, ownership and operations changed to the CFC. From 1973 to 1981, there were numerous operating violations including the absence of an initial layer of residual soil on the bedrock prior

to waste placement. In 1981, NJDEP issued an order for CFC to discontinue waste disposal operations upon completion of the existing trench. CFC ceased landfill operations, filed for bankruptcy and was liquidated. On September 1, 1983, the CFS Landfill Site was listed on the National Priorities List (NPL).

According to NJDEP files, wastes accepted at the landfill during its 40 years of operation included typical household wastes, personal care products, pharmaceutical products, calcium oxide, crushed containers of paints and dyes, aerosol product canisters, industrial wastes, dead animals, sewage sludge, septic tank wastes, chemicals, waste oils, and possibly asbestos. Numerous empty 55-gallon drums were scattered across the landfill surface. Most of wastes that were encountered during field reconnaissance, drilling operations, and test pit excavations included typical household wastes (garbage bags, paper, appliances, etc.). Refuse encountered during the drilling of a well that permeated the center of the landfill appeared to be highly decomposed rubbish. Hazardous materials were not found at the surface of the landfill during field operations.

Based on the original landfill design drawings and records of waste volumes received on-site, approximately five million cubic yards (CY) of waste material are buried in the CFS Landfill. No evidence has been found of disposal of hazardous materials outside of the Site boundaries.

Enforcement History

The State of New Jersey and EPA identified numerous potentially responsible parties (PRPs), including CFC and its parent company, Combustion Equipment Associates. CFC declared bankruptcy in October 1981, one month before the landfill was officially closed.

On October 5, 1983, 97 notice letters were sent to PRPs regarding a proposed RI/FS at the Site. None of the acknowledged recipients offered to undertake the RI/FS.

In 1985, EPA filed an application in bankruptcy court seeking reimbursement of Superfund monies spent at the Site to date. Because limited funds remained in the bankruptcy estate, EPA and CFC reached a settlement in which CFC paid $50,000 in May 1986 to resolve EPA's Superfund claims.

In October 1998, EPA and the State of New Jersey filed a complaint seeking the recovery of past and future response costs incurred and to be incurred in connection with the clean-up of the Site. An initial settlement reached in 2005 resulted in a consent decree with former owner/operators that required payment of $12,500,000 in costs to the State and EPA. A second consent decree entered in 2009 settled claims against approximately 300 private parties and municipalities. The consent decree required payment of $69 million in past costs, approximately $3.2 million in natural resource damages, and a $27 million annuity to fund future work at the Site.

OU1 Remedial Investigation

An RI for the Site was performed by NJDEP during 1984 to 1985. During the RI, major contaminants of concern (COCs) found were benzene, chlorobenzene, ethylbenzene, toluene, trichloroethylene (TCE), 1,2-dichloroethane, chloroethane, methylene chloride, and tetrachoroethylene. These hazardous substances and contaminants were consistent with known past usage of the Site and the variety of wastes accepted, and they persisted in groundwater and surface water. Volatile organic compounds (VOCs) were identified within both the unconsolidated and consolidated aquifers in and around the Site. Groundwater contamination predominantly migrates northeast and southwest from the landfill. The RI identified residents living on Schoolhouse Lane, less than one-half mile from the landfill, and pupils of the day-care facility located on Parker Road as being at risk because groundwater was the primary source of potable water in the immediate area surrounding the Site. The 1986 RI Report documented the presence of a wide range of contaminants in groundwater listed above.

Record of Decision (1986)

EPA issued a ROD on September 29, 1986. The major components of the selected remedy included:

- An alternate water supply for affected residences;
- Capping of the 65-acre landfill in accordance with Resource Conservation and Recovery Act requirements;
- An active collection and treatment system for landfill gases;
- Pumping and on-Site treatment of shallow groundwater and leachate, with discharge to Trout Brook;
- Surface water controls to accommodate seasonal

precipitation and storm runoff;
- Security fencing to restrict Site access;
- Appropriate environmental monitoring to ensure the effectiveness of the remedial action; and
- A supplemental feasibility study to evaluate the need for remediation of the deep aquifer.

Post-ROD Actions

An engineering design was performed to develop the details of implementing the remedy. The 1993 Final Design Report provided the design specifications for the cover system, landfill gas collection and treatment system, the shallow groundwater extraction system and the groundwater treatment system, as well as a groundwater extraction system effectiveness monitoring plan and a preliminary operations and maintenance (O&M) plan.

Construction activities began in January 1993 and were completed in September 1997. Initial activities included, installing temporary utilities, clearing and grubbing, conducting some work on the Site access road, and installing perimeter fencing. Buried drums were discovered in three separate areas along the eastern perimeter of the Site and they were either disposed of off-site or placed underneath the cap. Other major Site work included refuse relocation, conducting landfill cap construction, constructing the perimeter road, installation of wells, constructing the groundwater extraction system, and installing underground piping and electrical conduit. These activities are described in more detail in NJDEP's closeout report dated June 30, 2011.

In 2006, EPA issued an Explanation of Significant Differences (ESD) to revise one of the components of the 1986 ROD. The ESD modified the provisions for an active landfill gas and condensate collection and treatment system to a passive landfill gas venting system. The change to the passive system was made based on test results from studies completed after the 1986 ROD.

In 2001, non-native fill was encountered outside the cap limits along the northern property boundary during the installation of landfill gas probes. This area of non-native fill, which became known as the North Waste Cell (see Figure 1) was investigated and delineated by NJDEP through borings, test pits and trenches. From 2006 to 2009, NJDEP excavated a major portion of the North Waste Cell area, disposed of the waste off-site, and installed an impermeable cap over the area. A smaller portion of the North Waste Cell remains on Site.

Public Water Supply Extension

The deep aquifer is the major source of potable water in the vicinity of the landfill. Numerous residential wells within one mile of the site drew water from this aquifer. In the early 1980s, NJDEP collected water samples from several private wells near the landfill. The results of the water samples found that there were a few private wells contaminated with volatile organics. Based on limited information available from sampling results, NJDEP defined an area of approximately 62 affected residences on Schoolhouse Lane, Parker Road, and part of Old Farmers Road in need of an alternate water supply. The area was later expanded in 1989 to include about 325 homes.

Based on the 1986 ROD, water supply alternatives were evaluated for the affected residences and businesses around the Site. The extension of the Washington Township Municipal Utilities Authority (MUA) Hager Water Distribution System was selected as the water supply solution.

In the early 1990s, after additional sampling revealed fewer impacted drinking water supplies than originally projected. NJDEP installed point of entry treatment (POET) systems in 32 residences in the area of the Site. Initially, the POET systems were intended to be an interim measure pending the design and construction of a public water supply system. The POET systems were proven effective in removing contamination from the potable water supplies and the construction of the public water supply was deferred.

Prior to advancements in laboratory analytical technology, it was not possible to detect 1,4-dioxane at low concentrations. In 2008, 1,4-dioxane was first detected in the potable water supply of the residences with POET systems. An investigation conducted by NJDEP indicated that the POET systems were ineffective in treating the 1,4-dioxane contamination. Experiments with various types of treatment media and treatment processes failed to produce results showing a reduction of the contaminant to an acceptable level.

The discovery of 1,4-dioxane in the private drinking water supplies reinforced the need for an alternate

water supply for the properties surrounding the Site. In 2010, EPA performed additional studies that were conducted to thoroughly evaluate current Site conditions and the appropriateness of the existing remedy.

In January 2011, EPA initiated a residential well investigation within the area of concern. As part of the investigation, 213 potable water samples were collected from 160 residential properties located in Chester and Washington Townships, NJ. In June 2011, EPA collected an additional 75 potable water samples from 52 residential properties and from the landfill treatment plant. The analytical results of EPA's residential well investigation indicated that 13 residences located north and east of the Site contained concentrations of 1,4-dioxane in their potable water supply above the Site-specific Action Level of 3.0 micrograms per liter (µg/L) established at the time (2011).

In April 2011, EPA initiated a 1,4-dioxane treatability study to determine if the design and potential installation of systems to treat the 1,4-dioxane contamination was a feasible interim measure that could be implemented in the area of concern until the extension of the water main was completed. EPA evaluated treatment of 1,4-dioxane in private supply wells using a combination of ozone addition and ultraviolet radiation.

The study indicated that the developed system was able to reduce 1,4-dioxane concentrations in the tested water supply by more than 50% but would require multiple passes to achieve 99% removal.

Based on this finding, the design for the waterline extension project began in 2011. The design was completed in late 2012 and permits to construct were obtained in the spring of 2013.

From July 2013 to July 2015, construction of the water main extension project was implemented to address the groundwater contamination that originated at the Site. The waterline extension joins the existing Washington Township, New Jersey MUA system at the intersection of Flintlock Drive and Parker Road and was turned over to Washington Township in July 2015.

EPA connected 73 residences and businesses to the waterline (79 total connections) along Parker Road, Schoolhouse Lane, and a small portion of Route 513 that were threatened by contaminated groundwater from the landfill.

SUMMARY OF OU1 AND OU2 REMEDIAL INVESTIGATION ACTIVITIES

In February 2010, EPA initiated RI/FS activities for the deep bedrock aquifer underlying the landfill and areas outside the landfill property boundary. The RI conducted between 2010 and 2015 included the following field activities:

- Installation of 19 bedrock monitoring wells;
- Installation of nine pairs of piezometers and stream gauges;
- Collection of samples from five soil borings;
- Collection of approximately 200 groundwater samples, 22 soil samples, 24 surface water samples, 53 potable well water samples, and 24 sediment samples;
- Collection of short- and long-term water level monitoring data;
- Geophysical surveys including resistivity, Willowstick® electromagnetic, magnetic gradient and electromagnetic terrain conductivity to locate preferential flow pathways in bedrock and also possible buried drums in two locations at the landfill;
- Downhole investigations incorporating FLUTe™ hydraulic profiling, packer testing, and downhole geophysical surveys including single-point resistivity, long normal resistivity and short normal resistivity; fluid temperature; fluid resistivity; caliper; natural gamma; heat pulse flow meter; and acoustic televiewer; and
- Wetland delineation, wildlife surveys, well condition surveys and land surveys (topographic, boundary, stream cross sections and well/piezometer horizontal and vertical locations).

A long-term aquifer pump test and adsorption pilot test were conducted in 2017 in support of the FS, along with background surface water and sediment sampling in support of the Final Screening Level Ecological Risk Assessment (SLERA).

Multiple lines of evidence indicated that the landfill, including the North Waste Cell area, is a continuing source of groundwater contamination, which impacts surface water in some areas. These lines of evidence include:

- The historic waste burial practice of direct

placement on fractured rock;

- Historic and recent groundwater analytical data for the landfill and surrounding area indicating COC concentrations above standards and criteria;
- Concentrations of three COCs - 1,4-dioxane, benzene, and TCE - were higher within the landfill property than in the surrounding area;
- The highest 1,4-dioxane concentrations were detected at a bedrock monitoring well located immediately downgradient of the North Waste Cell, and the highest concentrations of benzene and TCE originated near the northeastern corner of the landfill based on the 2010 through 2015 RI data;
- Direction of groundwater flow is nearly radial and flows in line with the topographic high of the landfill to lower elevations in the surrounding area. Vertical groundwater flow in the bedrock aquifer has shown an upward gradient as well as artesian conditions in some areas;
- Detections of 1,4-dioxane in surface water; and
- Both the North Waste Cell and northeastern corner of the landfill towards Schoolhouse Lane, are along the three preferential groundwater flow paths in bedrock.

A summary of the RI results by media is as follows:

Groundwater

Groundwater flow in the overburden aquifer has three major components: 1) Horizontal flow outward from the landfill generally follows topography towards surface water bodies. The horizontal flow direction is nearly radial from higher elevations at and near the landfill. 2) Groundwater also flows along the bedrock surface from higher to lower top of bedrock surface elevations at the overburden/bedrock interface. Two bedrock surface highs beneath the northwest and southeast portions of the landfill frame the sides of a bedrock surface low that developed at the contact between two rock types and crosses CFS from southwest to northeast. The bedrock interface along this low slope to the northeast and southwest from a divide along the landfill's northern perimeter and marks a major fracture zone. From the divide, groundwater at the overburden-bedrock interface predominantly flows either northeast (towards Schoolhouse Lane and the Lamington River Un-named tributary (UNT)) or southwest (towards Trout Brook); and 3) Vertical flow is towards the bedrock interface into mostly steeply dipping bedrock fractures. Downward flow from the overburden to the bedrock aquifer occurs at the landfill and in the immediate vicinity, whereas upward flow occurs near the streams.

Eight target contaminants - 1,4-dioxane, benzene, TCE, di(2-ethylhexyl) phthalate (DEHP), alpha-benzene-hexachloride (alpha- BHC), lead, arsenic, and chromium - exceeded their respective groundwater quality standards (GWQS) in both OU1 and OU2 monitoring wells. 1,4-dioxane and benzene were the most significant organic groundwater contaminants with 1,4-dioxane exceeding the 0.4 µg/l GWQS at 20 locations in 95 samples with concentrations up to 350 µg/l in the aquifers.

The horizontal extent of 1,4-dioxane-contaminated groundwater is roughly three times longer than it is wide, and is oriented in a northeast-southwest direction, with the North Waste Cell as the "hot spot". The contamination extends from the overhead transmission lines that run perpendicular to Parker Road southwest of the landfill, to County Route 513 aka Washington Turnpike to the northeast. To the west, the contamination extends to the southeastern portion of the horse farm, and to the east, it extends to Parker Road.

The highest concentrations of 1,4-dioxane were detected at the northeast edge of the landfill, at and downgradient of the North Waste Cell and in the area between the landfill and Schoolhouse Lane. Samples collected from monitoring wells in all directions from the landfill and from the shallowest to the deepest depth intervals exceeded the GWQS of 0.4 µg/L. The samples with the deepest detections of Site related groundwater contaminants, including 1,4-dioxane above 0.4 µg/L were from approximately 700 feet bgs.

The benzene plume is roughly half the size of the 1,4-dioxane plume, but has the same general shape. Unlike the 1,4-dioxane plume, the benzene plume appears to originate near the northeast corner of the landfill. Most exceedances for benzene were in the shallower depth intervals.

Surface Water

No exceedances of VOCs, SVOCs, or pesticide COCs criteria are associated with the four investigated streams (Trout Brook, Lamington River UNT and Tanner's Brook UNT, and East Trout Brook). Copper, lead, silver, and cadmium concentrations

exceed surface water quality standards (SWQS). Maximum surface water concentrations for each of these four metals were less than an order of magnitude above the respective SWQS: copper (6.7 J µg/l vs. 2.2 µg/l SWQS), lead (9 J µg/l vs. 5.4 µg/l SWQS), silver (0.54 J µg/l vs. 0.12 µg/l SWQS), and cadmium (0.19 µg/l vs. 0.056 µg/l SWQS). Though widespread in surface water near CFS, 1,4-dioxane did not exceed the comparison criterion value (22,000 µg/L). Its presence in streams and seeps indicates that contaminated groundwater originating at the landfill is upwelling into the streams and seeps, but not at levels that would be of ecological concern.

Sediment

In sediment, concentrations of the polycyclic aromatic hydrocarbons (PAHs) anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene, along with benzyl butyl phthalate, exceeded the freshwater ecological screening criteria (lowest effects levels, or LELs) at two locations on the Lamington River UNT and at one location on the Tanners Brook UNT. These PAHs were not detected at intervening sediment sample locations between the landfill and the stream headwaters.

Soils

Five soils borings were installed along the landfill perimeter road to determine if remaining source areas within the landfill, such as possible buried drums and the un-remediated portion of the North Waste Cell, impacted soil. Collection of soil samples did not occur outside the landfill property boundary. Concentrations of nine metals - aluminum, arsenic, beryllium, cadmium, cobalt, manganese, nickel, silver and vanadium - exceeded criteria in various combinations at all five soil boring locations. Arsenic was the only metal in soil that is also a groundwater COC. 1,4-dioxane was not detected in any soil samples.

SUMMARY OF SITE RISKS

As part of the RI/FS, a baseline risk assessment was conducted to estimate the current and future effects of contaminants on human health and the environment. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects of releases of hazardous substances from a site if no actions to mitigate such releases are taken, under current and future groundwater, surface water, and sediment uses. The baseline risk assessment includes a human health risk assessment (BHHRA) and a SLERA.

Human Health Risk Assessment

EPA conducted a four-step BHHRA to assess Site-related cancer risks and noncancer health hazards in the absence of any remedial action. The four-step process is comprised of: Hazard Identification, Exposure Assessment, Toxicity Assessment, and Risk Characterization (refer to the text box "What is Human Health Risk and How is it Calculated").

The BHHRA began with selecting chemicals of potential concern (COPCs) in groundwater and surface water that could potentially cause adverse health effects in exposed populations. Site groundwater is designated as a potable water source. Although current exposure has been eliminated by construction of the water line, future exposure to groundwater was considered. The baseline risk assessment evaluated residential exposure to the most contaminated portion of the groundwater plume through the ingestion of, dermal contact with, and inhalation of volatile contaminants during daily activities and while showering/bathing. Risks and hazards were also evaluated for ingestion of and dermal contact with contaminated surface water from Trout Brook, Lamington River UNT, and Tanners Brook UNT, as well as consumption of fish from these water bodies. Sediment was not evaluated since there is minimal and infrequent contact with the medium based on review of the analytical data, Site use and conditions, potential for bioaccumulation, and exposure pathways. Subslab soil gas and indoor air samples were collected from nearby residences during the early part of the RI to assess the potential for vapor intrusion from Site contaminants; these samples were qualitatively evaluated in the BHHRA. Soil was not evaluated since it was capped as part of the OU1 remedy.

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. A four-step process is utilized to assess site-related human health risks for reasonable maximum exposure scenarios.

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

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of 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 effects, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a one-in-ten-thousand excess cancer risk; or one additional cancer

Summary of Risks:

Cancer risks and noncancer health hazards were evaluated for exposure to the most contaminated portion of the Site groundwater plume. Residential exposure to the site-related contaminants 1,4-dioxane, benzene, TCE, DEHP, alpha BHC, arsenic, and chromium results in an estimated excess lifetime cancer risk of 7×10^{-3} and a hazard index of 13 for the adult resident and 15 for the child resident. The exposure to site-related contaminants in groundwater results in an excess lifetime cancer risk that exceeds EPA's target risk range of 1×10^{-4} to 1×10^{-6} and a noncancer hazard index above 1. Recreational exposure to site-related contamination in surface water, as well as ingestion of fish, results in a lifetime cancer risk that is within EPA's target risk range of 1×10^{-4} to 1×10^{-6} and a noncancer hazard index below 1. A child residents' exposure to lead in groundwater was evaluated separately using the integrated exposure uptake biokinetic (IEUBK) model. The model predicted 68% of the population of children age 1-6 would be expected to have a blood lead concentration above 5 µg/dl, which exceeds the regional threshold of 5%. Subslab soil gas, indoor air, and groundwater sample results were compared to vapor intrusion screening levels. This analysis concluded that residents are currently unlikely to be exposed to Site contaminants through the vapor intrusion pathway, though this could change if the groundwater plume migrated over time.

At the time of the OU1 ROD, migration of contaminated groundwater posed a risk to downgradient well users. Although the water line has been installed as part of the OU1 remedy to eliminate this risk, groundwater in OU1 and OU2 continues to be contaminated above drinking water standards and additional efforts to control migration are necessary to protect human health and the environment. Detailed information regarding the human health risk assessment can be found in the June 2018 Final RI report.

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.

Ecological Risk Assessment

The SLERA was prepared to evaluate potential hazards for aquatic biota, benthic invertebrates, amphibians, and plants as well as wildlife exposure to contaminants present in surface water, seep/spring water, and sediment. Plant exposure to contaminants is via uptake and root absorption while wildlife is exposed via ingestion of water, plants, and invertebrates and incidental ingestion of sediment.

The evaluation of surface water and sediment exposure pathways from local streams and seep/spring pathways indicates that aquatic biota, benthic invertebrates, amphibians, and plants may potentially be adversely impacted by inorganics, PAHs, 2,3,4,6-tetrachlorophenol, and alpha-chlordane. Sediment exceedances of conservative screening levels were for inorganics, PAHs, and 2,3,4,6-tetrachlorophenol. Surface water exceedances of conservative screening levels were for inorganics. There were also some VOCs and one pesticide (alpha chlordane) identified as COPCs because no screening criteria are available. Though widespread in surface water near CFS, 1,4-dioxane did not exceed the comparison criterion value of 22,000 µg/L. Its presence in streams and seeps indicates that contaminated groundwater originating at the landfill is upwelling into the streams and seeps, but not at levels that would be of ecological concern.

For wildlife exposure via bioaccumulation of COPCs in the food chain, the evaluation of surface water and sediment exposure pathways from the four local streams (Trout Brook, Lamington River UNT, Tanners Brook UNT, and East Trout Brook) have LOAEL-based hazard quotients (HQs) less than 1 for all receptor groups, except for spotted sandpipers, representing avian invertivores. Exposure to vanadium in East Trout Brook for this receptor resulted in a HQ of 1.7, which is just above the acceptable limit of 1. However, vanadium was not found at significant levels in the groundwater plume and therefore the landfill is the unlikely source.

In summary, the wildlife food chain modeling HQs are less than 1, except for the spotted sandpiper which has an HQ of 1.7 for exposure to vanadium in sediment from East Trout Brook. This risk estimate, as well as other exceedances of conservative surface water and sediment screening values are not from compounds that are considered to be site-related.

Although 1,4-dioxane is impacting the surface water, it is not at levels of ecological concern. Further remediating the groundwater will reduce any impacts to surface water. Detailed information regarding the ecological risk assessment can be found in the 2018 Final RI report.

EPA has determined that the Preferred Alternatives identified in this Proposed Plan, are necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are defined as media-specific goals for protecting human health and the environment. RAOs are developed through an evaluation of data generated during the RI, including: the identified contaminants of concern, impacted media of interest, fate and transport processes, receptors at risk, and the associated pathways of exposure included in the conceptual site model. RAOs also consider preliminary remediation goals (PRGs), identified via an evaluation of applicable or relevant and appropriate requirements (ARARs) and advisories, criteria or guidance to be considered, and other technical and policy considerations that may be applicable to the Site.

The following RAOs were developed for the OU1 ROD amendment:

- Limit migration of contaminated groundwater and leachate from OU1 to OU2;
- Enhance the GWET to reduce concentrations of 1,4-dioxane being discharged to surface water;
- Reduce the toxicity, mobility and volume of contamination in the North Waste Cell to reduce impact on groundwater; and
- Prevent exposure to contaminated groundwater.

The following RAO was developed for the OU2 interim remedy:

- Prevent current and future exposure to human receptors (via ingestion, dermal contact and inhalation) to site-related contaminants in groundwater and surface water at concentrations in excess of federal and state standards.

The ultimate goal for OU2 is to achieve restoration of the groundwater in order for it to be used as a drinking water source in the future. EPA and NJDEP have promulgated maximum contaminant limits (MCLs) and NJDEP has promulgated GWQSs, which are enforceable, health-based, protective standards for various drinking water contaminants. The more stringent of the MCLs and GWQSs are the PRGs for the COCs in the OU2 groundwater.

SUMMARY OF REMEDIAL ALTERNATIVES

The FS identifies and evaluates remedial action alternatives. RAOs were developed for the Site, and then technologies were identified and screened based on overall implementability, effectiveness, and cost. Remedial alternatives consisting of one or more technologies were assembled and analyzed in detail with respect to seven of the nine criteria for remedy selection under CERCLA. The remaining two criteria, state acceptance and community acceptance, will be addressed in the ROD following the public comment period.

Remedial Alternatives

CERCLA Section 121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions be protective of human health and the environment, be cost effective, and use permanent solutions and, alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which use, 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. The NCP establishes an expectation that treatment will be used to address the principal threats posed by a Site wherever practicable (40 C.F.R. Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. The groundwater contamination at the CFS Site is not considered principal threat waste. However, the waste material in the North Waste Cell is source material, and is considered principal threat waste. As noted above,

CERCLA Section 121(d), 42 U.S.C. §9621(d), specifies that a remedial action must require 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).

Remedial alternatives for the Site are summarized below. Capital costs are those expenditures that are required to construct a remedial alternative. O&M costs are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial alternative and are estimated on an annual basis. Present worth is the amount of money which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project, calculated using a discount rate of seven percent and up to a 30-year time interval. Construction time is the time required to construct and implement the alternative and does not include the time required to design the remedy, or procure contracts for design and construction.

Common Elements

The alternatives for each OU contains a "No Action" alternative (OU1-G1 and OU2-G1 for OU1 and OU2, respectively). The No Action alternatives provide a baseline for comparison with other active remedial alternatives. Because no remedial activities would be implemented under the No Action alternatives, long-term human health and environmental risks would remain the same as those identified in the BHHRA and SLERA, with the exception of any changes due to incidental natural attenuation. There are no capital, operations/maintenance, or monitoring costs, no permitting or institutional legal restrictions.

Long-Term Monitoring (LTM) and Institutional Controls (ICs) would be implemented with all the alternatives except the No Action alternatives. ICs include establishing a classification exception area (CEA) to limit future use of Site groundwater and establishing deed restrictions. Current LTM involves collecting samples at groundwater monitoring wells to assess groundwater conditions over time.

For OU1, Alternatives OU1-G2 and OU1-G3, 1,4 dioxane treatment, North Waste Cell removal and upgrading the GWET are common components of the alternatives. The active OU2 alternatives are contingent upon the implementation of either OU1-G2 or OU1-G3.

Additionally, because alternatives OU1-G2 and OU1-G3 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.

The alternatives for OU1 and OU2 are summarized below.

Remedial Alternatives OU1	
Alternative	**Description**
OU1-G1	No Action
OU1-G2	Upgrade OU1 GWET System, Source area removal with LTM/ICs
OU1-G3	Upgrade OU1 GWET System, Additional groundwater extraction, Source area removal with LTM/ICs

Alternative OU1-G1: No Action

Capital Cost	$0
Annual O&M Cost	$0
Present Worth Cost	$0
Time Frame	0 months

The NCP requires EPA to consider the No-Action alternative. Under this alternative, no additional actions would be taken to improve the existing OU1 GWET system and operations. This alternative would also not involve ICs. Contaminants present in overburden and bedrock groundwater that are not being captured by the existing OU1 GWET system would remain in place.

Alternative OU1-G2: Upgrade OU1 GWET system, source area removal, LTM/ICs

Capital Cost	$ 9,828,414
Annual O&M Cost	$ 890,660
Present Worth Cost	$ 20,936,217
Time Frame	>30 years

Under its current configuration, the OU1 GWET system is not fully capturing the leachate or shallow

groundwater underlying the landfill.

Primary components of Alternative OU1-G2 consist of upgrading the groundwater conveyance system to increase the volume of contaminated groundwater that can be captured and to provide treatment for 1,4-dioxane as part of the GWET system. The components of this alternative are as follows:

The conveyance system around the northeast landfill perimeter would be upgraded to accommodate additional groundwater flow from the overburden extraction wells and RW-T to allow for continuous operation and achieve the intended capture. This alternative includes upgrading piping from a 2-inch diameter line to a larger line which will allow for additional capacity. The one existing bedrock extraction well will be operated at a continuous rate rather than in cycles as is the current practice. The continuous pumping of the bedrock extraction well, RW-T, would increase hydraulic influence up to 1,800 feet or more to the northeast of the landfill.

The OU1 GWET was originally designed to treat approximately 120 gpm of contaminated groundwater; however, it currently treats on average only 45 to 70 gpm of groundwater flow due to poor extraction well performance and limitations in the diameter of extraction well conveyance piping and reduced yield due to seasonal variations. Under this alternative, the OU1 GWET would be upgraded to operate at a minimum of 120 gpm, from the current operating flow rate of 45 to 70 gpm. An evaluation of the existing system and treatment requirements will be conducted during the remedial design (RD) phase to develop the details of the necessary improvements to upgrade the treatment capacity. The existing system operates in batch-flow and utilizes a sequencing batch reactor (SBR) to remove the ammonia concentrations that are typically found in landfill leachate. The necessity of SBR under the new pumping scenario will be evaluated in RD.

The OU1 GWET upgrade includes adding treatment for reducing 1,4-dioxane concentrations to or below the current GWQS of 0.4 µg/l. Various treatment technologies, such as adsorption and advanced oxidation processes, have been evaluated and pilot tested for use at the Site and adsorption results were positive. Recent studies into the potential efficacy of biological treatment are also being considered. A final ex-situ treatment option would be selected in the RD phase.

With reduced impact from contamination in the overburden aquifer, the conditions in the bedrock groundwater within OU1 would be assessed over time with LTM. Establishment of a CEA would limit future groundwater use and restrict installation of wells other than for monitoring within the known extent of the OU2 threatened and impacted area. Deed restrictions would limit future land use and protect the integrity of the cap.

As part of this alternative, remaining source material, including soil contamination and solid waste (buried drums and containers) located in the North Waste Cell would be excavated and disposed of off-site to a permitted facility.

Alternative OU1-G3: Addition of new bedrock extraction wells, upgrade OU1 GWET system, source area removal, and LTM/ICs

Capital Cost	$10,457,289
Annual O&M Cost	$920,360
Present Worth Cost	$21,933,592
Time Frame	>30 years

Alternative OU1-G3 utilizes the OU1 existing GWET overburden extraction well network, as well as the addition of new bedrock extraction wells to establish hydraulic control in the bedrock aquifer at the OU1/OU2 boundary. The OU1 GWET would be upgraded as described in Alternative OU1-G2 plus treatment of added volume from new bedrock extraction wells to operate at approximately 200 gpm. The new extraction wells would be installed within preferential flow paths identified via geophysical methods or other means during RD and previous investigations. It is estimated that three bedrock extraction wells would be installed within OU1 or near the OU1/OU2 boundary. Bedrock extraction wells would be installed to target groundwater contamination located approximately 100 to 350 feet bgs.

It is likely that pumping from the proposed bedrock extraction wells would establish hydraulic control at the OU1/OU2 border. Pumping from the bedrock aquifer in this area, especially within a preferential flow path, could influence groundwater far downgradient. This hydraulic control would limit the migration of contaminants from OU1 to OU2. LTM

of OU1 monitoring wells would be expected to show reduced contaminant concentrations and monitor the impact of the increased extraction over time. Establishment of a CEA would limit future groundwater use and prevent installation of wells other than for monitoring within the extent of the landfill property boundary. Deed restrictions would limit future land use and protect the integrity of the cap.

As described in the OU1-G2 Alternative, the source area material in the North Waste Cell area would be excavated and disposed of off-site.

Remedial Alternatives OU2	
Alternative	**Description**
OU2-G1	No Action
OU2-G2	LTM/ICs
OU2-G3	Extraction and Treatment of OU2 groundwater/LTMs/ICs

Alternative OU2-G1: No Action

Capital Cost	$0
Annual O&M Cost	$0
Present Worth Cost	$0
Time Frame	0 months

Under this alternative, no actions would be taken in OU2 to address groundwater contamination. This alternative would also not include ICs or monitoring. Contaminants present in overburden and bedrock groundwater and surface water in OU2 would remain unaddressed and unmonitored.

Alternative OU2-G2: Long-term monitoring/institutional controls

Capital Cost	$0
Annual O&M Cost	$111,200
Present Worth Cost	$ 781,100
Time Frame	10 years

Alternative OU2-G2 consists of long-term groundwater and surface water monitoring and institutional controls. Alternative OU2-G2 assumes an active groundwater remedial alternative for OU1. Alternative OU2-G2 includes multiple rounds of groundwater and surface water sampling to be collected from the existing or expanded monitoring well network located within OU2. LTM is expected to take place over a period of ten years or less, at which point a decision would be made about a permanent remedy for OU2 groundwater.

The effectiveness of LTM/ICs would be assessed over time in conjunction with the OU1 amended remedy.

This alternative assumes land and groundwater use in the OU2 area remains the same over the foreseeable future.

Establishment of a CEA would limit future groundwater use and restrict installation of wells other than for monitoring within the known extent of the OU2 threatened and impacted area.

Alternative OU2-G3: Installation of extraction wells and groundwater treatment with LTMs/ICs

Capital Cost	$9,056,339
Annual O&M Cost	$ 246,060
Present Worth Cost	$10,784,639
Time Frame	10 years

Alternative OU2-G3 consists of pumping groundwater from approximately three bedrock extraction wells located in the northeast and west-southwest portions of the OU2 area within the most predominant groundwater flow directions. This would establish some hydraulic control of the OU2 plume. The three bedrock extraction wells would be constructed to a depth of approximately 100 to 350 feet bgs.

The three bedrock extraction wells in this alternative would be in addition to the three bedrock extraction wells in OU1-G3, should that alternative be selected for OU1. If OU1-G2 is selected, these would be the only bedrock extraction wells at the Site with the exception of existing RW-T. The recovered groundwater would be pumped to and treated at the OU1 GWET. The OU1 GWET would be upgraded and expanded as described in Alternative OU1-G2 or OU1-G3 to handle the additional groundwater volume from this alternative, which is estimated to be

approximately 100 gpm. The treated groundwater effluent would either be discharged to East Trout Brook at the existing OU1 GWET effluent location, at a new infiltration/detention basin, returned to the streams nearest the extraction wells, or a combination of discharge locations to maintain the hydrology of the streams and avoid adverse impacts to open water and wetlands. These determinations would be made in the RD phase.

This alternative is contingent on the remedy selected to address the OU1 groundwater. It is assumed that the OU1 GWET system will be upgraded to accept the additional volume from Alternative OU1-G2 or OU1-G3. LTM and a CEA as described previously are also components of this alternative.

This alternative also includes: multiple rounds of groundwater sampling to be collected from the existing or expanded OU2 monitoring well network as well as surface water sampling; statistical analysis and groundwater modeling to predict the timeframe for groundwater restoration; and ICs to assure the interim remedy remains protective. It is likely that this alternative would be implemented for up to 10 years, at which point a decision would be made regarding a permanent remedy for OU2.

Comparative Analysis of Alternatives

This section includes a comparative analysis of the three alternatives developed for both OU1 and OU2. Each alternative is compared relative to seven of the nine NCP criteria, with the remaining two (community acceptance and state acceptance) to be addressed in the ROD following the public comment period.

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES

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

2. Compliance with ARARs evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

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

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

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

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

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

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

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

Overall Protection of Human Health and the Environment

Alternatives OU1-G1 and OU2-G1 would not meet the RAOs and would not be protective of human health and the environment since no actions would be taken. For OU1, the existing treatment plant would remain, but it primarily treats leachate and some shallow groundwater, and deeper bedrock groundwater would continue to migrate from the

landfill to downgradient areas uncontrolled. OU2 contamination would remain in groundwater for a long time in the future, while no mechanisms would be implemented to prevent exposure to contaminated groundwater, or to reduce the toxicity, mobility, or volume of contamination except through natural processes, which would not be monitored.

For Alternatives OU1-G2 and OU1-G3, RAOs would be met over time and would provide protection to human health and the environment through treatment processes, ICs, and LTM. The implementation of a deed restriction would provide a greater degree of overall protection of human health and the environment by providing limited use of the Site.

Alternative OU1-G3 would be more protective compared to Alternative OU1-G2 as it would provide a more comprehensive hydraulic control remedy with the addition of bedrock extraction wells for OU1 and would capture both overburden and bedrock contaminated groundwater underlying the landfill property to a depth of approximately 350 feet bgs.

Additional protection would occur based on the excavation and off-site disposal of source material in the North Waste Cell as part of both Alternatives OU1-G2 and OU1-G3.

For OU2, Alternatives OU2-G2 and OU2-G3 would meet RAOs and would provide protection to human health and the environment through the implementation of either long-term monitoring (OU1-G2) or groundwater extraction and treatment (OU1-G3). Alternative OU2-G3 would actively treat contaminated groundwater in the OU2 area of the Site, which may be more protective than the LTM called for in OU2-G2. However, the bedrock extraction wells which are part of Alternative OU1-G3, are expected to capture a portion of the OU2 bedrock plume, which depending on the success of the OU1 remedy, may provide similar protectiveness compared with OU2-G3. Further, streams and wetlands in the OU2 area could be negatively impacted by extraction and discharge of treated OU2 groundwater.

Compliance with ARARs

EPA and NJDEP have promulgated MCLs and GWQS (40 CFR Part 141 and N.J.A.C. 7:9C, respectively), which are enforceable standards for various drinking water contaminants (and are chemical-specific ARARs). If any state standard is more stringent than the federal standard, then compliance with the more stringent ARAR is required. As groundwater within Site boundaries is a source of drinking water, achieving the more stringent of the federal MCLs and GWQS in the groundwater is an ARAR.

Alternatives OU1-G1 and OU2-G1 would not achieve drinking water standards for the aquifer. Action-specific ARARs do not apply to these No Action alternatives since no remedial action would be conducted.

Alternatives OU1-G2 and OU1-G3 could meet the RAOs within the active treatment areas over the long term.

Alternatives OU2-G2 and OU2-G3 would meet the RAO for OU2 over the long term, provided that an active remedy for OU1 is effective. OU2-G2 would likely take longer than OU2-G3 to achieve compliance with ARARs within OU2.

Alternatives OU1-G2, OU1-G3, and OU2-G3 would meet action-specific and location-specific ARARs for example, by complying with substantive New Jersey Pollution Discharge Elimination System requirements for discharge of the treatment plant effluent to surface water and/or groundwater, implementing Resource Conservation Recovery Act requirements, and the Clean Water Act requirements. Locating extraction wells and conveyance piping within regulated areas, such as freshwater wetlands, would be avoided to the extent practicable. Alternative construction techniques such as directional drilling vs. open trenching of conveyance piping would be evaluated for greater compliance with location-specific ARARs for Alternative OU2-G3.

Excavation of contaminated soils and solid waste from the North Waste Cell as part of Alternatives OU1-G2 and OU1-G3 would achieve compliance with soil standards. Excavated materials would be disposed of at an off-site permitted facility.

Long-Term Effectiveness and Permanence

Alternatives OU1-G1 and OU2-G1 would not be effective or permanent since there would be no mechanisms to prevent or monitor migration and exposure to contaminated groundwater. Alternatives OU1-G2 and OU1-G3 would provide long-term effectiveness and permanence by hydraulically containing the contaminant mass within the

overburden in the case of OU1-G2 and, in the case of OU1-G3, overburden and bedrock aquifers within OU1 and treating the contaminated groundwater ex-situ. Alternative OU1-G3 would provide more hydraulic control and additionally in the bedrock aquifer compared to OU1-G2. Additionally, ICs and deed restrictions would ensure continued protection of human health receptors in the long-term under both Alternative OU1-G2 and OU1-G3 by providing protection against potential exposures to low-level threat buried landfill materials is maintained.

Eliminating the source material remaining in the North Waste Cell area would help achieve long-term effectiveness and permanence as part of both Alternatives OU1-G2 and OU1-G3.

Alternatives OU2-G2 and OU2-G3 are both contingent on the successful implementation of an active OU1 remedy. Alternative OU2-G2 would rely on the implementation of either OU1-G2 or OU1-G3, for long-term effectiveness. Alternative OU2-G3 will use extraction from OU2 extraction wells and treatment at the OU1 plant to restore the OU2 aquifer to PRGs. The bedrock OU2 extraction wells in alternative OU2-G3 may expedite removal of contaminant mass from OU2. Both OU2 alternatives are expected to improve groundwater quality outside the landfill and bring the site closer to the long-term goal of restoration. The final remedy for OU2 would be later considered based on the effectiveness of the OU1 amended remedy and OU2 selected interim remedy.

Reduction of Toxicity, Mobility, or Volume

Alternatives OU1-G1 and OU2-G1 would not provide any reduction of toxicity, mobility or volume of contaminants since no remedial action would be conducted.

Alternatives OU1-G2 and OU1-G3 would provide reduction of toxicity, mobility, and volume through treatment and removal of contaminants in OU1. Alternative OU1-G3 would be more effective compared to OU1-G2 in reducing toxicity, mobility and volume of contamination in groundwater by hydraulically controlling and treating more contaminated groundwater, from both the overburden and bedrock zones underlying the landfill. Both OU1-G2 and OU1-G3 would reduce the toxicity, mobility, and volume of 1,4-dioxane by addition of treatment elements to the existing GWET system to address this contaminant, which is not currently being treated by the GWET.

The reduction of toxicity, mobility, and volume of source material would be achieved by the removal of the remaining source material from the North Waste Cell area under both Alternative OU1-G2 and OU1-G3.

Alternatives OU2-G2 and OU2-G3 would both see the reduction of contaminant toxicity, mobility, and volume through the successful implementation of an active OU1 remedy which would improve hydraulic control of contamination in the OU1 area and therefore limit migration of contaminants to the OU2 area.

Alternative OU2-G3 would be the most effective in reducing toxicity, mobility and volume of contamination in groundwater through extraction and treatment at the furthest downgradient portions of the OU2 plume.

Short-Term Effectiveness

Alternatives OU1-G1 and OU2-G1 would not have short-term impacts since no action would be implemented.

There would be minimal short-term impacts to the local community and workers for Alternatives OU1-G2 and OU1-G3 due to the fact that associated construction, operation and treatment activities would occur within the OU1 property boundary. In addition, there would be minimal short-term impacts related to the removal of the source material in the North Waste Cell area.

Alternative OU2-G2 could be performed with limited impact to Site workers or the community. Coordination and access would be required for construction of the OU2 extraction wells and pumping in Alternative OU2-G3.

For Alternatives OU1-G2, OU1-G3, and OU2-G3, Site workers would undergo required training and would wear appropriate personal protective equipment to minimize exposure to contamination and as a protection from physical hazards. Best construction practices to control dust, noise and vibration related to construction would be used. These precautions would provide effective protection to the Site workers and the community from the impacts related to construction.

Implementability

All groundwater alternatives developed for OU1 and

OU2 are implementable. Alternatives OU1-G1 and OU2-G1 would be the easiest to implement as no work would be performed.

For OU1, Alternatives OU1-G2 and OU1-G3 would be similarly implementable. Services, materials and experienced vendors are readily available. During remedial design site-specific design parameters for Alternatives OU1-G2 and OU1-G3 and substantive requirements of otherwise required state and local permits would be met for on-site work. The North Waste Cell source area removal is implementable by using standard practices for excavating waste material.

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.

For OU1, ICs, requiring the establishment of a deed restriction, the performance of five-year reviews and continued monitoring and maintenance, are easily implementable.

For OU2 groundwater, Alternative OU2-G2 would be technically and administratively easier to implement than Alternative OU2-G3 as it only includes sampling, while OU2-G3 involves construction of extraction wells and extensive piping from the OU2 area back to the OU1 plant. While implementable, this work would be more difficult to implement compared to OU2-G2.

For OU2-G3, it is possible that groundwater extraction from these proposed locations would have a negative hydraulic impact (i.e. dewater) on the nearby streams and wetlands. Since these water bodies are headwaters to trout streams, it is likely that this alternative would include returning the treated water to those streams to mitigate any hydraulic disturbances. This would involve constructing two miles of conveyance lines. Getting the hydraulic balance right would be challenging and would require significant modeling in the design phase.

Cost

A summary of the cost estimates for each alternative is presented in Appendix A of the FS. In summary, alternatives OU1-G1 and OU2-G1 are No Action alternatives and have no cost. For OU1, alternative OU1-G2 is approximately $1,000,000 less than Alternative OU1-G3 with total present values estimated at $20,936,217 and $21,933,592, respectively. The added costs for Alternative OU1-G3 are a result of the drilling (capital cost) and operation (O&M cost) of the bedrock extraction wells.

For OU2, Alternative OU2-G2 is substantially less expensive than Alternative OU2-G3 with a total present value of $781,100 (OU2-G2) compared to $10,784,639 (OU2-G3). The major costs associated with Alternative OU2-G3 are from the extraction well installation and the groundwater conveyance lines to and from the GWET system. It is assumed that groundwater extraction from these proposed locations will have a negative hydraulic impact (i.e. dewater) on the nearby streams and tributaries. Since these water bodies are headwaters to trout streams, it is assumed that this remedy would have to include returning the treated water to those streams to mitigate any hydraulic disturbances. The water conveyance line is approximately two miles long and direct discharge to surface water for Alternative OU2-G3 represents a significant cost.

State Acceptance

NJDEP defers concurrence on the proposed alternative until the remedial design is completed, specifically for the treatment of 1,4-dioxane and the characterization of the North Waste Cell source area.

Community Acceptance

Community acceptance of the preferred alternative will be assessed in the ROD following review of the public comments received during the public comment period.

PREFERRED ALTERNATIVES

EPA is identifying Alternatives OU1-G3 and OU2-G2 as the preferred alternatives because they satisfy the two threshold criteria (protection of human health and the environment and compliance with ARARs) and provide the best balance of tradeoffs among the other alternatives with respect to the five balancing criteria (short-term effectiveness; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; implementability; and cost). The major components of the preferred alternatives are as follows:

OU1-G3

- Upgrading the existing groundwater conveyance

system to handle an increased volume of contaminated groundwater;
- Installation of bedrock extraction wells near the OU1/OU2 border to increase hydraulic control of contaminated groundwater in OU1;
- Upgrading the OU1 GWET treatment system to include treatment for 1,4-dioxane;
- Excavation and off-site disposal of source material in the North Waste Cell area; and,
- LTM/ICs

OU2-G2
- LTM/ICs

These two preferred alternatives work well together, are protective of human health and the environment, and meet the RAOs established for the CFS Site.

BASIS FOR THE REMEDY PREFERENCE

Under the OU1-G3 Alternative, the GWET system would be expanded and improved. Currently, the GWET operates at a rate of about 45 to 70 gpm. It is limited in the volume of groundwater that can be extracted due to poor extraction well performance and limitations in the diameter of extraction well conveyance piping. This requires the extraction wells to be run intermittently instead of continuously. The current system also extracts mostly shallow groundwater. Increasing the size of the conveyance piping will enable the system to operate at approximately 200 gpm. This increase in extraction rate allowing for continuous operation, along with the addition of much deeper bedrock extraction wells will significantly improve containment and hydraulic control of the OU1 contaminated groundwater.

ICs (in the form of a CEA and deed restrictions) and LTM will ensure that human health and the environment are protected during the operation of the GWET system by preventing inadvertent installation of wells other than for monitoring and by observing the effects the enhanced GWET has on groundwater contaminant concentrations over time.

Alternative OU1-G3 would be reliable in achieving the OU1 RAOs, since additional extraction wells will be installed to pump and treat the deep aquifer and the increased extraction rate will increase containment and treatment of overburden groundwater.

In addition, the source material in the North Waste Cell area will be excavated and disposed of off-site. Removal of this source material, which is principal threat waste, will assist in the remediation of groundwater.

Alternative OU2-G2 is an interim remedy. A final groundwater remedy for OU2 will be selected at a later time, based on the results of the implementation of the amended OU1 remedy and the interim OU2 remedy. It is expected that the more aggressive pumping as part of the OU1 ROD amendment will take place near the OU1/OU2 border. This pumping is expected to have a significant impact on groundwater in OU2, and its effects will be monitored through LTM throughout the OU2 area as the primary element of the OU2 preferred alternative.

EPA expects to select a final remedy for OU2 based on groundwater and surface water data from the implementation of the final remedies selected for OU1 and OU2 after input from the public and to be documented in a Record of Decision. A final remedy will identify and address the long-term OU2 RAOs and PRGs. In addition, impacts of the selected ROD amendment for OU1 and interim remedy for OU2 will be evaluated over time to measure impacts on very deep groundwater quality (deeper than the estimated range of 350 feet bgs to be addressed in the OU1 ROD amendment).

The total estimated, present-worth cost for the preferred alternative to amend the OU1 ROD, OU1-G3, is $21,933,592. The estimated present-worth cost for the preferred alternative for the OU2 interim remedy is $781,100. Details of the cost estimates for all alternatives are presented in the FS Report. This is an engineering cost estimate that is expected to be within the range of plus 50 percent to minus 30 percent of the actual project cost.

Consideration will be given during the remedial design, to technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy. This would include green remediation technologies and practices.

Because the preferred alternative to amend the OU1 ROD would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA five-year reviews will be required.

Based upon the information available, EPA believes the preferred alternatives meet the threshold criteria (protection of human health and the environment and compliance with ARARs) and provide the best

balance of tradeoffs among the other alternatives with respect to the balancing criteria. The preferred alternatives satisfy the following statutory requirements of Section 121(b) of CERCLA: 1) the proposed OU1 ROD amendment and OU2 interim remedy are protective of human health and the environment; 2) the preferred alternatives comply with ARARs; 3) the preferred alternatives are cost effective; 4) the preferred alternatives utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and, 5) the OU1 remedy satisfies the preference for treatment. For OU2 the preference for treatment will be addressed in the final ROD.

Long-term monitoring would be performed to assure the protectiveness of both the OU1 and OU2 remedies. With respect to the two modifying criteria of the comparative analysis (state acceptance and community acceptance), the state is reviewing the remedy and community acceptance will be evaluated upon the close of the public comment period.

COMMUNITY PARTICIPATION

EPA and NJDEP provided information regarding the cleanup of the Combe Fill South Landfill Superfund Site to the public through meetings, the administrative record file for the Site, and announcements published in the Daily Record. EPA and NJDEP encourage the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted. The dates for the public comment period, the date, location and time of the public meeting, and the locations of the administrative record file, are provided on the front page of this Proposed Plan.

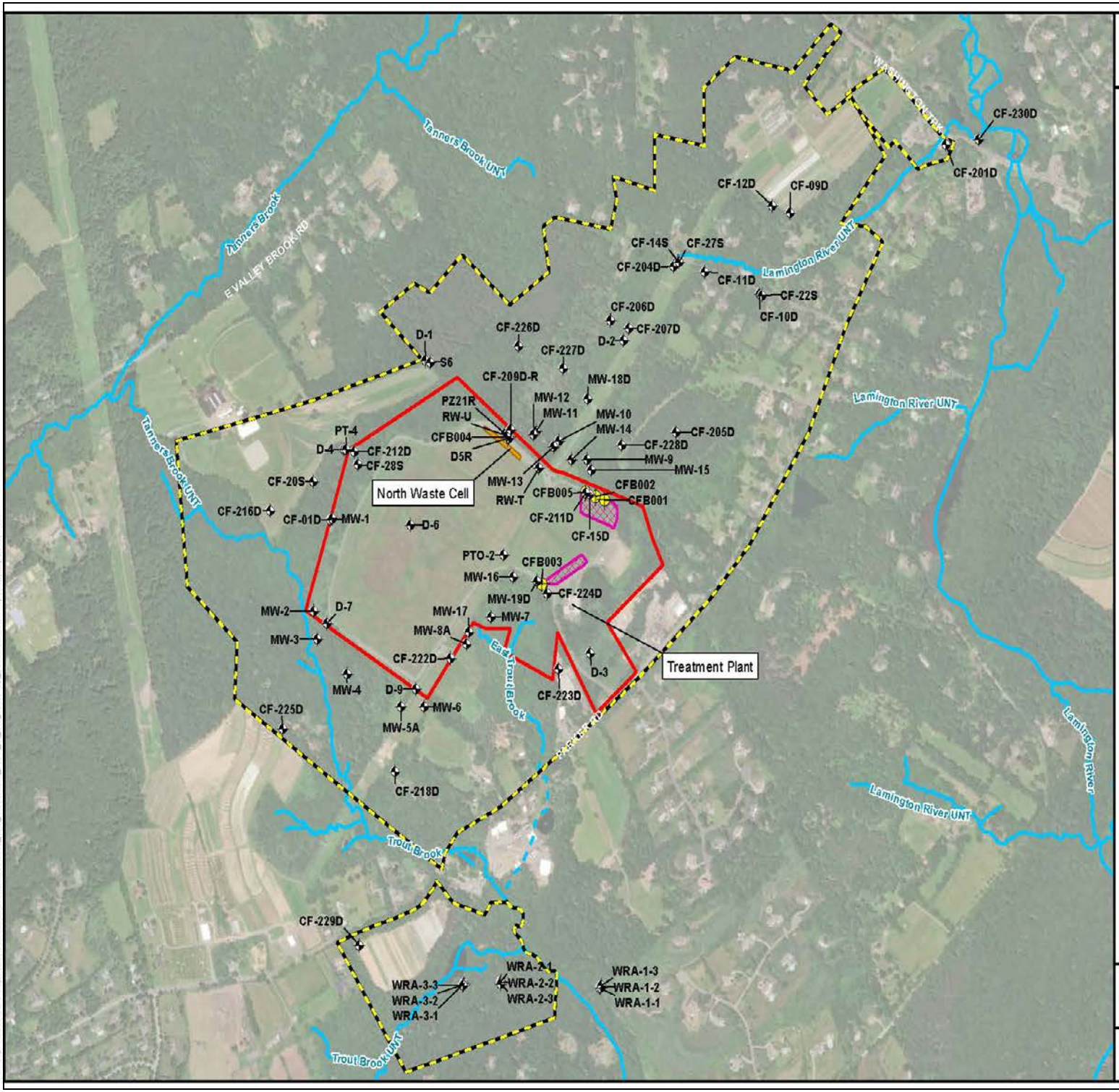
FOR FURTHER INFORMATION

The administrative record file, which contains copies of the Proposed Plan and supporting documentation, is available at the following locations:

Chester Library
250 West Main Street
Chester, NJ 07930
(908) 879 - 7612
Summer Hours: Monday - Thursday 9:00 a.m. - 9:00 p.m., Friday 9:00 a.m.- 5:00 p.m., Saturday 9:00 a.m. - 1:00 p.m. Sunday CLOSED

EPA Region 2 Superfund Records Center
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308
Hours: Mon – Fri, 9:00 AM-5:00 PM

In addition, select documents from the administrative record are available on-line at: https://www.epa.gov/superfund/combe-fill-south



Combe Fill South Landfill Superfund Site Proposed Plan

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane New Jersey FIPS 2900 Feet
Projection: Transverse Mercator
Datum: North American 1983
Units: Foot US

Legend

- OU1 Landfill Property Boundary
- OU2 Investigation Area
- Monitoring Well
- 2014 Soil Boring (identified as CFB00#)
- North Waste Cell Excavation
- 2011 Buried Drum Delineation Report Geophysical Investigation Areas (Delta Geophysics)
- Surface Water

N

0 400 800 Feet

Operable Units and Site Features

Figure 1
July, 2018

Attachment B
Public Notice

ENVIRONMENTAL PROTECTON AGENCY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE COMBE FILL SOUTH SUPERFUND SITE CHESTER TOWNSHIP MORRIS COUNTY, NEW JERSEY

The U.S. Environmental Protection Agency (EPA) announces the opening of a 30-day comment period on the preferred plan to address groundwater contamination at the Combe Fill South Landfill Superfund Site located in Chester Township, NJ. The preferred remedies and other alternatives are identified in the Proposed Plan.

The comment period begins on **August 12, 2018** and ends on **September 11, 2018**. As part of the public comment period, EPA will hold a public meeting on **August 22, 2018** at 7 p.m. at the Chester Town Hall located at 1 Parker Road, Chester, NJ. EPA's proposal includes expanding and enhancing the existing groundwater treatment system that is currently operating at the site in addition to excavating and removing a small area of soil and solid waste materials, which are a contributing source of contamination. The proposed approach also includes long-term monitoring as an interim step to address deep groundwater contamination outside of the landfill area.

The Proposed Plan is available electronically at the following address:

https://www.epa.gov/superfund/combe-fill-south

Written comments on the Proposed Plan, postmarked no later than close of business on September 11, 2018 may be emailed to **baxter.pamela@epa.gov** or mailed to Ms. Pamela J. Baxter, Ph.D., CHMM, US EPA, 290 Broadway, 19th Floor, New York, NY 10007-1866.

The Administrative Record files are available for public review at the following information repositories:

Chester Public Library, 250 West Main St., Chester, NJ or at the USEPA-Region 2 Superfund Records Center, 290 Broadway, 19th Floor, New York, NY 10007-1866.

For more information, please contact Pat Seppi, EPA's Community Liaison, at 646.369.0068 or **seppi.pat@epa.gov**

AP-GCI0060351-01

Attachment C
Public Meeting Transcript

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 2

- -X

COMBE FILL SOUTH SUPERFUND SITE

PUBLIC MEETING

- -X

Chester Township Municipal Building
1 Parker Road
Chester, New Jersey 07930

August 22, 2018
7:00 p.m.

P R E S E N T:

PAT SEPPI,
EPA Community Involvement Coordinator

PAMELA BAXTER,
EPA, Project Manager of Combe Fill South

CHLOE METZ,
EPA, Remedy Selection Manager

PATRICIA PARVIS,
HDR, Project Manager

MAYBLE SAWYER,
HDR, Human Health & Ecological Risk Assessor

MAYOR ASDAL: Good evening, everyone. Thank you so much for coming.

For those of you who don't know me, my name is Marcia Asdal. I'm the mayor of Chester Township and I'd like to introduce our councilman who I see here, Mike Inganamort, for those of you who don't know him.

Thank you all for coming to talk about this very important topic. We are fortunate in town to have an active environmental commission who is -- and the members are highly skilled environmental engineers, a couple of them, and right now tonight, we have our chair of the environmental commission, Andy Judd.

For those of you who read my newsletter, you might have read his little blurb, courtesy right from his very scientific mind, so I've asked him to say a couple of words of introduction and then he will introduce our guests tonight. But, again, thank you for coming.

And Andy.

MR. JUDD: Great. Mayor Asdal.

Again, I'm Andy Judd. I am a resident of Chester and a volunteer and in the form of the committee chair for the Chester Township Environmental Commission and I've heard you never pass up the opportunity of a captive audience, so I'll start with a very quick public service announcement about the Chester Township Environmental Commission or CTEC. As our EPA friends will tell us, all the cool agencies have acronyms, so I like to go by CTEC. But there is an environmental commission in town.

Overall, we're looking to represent the residents and their long-term interests as local environmental advocates; a lot of words that kind of said we do a little bit of everything, sort of whatever floats our way related to the town and the environment on kind of long-term planning.

We touch on activities, everything from sites like the Combe Landfill that we'll hear about tonight, environmental cleanup sites.

We also touch on open space

preservation, residential water testing, educating the community on various topics and even the community garden is under the auspices of the environmental commission.

We do have a web page on the council page that you can go to under the council and commission linked to us and we have meetings here in the upstairs room on the second Tuesday -- excuse me, the second Monday of every month.

And with that, we're here tonight. It's great to see some of the people coming out with interests to learn about the Combe Landfill. You know, it's important to not just the immediate residents down the street from the landfill or maybe a little more distant residents but to the whole town because having a Superfund site in town affects the town in general. So it's great that people are interested and coming out to find out more.

I know -- I don't want to steal too much of their intro, but EPA and the state have been working on the site for many years, working on a cleanup through

many phases of work. It's not an instant process. It takes time to study and evaluate and figure out what to do and then go ahead and do it. And tonight, we'll be getting an update from the EPA on what the status is and what their most recent plans for the next phase of work are.

I know that the process of EPA and the Superfund process does account for community involvement, so they look to get feedback from the community, the residents, estate holders, businesses in town that have interests in the site and how it's run and how it's managed. So they do actively solicit our input as a community, so I hope we will listen to what they have to say tonight, be thoughtful and give some feedback in the weeks to come. And along those lines, we have to understand what's going on to be able to give a good opinion or a thought, so I encourage you to listen, ask questions, understand the process, understand the site and find out more this evening.

So with that, I'll turn it over to EPA. And Ms. Pat Seppi is the EPA's Community Involvement Coordinator and I think you'll kick us off, Pat.

MS. SEPPI: Thank you. Thank you very much, Andy, and thank you, Mayor, for allowing us the use of this room tonight for our meeting. We really do appreciate that. And I have nothing to say because, obviously, you just said it all, so -- no, thank you very much. We appreciate that.

So in just a couple of minutes when Pam is up, she will introduce the people who are here, you know, either EPA or contractors or whoever is involved with the site and they can explain how they are involved.

But the reason we're here tonight, and as Andy so nicely said, is to seek your comments. We put out a proposed plan for some work that we want to do at the site. However, it's EPA's preferred remedy. So what we're doing is having a comment period, it's thirty days; it started when we released the plan. It will end on

September 11th close of business. So all the comments that you may hear tonight will be part of what's called a responsiveness summary. We have to respond to all the comments. Now, and that's why you'll notice we have a stenographer here this evening. When we have one of these more formal meetings for a proposed plan, we have everything transcribed and then it is sent to us and we use it for this responsiveness summary.

Now, just if you're not here tonight or you leave -- well, if you're not here, you don't know that you're not here. Sorry. But if -- when you leave tonight, if you should have additional comments, you can certainly get in touch with Pam either through email, you know, or snail mail, whatever is easier for you, and still give some of your comments later. So, you know, we don't want you to think this is your only chance tonight to give us comments.

So there are a few copies, and I don't know if they're gone yet, but I know there are a few copies of the proposed plan

in the back where the sign-in sheet is and we would truly appreciate it if you would sign in. And the proposed plan, if you may have already seen it, is also available online on the EPA web page for the Combe Fill South Landfill site and, you know, I can give you that link. But, honestly, what I tell people, the easiest thing to do is Google Combe Fill South Landfill Superfund site and it will take you right to it, to our web page.

So I'm just going to ask a couple things. Again, if you wouldn't mind signing in, I would appreciate it. And when it comes time for your comments, I'm going to ask you to please come up to the front because we don't have a microphone and we want to make sure that Susan, our stenographer, hears what you have to say. And if you would just give your name before you give your comment or your questions, that would be greatly appreciated.

And one other thing and I know sometimes it's difficult. If you could hold your questions until the end of the

presentation, we would appreciate that, too. I know sometimes, you know, you're dying to raise your hand and ask that question, but we find that a lot of times, maybe your question will be answered as the presentation is ongoing.

So I think that -- you know, Pam is going to go into a lot more information about what the proposed plan says and what EPA's remedy is, but in the meantime, Pam, do you want to introduce right now some of the people?

MS. BAXTER: Yes.

MS. SEPPI: Yourself first.

MS. BAXTER: Okay. Are you done?

MS. SEPPI: Yeah, I'm done.

MS. BAXTER: Okay. Hello, everyone. Good evening. There's seats here if you would like to have a seat. Okay.

I'm Pam Baxter. I'm the project manager for Combe Fill South and Andy mentioned Combe, but I just wanted to let you know that there's Combe Fill North, that most of the project managed is located

in Mt. Olive Township.

I've been the project manager for the last 21 years, so I started when I was a kid. But anyway, I'm really happy that you guys are here and want to introduce our team. Our contractor is HDR, so we have Patty Parvis who's the program manager?

MS. PARVIS: Project manager.

MS. BAXTER: Project manager. We have Mayble Sawyer.

MS. SAWYER: Yeah, I just got married, so I'm Mayble Sawyer. I'm a risk assessor for HDR.

MS. BAXTER: We have Erich Zimmerman.

MR. ZIMMERMAN: I'm the remediation engineer working on the project.

MS. BAXTER: Stan.

MR. PAUWELS: I'm Stan Pauwels with HDR. I'm the ecological risk assessor.

MS. BAXTER: Colin.

MR. MILLS: My name is Colin Mills. I'm the geologist and data manager

with HDR.

MS. BAXTER: Andrew?

MR. WATSON: My name is Andrew Watson. I'm the environmental engineer for HDR.

MS. BAXTER: Right. So all of these folks have done great work for the EPA. And we also have here representing the state is Mark Herzberg.

MR. HERZBERG: I'm Mark Herzberg, DEP community relations.

MS. SEPPI: And Chloe.

MS. BAXTER: I can't forget Chloe.

MS. SEPPI: You can't forget Chloe.

MS. BAXTER: I'm sorry, Chloe is EPA.

MS. METZ: I'm with EPA. I'm what's called the remedy selection manager, so I'm involved with the site on a daily basis.

MS. BAXTER: All right. Is that everybody? Okay. Okay.

So can we go to the next slide? Okay. So the purpose of this meeting is to

talk about our preferred remedies. So we -- and we'll go into more details later, but I just want to start off by saying that the site is divided into two operable units.

So OU1 would be a ROD amendment because we do have a ROD that was issued back in 1986, and so this amendment, it upgrades and expands the existing groundwater treatment plant that's currently located at 98 Parker Road. It expands the conveyances of the treatment system and it includes long-term monitoring and institutional controls and also includes removing the remainder of a North Waste Cell which is like a source contributing to the groundwater contamination.

And operable unit two is what we consider an interim remedy and it's basically implementing long-term monitoring and institutional controls.

So once we present this to the public and we receive your comments, then we memorialize everything in what we call a

Record of Decision which is the agency's decision document and it talks about the -- all -- everything that we've done, more so than what the proposal plan we issued, and then it talks about our final remedy.

Okay. So according to that, I just want to explain to you this whole process because it's a whole cycle.

So once we get a site, you know, we start with the preliminary assessment, do the site inspection once we get notification that something is going on. Then if it meets -- we have what we call hazards ranking. If it's scored and if it's over I believe the number is --

MS. METZ: 28.

MS. BAXTER: -- 28, then it's placed on the National Priorities List. Then that's when we start doing remedial investigation and feasibility studies which is what this phase is where we've done a lot of extensive work. And then, actually, now we're into a proposed plan, and once we get all the -- all the comments and concurrence or acceptance, then we

memorialize that into a Record of Decision. And then after that's issued, then we start work on the design where we do a little bit more investigation and we actually start developing the specs for the remedy. And then after that's done, we go into a remedial action which is construction of the remedy. And once that's all done, we have construction complete and operating whatever remedy we have chosen; and after all that's done, we hopefully can delete it from the NPL and then maybe reuse the site, if possible. And, of course, I just want to emphasize community involvement as Andrew mentioned; that we want to make sure that the community is involved and understands what we are doing.

Okay. Just a little bit of history. So Combe Fill South is located in Chester and Washington Township. It is an inactive municipal landfill and it's located at 98 Parker Road. So this landfill -- I'll get to the history, but it's an inactive landfill and consists of three separate parcels. It covers about --

the landfill covers about 65 acres of the entire 150-acre parcel and it was listed on the Superfund site or National Priorities List back in September of 1983.

Okay. So for what we're doing, the scope of work, what we're doing, we have divided the site into two operable units. So OU1 is the landfill property and groundwater directly underlying the landfill. So this OU1 is what we call the state lead site, so New Jersey Department of Environmental Protection is the one that had implemented the ROD back in 1986, so they built the treatment plant and they did the landfill and they currently are doing operation and maintenance on the landfill.

So operable unit two is what we have been studying and that consists of groundwater, both overburden and bedrock, surface water sediment and downgrading of the landfill property, so we will get into that detail a little bit later.

So here's the site layout. Just to get your bearings, this is Parker Road right here, so this is like 98 Parker Road,

so I think we should be -- this town hall should be somewhere here.

MS. PARVIS: You're close.

MS. BAXTER: Around here. So OU1, this is the landfill here. Well, this is the landfill property, but the landfill is what you can see here. We have the groundwater treatment plant here and, I'm sorry, I should be --

MS. PARVIS: It's okay. Your fingers work just as good.

MS. BAXTER: Okay. And we have -- and so our study with the deep aquifer was all this dotted line here, so we did a lot of studying here and, again, we'll go into that a little bit later.

So, again, so this is OU1 with the landfill here and then OU2 we studied outside the landfill area. Okay.

So a little bit of history. You know, it started in the 1940s. It was, you know, a municipal solid waste landfill and then back in 1982, Chester Hill Company, they took over ownership. They were approved to accept municipal nonhazardous

industrial waste, sewage, septic tank waste stuff, and then back in 1978, the Combe Fill Corporation took over ownership and operation. And then from 1973 to 1981, they were cited with a number of violations, including initial layer of residual soil in the bedrock priority waste placement and then the company Combe Fill Corporation was ordered to discontinue waste disposal operation. So they stopped doing that and then they filed for bankruptcy and was liquidated.

So, yeah. So a lot of stuff that they accepted at the landfill was, you know, paint cans and all kinds of toxic materials, so this is where their violation -- this is why they were penalized for all the stuff they were accepting and they weren't properly maintaining the landfill.

So after that study, a ROD, the original ROD was issued back in 1986 and it addressed the remediation of the landfill and the overburden groundwater by it, including an alternate water supply for the

residents, capping the landfill, putting in an active collection treatment system and pumping or installing this treatment plant.

So I just want to say for the first one, alternate water supply, it was originally slated for -- it was very extensive. It was going to include about over 300 homes, so then it went to design and they did the sampling. It was decided that the contamination wasn't -- it wasn't necessary to put in an extensive waterline, so it wasn't done during OU1 construction activities. And, also, I wanted to mention that this active collection treatment system, they actually put in a passive collection treatment system, so back in 2006, that water information had differences -- there was a significant difference to make that correction. So these are the two changes based on a ROD.

Next slide. And then also it included surface water controls, security fencing, appropriate monitoring which they do, and doing this supplemental feasibility

study to evaluate for cleaning up the deep aquifer which is what we're doing. This is what OU2 is doing.

Next slide. So during operation and maintenance, the State of New Jersey, they found an area that was just outside of the capped landfill back in 2001 and so this area contained mostly pharmaceutical waste and it turns out that it was a significant contributor to the groundwater which contained 1, 4-Dioxane. So a lot of this detail is in the proposed plan, but at the time, 1, 4-Dioxane wasn't something that you could really detect when you did the analysis. I think it was like somewhere between like 2008, 2009 is when the methodology had changed and that's when you were able to detect 1, 4-Dioxane, so a lot of our sites, even if they were deleted, had to go back and handle this 1, 4-Dioxane one way or the other.

And then so they excavated the waste and disposed of it back in 2006, and so currently, there's still a portion of this waste that's underneath the landfill

cap or really underneath the road that goes around the landfill, so that still remains.

So this is the North Waste Cell area. Again, this is Parker Road, so when you go in, like, the treatment plant is over here and if you go around the landfill, so this is the cap area here and this is where the -- this is the North Waste Cell area was discovered.

Okay. So a little bit of enforcement. We had initial enforcement back in '05 where we settled with some of the PRPs, potentially responsible parties, and they initially paid EPA and the state about $12 and a half million in costs. And then back in '09, we had a second settlement against over about 300 private parties, municipalities and which paid EPA $69 million in past costs and then paid the national resource damages of $3.2 million and then paid New Jersey $27 million in an annuity which means they get $900,000 a year to operate the landfill and the plant and for any future work.

So that was a very interesting

process. That whole enforcement thing took about 11 years of trying to gather all these parties and getting them to bring us stuff, so -- but in the end, you know, EPA was awarded this amount of money.

So, also, a little bit more recently, which some of you might remember, we did the waterline project. So now this is significantly smaller than what was initially envisioned back in the 1986 ROD. So the purpose was to protect residents that were potentially threatened by contaminant groundwater from the landfill. So with this project, we did initial work back in 2011 where we did this comprehensive water sampling in peoples' homes and then we started the actual construction back in 2013 and it took us about two years to finish and so we were able to connect about 73 homes or businesses and the connection was along Parker Road, Schoolhouse Lane and a small portion of Route 513. So the work was completed in 2015 and the cost was about $9 million, so that's all done. Done. Okay.

So now I'm going to turn it over to HDR and they're going to talk about the study that they did with OU2.

MS. PARVIS: So some of you have probably seen us out in the field from about 2011 till 2015 and these are some of the things we were doing. So we were studying the groundwater and the bedrock aquifer which is where most of the public's potable wells are screened for the residences. We also studied surface water. There's several tributaries very close to the landfill. Actually, the headwaters are there. There's the tributary to the Black River along Schoolhouse Lane, there's Trout Brook and then there's also Tanners Brook and then we also collected samples from the same tributaries and we also evaluated background surface water and sediment which means surface water and sediment in areas outside of the influence of the landfill so we can make a comparison. Busy slide, I know.

So this is what we found. After all of the studying, we found eight

groundwater contaminants exceeding New Jersey's groundwater quality standards; 1, 4-Dioxane, which we'll talk about more in detail; benzene, which you find in gasoline; trichloroethylene which is your old school dry cleaning fluid, they don't use it very often anymore; DEHP which is found in a lot of plastics; alpha-BHC, which is a pesticide; arsenic, lead and chromium. Those are all metals. Arsenic is in a lot of historic pesticides. And we found the groundwater contaminates in both what we're calling the overburden and bedrock aquifers.

So the overburden aquifer is the water below the ground that is in contact with the air. So, essentially, there's nothing covering it so it has free exchange with the air.

The bedrock aquifer is the water that's within the bedrock underneath the unconsolidated material. That's where most of the wells are screened but not all. We also found bedrock particularly challenging because if you can imagine, if you shatter

a window, you can't predict all the cracks that will form and bedrock is very similar to that and you just have millions and millions of fractures in rock and the water goes in all those different directions, so it really is the hardest aquifer to study would be a bedrock aquifer. But we were able to find, and I don't know if any of you remember, but we ran three miles of electric cable through the neighborhood to do this study. But we were able to find three preferential fracture zones where most of the contamination was leaving the landfill and flowing through. We did this with a geophysical survey technique. We also found that some of the groundwater goes from the bedrock and overburden aquifers into the local streams and tributaries.

Several of the groundwater contaminants were also found in surface water, although as it turns out, it was not a problem, and we'll get into that later. We have -- the contaminants we found in the sediment were what you typically find along

roadsides in New Jersey, so we don't believe the sediment contamination is related to the landfill. And EPA also did a study of indoor air along Schoolhouse Lane quite a few years ago and found out that there were no indoor air contaminants related to the landfill.

This may be a little hard to see, but -- so we would be -- this is Parker Road. So we're somewhere over here. Actually, yeah, we're right here. So what this tries to explain, and you probably saw this in like high school earth science books, this kind of explains what's going on above and below the site. So this is the landfill here and we've kind of split it in half so you can see what's going on below the surface. These are those three zones where you've got a lot of contamination flowing from the landfill towards Schoolhouse Lane. The waste that's buried directly within the landfill that sits right on the bedrock, that waste goes directly down. It also goes a little bit horizontal, but predominantly downwards.

It goes into the bedrock here which is all fractured and it kind of goes in all directions from the landfill except one to the northwest here. And then when it gets close to the streams. Like, this is the stream along Schoolhouse Lane. It's -- a portion of the groundwater starts going back up into the streams. And then within this visual, this is where you -- this is where we describe the potential points where you would come into contact with something.

So before the waterline, you could ingest the water by drinking water out of your tap. If you were showering and you had a well, your body would come in contact with the water. If anybody fishes, and I don't believe anybody fishes in these little tributaries, but if you caught, you know, fish and ate it, obviously, birds and other animals would eat fish and so forth and so on; ingestion of surface water by animals and ingestion of surface water and sediment by other wildlife.

We'll go to the next slide.

So this is showing the extent and the magnitude of the 1, 4-Dioxane contamination in groundwater. So 1, 4-Dioxane, like Pam said, not until very recently, within the last 10 years or so, this was a contaminant that wasn't typically detected. So when this project started in 1983, the laboratories, just like everything else, imagine your phone at home, how primitive your phone was in 1983 versus what your iPhone is now. Same way with laboratory equipment. They could detect very little back in 1983, so we just kind of had broad groups of chemicals and not very detailed resolution on the concentrations.

So now thirty-something years later, 1, 4-Dioxane is kind of a new emerging contaminant because we didn't really know about it back then, and the laboratories have evolved so that they can detect much lower concentrations. The current standard in New Jersey for 1, 4-Dioxane is 0.4 parts per billion. That's forty cents in a billion dollars to

give you a perspective of its toxicity.

So this the landfill here. This inner line is the extent of groundwater with 1, 4-Dioxane above a hundred parts per billion. So it's a hundred dollars in a billion dollars. And then this line here is the extent of 1, 4-Dioxane in groundwater at ten parts per billion; $10 in a billion dollars. And then as you get out here, this is your fifty cents in a billion of 1, 4-Dioxane. So you can see as it spreads out, it tends to dilute over time. It's also something that's very hard to fully investigate because it's very common in consumer products. So you will have 1, 4-Dioxane in a lot of products in your home, so if you -- if an area isn't connected to a municipal source system, you're going to find this in your septic systems. So that's why the further you move out from a source like this, the harder it is to figure out where it's coming from.

And this is just kind of a close-up of the -- it's the magnetometric

resistivity survey is the type of survey we did to locate these deep fractures. But this is -- this is the North Waste Cell, the north -- northern/northwest corner of the landfill, this is Schoolhouse Lane. And after running our three miles of cable. And putting electrodes in wells, we were able to trace this, you know, from deep in the earth on the ground surface and these were the pathways that we found from the landfill that headed right towards the residential wells on Schoolhouse Lane.

And I will turn it over to Mayble.

MS. SAWYER: Hi, everyone. My name is Mayble. So for the remedial investigation, we performed two risk assessments.

The first one was to evaluate the potential exposure to the contamination for humans just like you and me. The second risk assessment that we performed was to evaluate the exposure to wildlife. The risk assessments we conducted are important tools to understand the risks, the health risks associated with the contamination.

They are also important tools to help decide what kind of remedy we're going to need to address the contamination.

So as you can see on the slide, there are four steps for the human health risk assessment process. The first step is hazard identification. It answers the question what are the sources of contamination. In this case, the source of contamination is the landfill, and the materials in the landfill have leached out into the groundwater, and so the next step in the process is exposure assessment. It answers the question how many -- how much of the contamination are people being exposed to and for how long.

So for the exposure assessment, we evaluated two scenarios. The first scenario is we evaluated a resident's exposure to the groundwater, so that means if you are using your tap water, you know, if you're drinking the tap water or if you're washing your hands in the sink, doing the dishes or if you're taking a shower.

The second scenario is evaluating the recreator to surface water as they go around in the creeks and the surface water bodies in the area, so like someone hiking around Black River or Trout Brook, like that.

So the third step in the process is toxicity assessment. Basically, in this test, we take a look online, we look for values that kind of tell us what kind of toxicity these chemicals will have on the body, and we look at scientific literature experiments that have been conducted.

And, finally, the fourth step in the risk assessment process is risk characterization. This step answers the question what is the extra risk of the health problems that you could potentially get from being exposed to the contamination. So, in other words, it combines the information from step two, exposure, with the information from step three, the toxicity assessment, and it gives you a final -- like, basically a number, a risk, a cancer risk that you can

then compare to standards that EPA has put forth. And I will go into that in the next slide.

So, our risk assessment evaluated exposure to the contamination from the landfill for residents and -- to residents and to recreators. We concluded that for residential exposure to groundwater, there -- the cancer risk exceeded EPA's target risk range. The target risk range is one times ten to negative four which means that it's -- the probability of getting cancer is one in 10,000 people to one times ten to negative six which means the probability of getting cancer is one in a million. So our risk assessment concluded that we have risks higher than that risk range. We have a risk of seven times ten to negative three, so that's seven in a thousand people getting -- potentially getting cancer.

On the noncancer side, we were looking more at the effects of the contamination to, like, our heart, our lungs, our nervous system. We determined

that we have a noncancer hazard of 13 for an adult and 15 for a child, which the acceptable limit is one, so you can see it's a little bit above one. We also evaluated --

UNIDENTIFIED WOMAN: Can I ask a quick question? When you use the word "residents", what's the proximity to the landfill that constitutes safety in terms of exposure with regards to the actual --

MS. METZ: Just to clarify, this is all kind of a hypothetical scenario if someone were living adjacent to the landfill and the contaminated groundwater got in their well and they drank it and bathed in it and that kind of thing. Since the waterline went in -- when was that?

MS. BAXTER: 2015.

MS. METZ: In 2015, there are no current exposures in this community. It's just a hypothetical, say someone were to put in a well somewhere close to the landfill. So it's just a hypothetical resident who might use groundwater in a way that they could be exposed to this

contaminant.

UNIDENTIFIED WOMAN: So this is the rivers and stuff they're walking through and all that?

MS. BAXTER: Okay. We're going to have a question and answer session afterwards.

UNIDENTIFIED WOMAN: Sorry. That just scares me.

MS. METZ: No one is drinking the water at the level that she's talking about, so --

UNIDENTIFIED WOMAN: Okay. So we're talking about hypotheticals.

MS. BAXTER: We have to record all the questions, so at the end, we'll ask people to come up and give your name and the question and then we'll respond to it. So if you could just wait a little bit and we're more than happy to answer your questions.

MS. SAWYER: So, yes, these look like scary numbers, but because of the water coming in, exposure to actually drinking this water, we are just -- we did

this hypothetical scenario to be conservative to make sure we're covering our bases as far as EPA's protocol.

So for the lead evaluation, what we did is we looked at the potential -- what could potentially be the blood lead levels in children if their mothers were exposed to the lead in the groundwater, say.

So we used an EPA model and we determined that for children ages one to six years old, 68 percent of the population would be expected to have a blood lead level of five micrograms per deciliter. The five milligrams per deciliter is EPA's -- basically the level for base exposure. Above that level, you might consider having -- you might see, like, average health effects from exposure to the lead.

So as a result of the resident analysis, the hypothetical resident analysis, we determined that the risk drivers causing this increased excess cancer risk is contributed by these

chemicals both shown here on the slide. They're the same chemicals that Patty mentioned earlier.

And we also evaluated as a risk assessment the scenario of a recreational user. Based on our analysis, there -- the cancer risks were within the acceptable target risk range and they were -- their hazards and noncancer hazards were less than one, which means, basically, there isn't an issue for a recreator walking around in the surface water or sediment in the streams.

So to conclude for the human health risk assessment, we determined that if people are -- would be exposed to the groundwater, it is necessary that a remedy needs to be done to protect our public health.

So for the screening level ecological risk assessment, as you can see, it basically follows the same four steps. You're looking at identifying what is the source of contamination, what is the exposure and the toxicity to the

contamination and putting it all together to determine what the hazards are. So it follows the same overall methodology as the human health risk assessment but it's geared toward wildlife, like small mammals and birds.

So the ecological risk assessment that we performed evaluated potential hazards to acquired species. We looked at exposure to fish, benthic invertebrates, amphibians, plants and wildlife. We did two analyses for this ecological risk assessment.

The first analysis was the analytical chemistry data that we selected for our investigation and we compared that to established ecological benchmarks that kind of indicate a safe level of toxicity for animals being exposed to contamination.

The results of that first analysis indicated that there are some metals and a couple or a few organics that had exceedances of those safe level benchmarks.

The second analysis that we did was evaluating the potentials for the

chemicals in a contamination to bioaccumulate up the food chain. What we found out in that analysis was that all of the hazards were less than one except for one situation where we had vanadium with a hazard of 1.7. This is in comparison to the acceptable limit of one. So if the acceptable limit is one, the hazard that we got was 1.7; it's just above. We also looked into this further and determined that vanadium is not related to the contamination coming from the landfill, and we looked at the groundwater concentration and we saw that there were very low vanadium concentrations. So, overall, for the conclusion for the ecological risk assessment, we didn't find very much hazard to animals and birds and bunnies.

So, to conclude and to summarize, performing these hypothetical risk calculations, we determined for the human health side that there are cancer risks and noncancer risk exceedances for residents if exposed to the groundwater and that warrants some sort of remedy. In the eco

risk assessment, we didn't find any significant effects on the wildlife.

And so thank you for your time, and I'll give you back to Pam.

MS. BAXTER: Okay. So after all this hard work that we've done, and by the way, a lot of this investigation we started about 2010? 2010. So this is eight years of studying the site. We had developed some remedial action objectives for handling the contamination.

So for the OU1 ROD amendment, we were -- we are planning to limit migration of contaminant groundwater and leachate from OU1 to OU2. So we don't want it leachating from the landfill to outside of the landfill.

We want to enhance the treatment plant to reduce the concentrations of 1, 4-Dioxane being discharged to surface water. So the plant currently does not -- it is not geared toward treating 1, 4-Dioxane, so we probably would have to put in some kind of a treatment system or treatment train so that it could

treat 1, 4-Dioxane so it's not discharging into the stream, the surface water.

We want to reduce the toxicity, the mobility, the volume of the contamination of the North Waste Cell with its impact on the groundwater, and we want to prevent exposure to contaminated groundwater, so those are the goals for OU1.

So for OU2, basically, we want to prevent current and future exposure to human receptors, whether it's ingestion, dermal contact, inhalation, and contamination in groundwater and surface water that concentrates in excess of the federal and state standards, so that's what we want to do with OU2. We want to make sure it is not being contaminated from the landfill. Okay?

So what we described was -- what we described was what we do in our remedial investigation stage, so now we have the feasibility study. So for a feasibility study, what we do is we investigate different remedies, different ways of

trying to come up with ways to deal with the contamination. And once we come up with these alternatives, we have to evaluate them, so we have nine criteria.

So the first one is we have to consider overall protection of human health and environment. It has to be in compliance with the state and federal regulations. There should be a long-term effect from this or some type of permanence with these remedies. It should be a reduction of toxicity, the mobility of volume through this treatment. There should also be short-term effectiveness. We should be able to implement this. We shouldn't pick anything that's really impossible or have some kind of goals that are impossible to achieve. Cost is also an issue. And then the last two, support agencies, so we would need support from the state acceptance and also from the community. Certainly your concerns are important in how we pick the remedy.

So, now for OU1, which is, again, the landfill, we -- first we start with no

action. That's just something that's standard so we have something to compare the other alternatives to. So we just do that as a -- sort of like a comparison alternative. So we found two different alternatives to treat OU1. Basically, both of them are to upgrade the current system, which means putting in bigger conveyance systems, the extraction system, having more piping, removing the source area, that North Waste Cell, removing that contamination, and then we would do long-term monitoring and institutional controls.

Now, institutional controls are controls to protect the site so that there isn't -- for instance, we have fencing to protect trespassers. We would put in a classification exception to protect the groundwater so people can't go in and put wells in there and then maybe use it for drinking water. It could also -- there's also other criterias.

And then for OU1-G3, the only difference is that we would add additional

groundwater extraction wells. So for cost purposes, we cost it up for three but, you know, it just depends on what we design.

So the difference between these two is just putting in additional wells to pump, to do more aggressive pumping to make sure that the contamination is not migrating off-site. So that would be the OU1 ROD amendment. So just sort of upgrading it and making it better than what we have now.

And then for OU2 -- oh, yeah, I'm sorry. For OU1, so this is what we're picking; doing the -- upgrading the system, the conveyance line and doing the long-term monitoring and putting these additional wells and this is the cost. So the capital cost is about ten and a half million dollars; the annual costs for operating the site is -- would be about $920,000 a year. The present worth -- so we have to do the present worth calculation. It comes out to about almost $22 million and the time frame, we use 30 years just -- again, just with costing and for comparison, so

sometimes we can achieve stuff less than 30 years and sometimes more, but this is what we standardize when we do all this comparing between the alternatives, and using the nine criterias, we usually use 30 years as a default.

Okay. So now for OU2, again, we have to use the no action for purposes of just costing it out and comparing and so we have just long-term monitoring or institutional controls or we can install three more extraction wells. So the way this works -- would work is we have to upgrade OU1 no matter what. And OU2, we call this the interim remedy because for now, we want to see if in OU1 -- because we are recommending installing the three additional wells, we want to do long-term monitoring to see if that's -- if that's working, putting up three more wells and aggressively pumping it and you have more details of the proposed plan, but, you know -- and the advantage of improving the conveyance line is that it allows us to do more aggressive pumping because right now,

the plant is only pumping at about 45 to 70 gallons per minute, and with this, we are hoping to go up to 200 gallons a minute, so it's more aggressive pumping.

So for OU2, we picked the second one, which is long-term monitoring, because we don't want to over pump the system and possibly dewater the streams. So, for now, we just want to monitor the OU2 which is the groundwater outside the landfill and see if there's any contamination migrating, so that would have a pretty extensive monitoring system.

So the cost for just doing a long-term monitoring, the annual cost is about $111,000. So that's just the cost of taking samples, analyzing it, and then the present worth would be about $781,000 and the time frame would -- in this case, we used 10 years because it should be less than OU1 with the 30 years because we should -- because if OU1 is working, then this should work as well, so that's why we estimated at 10 years.

Okay. So our basis for choosing

these two remedies. So for the OU1 ROD amendment, again, it improves the extraction rate from 45 to 70 to 200 gpm's, it uses larger conveyance lines and allows us to continue pumping. These deeper wells would improve the containment and hydraulic control of the OU1 contaminated groundwater. So, again, you want to make sure that these wells that are within the landfill are sucking in the water and sending it to the treatment plant and is being treated. You don't want anything migrating off-site. That's the goal we're trying to achieve. And for the North Waste Cell, that is a source contributing to the ground -- to the contamination, so as we mentioned, the state had removed some of it, about two-thirds of it, and we just want to go back and remove about a third of it, so that's to eliminate that source of contamination. So that's the OU1-G3.

And then for the OU2-G2 interim remedy, again, would be -- okay. So the aggressive pumping from the OU1 remedy would affect the OU1/OU2 border, so the

border between the landfill and then outside the landfill, and it's expected to impact the OU2 groundwater and so hoping that some of the groundwater from OU2 would be sucked in and treated. And then after we do I don't know how many years of long-term monitoring, we would go back and look at the remedy and see if it's working.

So once we implement this and we get construction completion, then what we do is what we call a five-year review. So after five years -- after -- five years after the remedy has been constructed, we go back, we look at the data and we see are the remedies -- we'll check to see are the remedies functioning as intended. Is it doing what we're expecting it to do? And in the OU2 case, if it's not, then that's when we would go back and say, well, maybe we do need to pick that other remedy; maybe we do need to put in these additional wells. But for now, we're thinking that let's just see what happens with improving OU1, and then with OU2, hopefully we wouldn't have to do much more. But we

won't know that until we do this five-year review and then we look at all the data.

So as Pat mentioned earlier, we're sort of in the middle of a comment period. We started August 12th and it's through September 11th. The Chester Library has administrative records, so if you want to see anything for -- any files on this project, you can go to the library and they should have it on CDs. We try to keep it updated. You can also come to New York if you want and you can go to our file rooms or you can go to the site there and we have the administrative record and all the information to back up what we have talked to you about tonight, and if you have any questions, this is Pat, her information, or you can contact me as well.

So, at this time, we're going to take questions, okay, Pat?

MS. SEPPI: Yes. Thank you.

MS. BAXTER: Thank you.

MS. SEPPI: Thank you very much. That was a interesting presentation. That was probably the best explanation of an

aquifer I ever heard, it really was, so I have to use that in the future. That was very good.

So what we're going to do now is open the floor to your comments. You know, if you want to stand where you are, as long as you use your big voice, that should be fine. But if Susan can't hear you, we will probably ask you to come up front and get closer to her. And if you would start your comment and just let Susan know your name and -- oh, already we have a comment. Certainly, sir, go right ahead.

MR. WOOD: Hello. My name is William Wood. I live in town.

In 1986 when you came up with the original Record of Decision, you went to the wells on State Park Road and tested them, but I guess you couldn't test for the 1, 4-Dioxane back then.

MS. BAXTER: Right.

MR. WOOD: Do you have any intention on testing the residential wells since we're one block over from Parker Road? Every picture you've had of the

landfill has about a dozen houses on State Park Road on it as well.

MS. BAXTER: Okay. So I'm not sure if the game has changed, but I know back in 2011, we did an extensive monitoring of residential wells in the area. Well, not wells but also peoples' tap water.

MR. WOOD: Okay.

MS. BAXTER: And so this is how we were able to narrow it down to what we have now. But we did Parker Road, we did Flintlock, I think we did -- I don't know if we did Route 24 or 513. We went around. It was very extensive.

MR. WOOD: We're directly behind Parker Road, to the east between Parker Road and the Lamington River.

MS. BAXTER: Okay.

MS. SEPPI: What was the name of the street?

MR. WOOD: State Park Road. It's this road right here.

MS. SEPPI: This road right here.

MS. PARVIS: So Parker Road, when

they did -- when they tested all the wells, Parker Road was really the limit, so the contamination didn't go beyond that.

MR. WOOD: Okay.

MS. PARVIS: So that --

MR. WOOD: How could we know where --

MS. PARVIS: Well, they tested -- so along Parker Road -- you have both sides of Parker Road. And, essentially, there were very few homes on Parker Road at all that were contaminated, so those were cleaned. There were only a couple near the intersection of Schoolhouse Lane. Like, they tested that new residential subdivision, Highland or --

MS. BAXTER: Yeah, right.

MS. PARVIS: No contamination in that. So Parker Road just kind of turned out to be the boundary of where it had moved in that direction.

MR. WOOD: Okay.

MS. METZ: And our data supports that, too.

MS. PARVIS: Right.

MS. METZ: We did see some lower detection limit along Parker, so we feel really comfortable with the extent of, you know, the plume and that it doesn't extend to the area you're speaking of.

MS. SEPPI: Yes, sir?

MR. JAFFE: Shelly Jaffe. I live on the other side of Chester, closer to going towards Route 10. But you're suggesting that the plume in the bedrock may be -- and if you don't get enough of the water out, it will continue to go north? Northeast? Which direction are you talking about? Including homes that are very close or whatever? Where are you talking about the potential groundwater if it rains or whatever leaking out?

MS. PARVIS: So the landfill is --

MS. BAXTER: Can you put up the picture so we have it --

MS. PARVIS: Yeah. Let me get the one -- okay. So this is also an unusual situation. So the landfill just happens to be one of the highest elevation points in the area. So if you can imagine, you know,

as you get rain and precipitation coming down, it does somewhat follow the topography. So it kind of -- it doesn't just go in one direction. This is the predominant direction. So out of a hundred percent, you get the most in this direction, but you also get flow in this direction. You get a little bit of flow here that stops at Parker Road and you get a little bit here that kind of stops in the middle of the horse farm. So the flow direction is 360 degrees minus this corner where, fortunately, groundwater goes towards --

MR. JAFFE: Is that going down towards Route 206 then or what? Am I wrong on the map?

MS. PARVIS: Well, 206 is way, way, way -- you know, a couple miles, so we're not talking -- we're not -- you know, this is -- this is 513. This is Parker Road.

MR. JAFFE: I mean, my concern is for the man who just asked the question as well as the other people --

MS. PARVIS: Right. Yes, he's over in here, correct?

MR. WOOD: I'm a little further to the --

MS. PARVIS: Off the map?

MS. SEPPI: Closer in?

MR. WOOD: It's right about there, yeah.

MS. PARVIS: Okay. In here?

MR. JAFFE: Your suggestion would be that you're -- with OU2 or whatever, you will be continuing to test homes, etcetera, so that you see possibly where that plume or -- plume may go to.

MS. BAXTER: Well, we're not testing plumes.

MS. METZ: Well, no, we'll continue to test the groundwater so we can then see, you know, the boundaries of that plume, and I think it's important to recognize, too, that there is course control currently keeping most of the landfill contained under the cap. It's just that deeper stuff that's getting out underneath and that's what we're saying

with our, you know, optimizing that groundwater treatment system to pull more back, so we would expect concentration to go down as opposed to go up.

MR. JAFFE: And the water that you do pump out, you're pumping it into --

MS. BAXTER: The treatment plant and it's being treated.

MR. JAFFE: And then it goes to --

MS. BAXTER: It's discharged to Trout Brook.

MR. JAFFE: Trout Brook?

MS. BAXTER: Yes.

MS. SEPPI: Yes?

MR. ZIMMERMAN: I think it's important to note, too, that the existing system that the NJDEP put in as a result of the 1986 ROD treats for everything that has been detected with the exception of 1, 4-Dioxane. So it's doing a good job of treating everything out. The purpose of this ROD for OU1 is to just increase the capabilities of that treatment system and also to treat 1, 4-Dioxane and then to increase the capacity of that treatment

system through increasing the size of the lines associated with it and also to put additional wells in which is going to create more hydraulic control of the groundwater in that area, so the risk to the homes outside of the landfill will go down as a result of this work.

MS. SEPPI: And you forgot your name.

MR. ZIMMERMAN: I'm sorry. My name is Erich Zimmerman.

MS. SEPPI: Thank you. Yes, sir. Oh, Andy.

MR. JUDD: Andy Judd. Can you speak a little bit more about how the yellow line of OU2 is determined sampling inside the line, sampling outside the line? It's not just a pretty line. It's based on something.

MS. PARVIS: Well, no. So the line is actually the tax parcel boundaries. The line represents the area of study. So, essentially, you start within the landfill and then you work your way out. And we don't want to just randomly draw the line

bisecting the property and say, well, we put a well on this tax parcel, we put a well on that tax parcel.

We also had a lot of prior data from wells and such, so we kind of knew where the contamination extended to and it also generally follows New Jersey's line called CKE, you know, the known extent of contamination. So it kind of -- it's almost their regulatory line, but it's also a little where we did a couple of studies on some additional adjoining tax parcels.

MR. JUDD: Concentration map? Pull that one up.

MS. PARVIS: Yes, I can pull up the concentration map.

MS. SEPPI: And don't forget, all these questions and comments will be part of that responsiveness summary that's attached to the Record of Decision so, you know, even though you ask a question here tonight, you'll see it again in writing in that summary.

MR. JUDD: So in this figure, the white lines show where the contamination is

but that's well within that yellow line on the --

MS. PARVIS: Yeah. And we had the yellow line on here but it got kind of busy just for visualization, but -- so if you remember from the other side, Parker Road happens to be the boundary on this side. We did the -- so the most, the bulk of the contamination originally was concentrated on Schoolhouse Lane. So there were just a couple homes on Parker Road here that had some contamination and then most of the homes on Schoolhouse Lane. These areas here really never had anything and there was nothing here except at the church. We had some very low contamination at the church. We went across the street into the wildlife refuge, no contamination, so we're pretty confident on this one; got a lot of well data along both sides of the road here.

Once you get over into this area, that's where groundwater now comes onto the landfill, so it's not spreading past -- this is like a ridge, kind of a top of a

hill; you have bedrock outcrop here. When you get to here, the horse farm well is clean. They have their well over here. So, but we do have some wells over here, so there's some contamination here, but -- so this is pretty much the boundary on this side.

And then the southern side, we still have some low levels of contamination down here, but you start to get towards the standard, and then as you get off the map, we had some wells further down on Parker Road that were clean. So this is pretty much what the footprint of the contamination looks like. And it pretty much aligns with the OU2 boundary except it doesn't have the zags because of the property boundary, so --

MS. SEPPI: Thank you, Pat. Sir?

MR. DRAG: Yes. Hi, I'm Tim Drag. When was the last time that you -- did you guys do indoor air testing of affected residents?

MS. PARVIS: 2011 or '10? 2010.

MR. DRAG: Was that sub slab

testing or was that just a canister?

MS. PARVIS: I think it was both. It was both, yeah.

MR. DRAG: It was both? And were the radon systems off when you were doing that testing? Because wouldn't that affect, say, the VOC's?

MS. METZ: We have to look into that.

MS. SEPPI: I think they have -- do they have radon systems? We don't know if they had radon systems at that point.

MR. DRAG: Wouldn't that be pretty pertinent? Because the radon system would effectively remove the VOCs and other contaminants from below the slab. You would never know if they were there, correct? So if somebody's radon system was inoperable or failed, there basically -- it could be hypothetically filling up with VOCs and other sorts of nasties, correct?

MS. METZ: Hypothetically. I think -- I don't know that every single home would have had a system, a radon system and --

MR. DRAG: Radon is pretty common around here.

MS. SEPPI: Yeah, they may. They may.

MS. METZ: You know, that's something we'd have to go back and look at the field notes.

MR. DRAG: I would suggest it. I mean, I have -- I'm formerly from Pompton Lakes, so the DuPont plume is near and dear to my heart and they did testing of -- non-sub slab testing prior and everything was hunky-dory. The sub slab and the results were fairly shocking. And one of the things they made sure was that radon systems were off and windows were closed and everything else. So it's just important that you guys are doing that updated testing methods for the people that are in these areas, right?

MS. METZ: We did do sub slab testing in addition to indoor air. We don't ever do indoor air by itself.

MR. DRAG: Okay.

MS. METZ: We just do it. So, you

know, even if the system was running, we would get something that may be different but, you know, so that's a concern we can look at.

MR. DRAG: Okay.

MS. SEPPI: Yes, ma'am.

MS. HOLTZ: Was this --

MS. SEPPI: What's your name, please?

MS. HOLTZ: Liz Holtz.

MS. SEPPI: Thank you. I'm sorry.

MS. HOLTZ: To further your question, when you first tested and you drew the blue line of the areas of the homes you tested, was that before the waterline was put in? Right? You tested all the homes on Parker Road and then put the waterline in; am I correct?

MS. BAXTER: Yes.

MS. PARVIS: Residents were 2011.

MS. BAXTER: 2011. The waterline construction was 2013.

MS. HOLTZ: So once the wells are capped, isn't the water going to move and potentially go down State Park Road or

contaminate other -- because now the water we were drawing is going someplace else, isn't it? Our wells are capped.

MS. BAXTER: Right. That's correct.

MS. HOLTZ: So we can't draw any water from our ground, so where is that groundwater going?

MS. BLACKWELL: Which is the explanation you gave us why you haven't capped it because you said you can't really control bedrock, where it goes, so it becomes like a -- I'm trying to remember someone saying that --

MS. METZ: Well, we did collect a lot of data on the site.

MS. PARVIS: Well, so that's one of the reasons we're increasing what we call the capture zone, so we're going to be pumping more water. We're going to be pumping water from deeper zones and we're going to be pumping it 24 hours a day, not on and off. So, essentially, it's kind of like you're holding it in, you're corralling the groundwater within the

landfill and very close to the landfill and that's what keeps it from migrating. For what's already way, way, way past it, by the time you start getting up to like Route 513, you're getting to where you can no longer detect it. So I understand that your wells are pumping at such small flow rates as compared to what the treatment plant pumps at. The cumulative watts of pumping it are so miniscule compared to, you know, the flow rates that we would be pumping at. I don't know what the residential pump at.

MR. ZIMMERMAN: Well, typically, it's less than two gallons a minute per location and it's not a continuous pumping. But do you have any figures to show the figures from the long-term pump test that was --

MS. PARVIS: Not in the presentation, but it is in the remedial investigation report which is in the repository. There has been a number of what we call pump tests done and aggressive pumping of just one well near the landfill,

and we're going to be doing multiple, was able to extend out 1800 feet from the landfill and start drawing that water backwards towards the landfill.

So what we're proposing is to do something much more aggressive that will have like a longer reach, so to speak, to keep holding that groundwater back from moving.

MS. HOLTZ: How many homes were there connected to the waterline?

MS. SEPPI: How many what? Homes? 73, I believe.

MS. BAXTER: Yeah, 73. Yeah.

MS. SEPPI: Yeah.

MS. HOLTZ: So, in theory, if 73 homes had their well on the aquifer that you're talking about --

MS. BAXTER: Wait. What was your question? How many homes had the waterline or how many homes were tested?

MS. HOLTZ: 73 had the waterline connected.

MS. BAXTER: Yes. About 73, yes.

MS. HOLTZ: So the pump you're

talking about is only pumping forty to seventy? Was that the one -- that's kind of just --

MS. BAXTER: That's currently.

MS. PARVIS: That's currently. We're going to be pumping it to about 200 gallons per minute. But you have to realize the wells we're talking about are all spread out and the way the fractures are, so there's a number of fractures where a well may have been drawing water from that aren't connected to the fractures from the landfill. It's almost like a maze. So there's -- when you're inside fractures, you find a lot of dead ends, so your well may be screened locally in a nice big fracture and it's actually getting its water from a direction opposite of the landfill because it doesn't have a dead end in that direction, but as it goes towards the landfill, the fracture dead ends.

So it's not -- it's not a continuous system. I mean if all the fractures are connected to -- like, if the landfill was like the sun and all the rays

coming out were connected to it, that would make sense what you're saying. But in this case, they're not, and it's just a very complicated subsurface environment. So you can't just say, well, there are 73 wells and two gallons a minute, that's a hundred 46 gallons. It doesn't -- it's not apples and apples, unfortunately.

MS. HOLTZ: But I think it's just making the argument that the water could have spread.

MS. PARVIS: Well, the testing -- the data is recent and the DEP tests every six months, also. They test -- they also have their own monitoring wells, so they test every six months. So everybody's monitoring the stacks and the plumes all the time.

MS. HOLTZ: But not on State Park Road.

MS. PARVIS: No. As I said, the DEP allegations, it never extended. But I should also mention that if anybody has a well anywhere, irregardless of a Superfund site nearby should be testing their water

all the time, because all it takes is your neighbor, like, doing some maintenance of his garage to contaminate your well, so --

MS. SEPPI: I think before I get to you, you had a question first?

MS. BLACKWELL: That was my question. I'm Becky Blackwell. Kind of. I did -- like when you -- before we got our public water, you were testing our well, so that was my question. Where are -- I mean, do you have a testing well that can definitively say, oh, in that direction or whatever, that no, it's not contaminated? Where are the testing wells? Because I remember you saying --

MS. PARVIS: So we have monitoring wells.

MS. BLACKWELL: Monitoring wells.

MS. PARVIS: We have monitoring wells up here, for example, in the wildlife refuge. We have a well over here on the horse farm. We have a well up here on the ridge. We have wells on Parker Road here and we have another well on Parker Road down here and then, of course, we have a

lot of wells in between. There's almost a hundred -- there's over a hundred and fifty wells. So --

MS. METZ: Last year, the proposed plan actually shows a diagram of where the wells are.

MS. BLACKWELL: If, as a resident, you were to test a well, I don't have a well, would that pick up the same or -- that's why we didn't know about it then. Does it have to be a EPA government test or can they privately test the wells to detect these contaminants?

MS. PARVIS: If you hire a reputable laboratory in New Jersey, certified or residential potable water sample, you will get the same type of -- the same quality of result.

MR. JUDD: Well, you have to be careful that you get 1, 4-Dioxane testing. It's not part of the standard sweep of tests.

MS. PARVIS: Right. Correct.

UNIDENTIFIED MAN: It costs a lot of money too, doesn't it?

MS. PARVIS: Yeah. Well, for --

MS. SEPPI: Can we just have one conversation at a time, please?

The woman back here, you had the next question.

MS. GIBBS: My name is Chris Gibbs. Just out of professional experience, a standard VOC 524 method does not include 1, 4-Dioxane and I tried hard with Andy to locate a lab that will test for 1, 4-Dioxane and we spoke to the DEP regularly. The labs just aren't there. And they -- the labs that do do it --

MS. PARVIS: They're not there for residential but for -- I can take a groundwater sample tonight and send it out to many labs in this area that can detect down to 0.2 parts per billion which is half the standard. The environmental laboratories can all do it. The best method right now is 522. Test America does it. But you can use modified 8260C SIM and you could also do modified 8270 SIM. So if you go to, like, a lot of the New Jersey labs like the Hampton-Clarkes and the

ChemTech and, you know, the guys that you see on most jobs, they -- most of them can do that and they can achieve those detection limits. But it's not routinely -- you're correct. It's not routinely done for peoples', you know, private wells.

MS. GIBBS: Right. And all those methods you referred to aren't certified for drinking water, are they?

MS. PARVIS: Correct. They are not.

MS. GIBBS: Can you provide us with a research list of all the laboratories and the methods?

MS. PARVIS: Sure.

MS. SEPPI: The gentleman in the doorway, you had a question?

MR. PENA: Hi. Eduardo Pena. My home is actually off the map, it's on the other side of town, but the question here is are the methods implemented here, are they mostly all options to make sure that the water system in Chester is considered safe? And I think just to add to what you

were saying as far as testings are concerned, yes, I'll -- the onus is on each homeowner to test, right, but with this particular effort to make sure the water systems are monitored, are you going beyond the borders to make sure that none of it has affected other parts of town? I don't know if that makes any sense.

MS. SEPPI: Would you mind talking more about the wells? I mean can you be --

MR. PENA: I mean, or is it contained in this water?

MS. PARVIS: Well, when you say water systems, do you mean other private wells or do you mean actual public waters?

MR. PENA: As a layperson, I'm not sure it's the same -- just -- I don't want --

MS. PARVIS: So if you're talking about Chester's public water supply and in fact, these homes are connected to the Washington Township's water supply --

MR. PENA: Right.

MS. PARVIS: -- but all of the municipal water suppliers and the private

water suppliers are required to comply with various strict regulations, state regulated. They do the testing. You can go on their websites and see what -- if their wells are contaminated or not. And they don't all test for 1, 4-Dioxane, so it's not even a required test at the drinking water level when you pay for drinking water.

MR. PENA: Right.

MS. PARVIS: In terms of wells outside this boundary, like I said, we have over a hundred and fifty monitoring wells, so we know the extent of that contamination, so that is how we monitor the size of that. We don't -- you know, they don't go into peoples' homes. Rather, we use the monitoring wells. It's much less intrusive than us knocking on the door and turning on your faucets, but that's how we monitor the size and extent of the plume.

MS. SEPPI: And, also, I mean, are you on public water?

MR. PENA: No, I'm also -- a

private --

MS. SEPPI: You have -- okay. All right. Because if you're on public water, you should get a report every year from the water company and it's also really good, like Pat said, going online with the website because that has a lot of information there, but that's, you know, if you're a public water supply.

Sir?

MR. SHORE: Sid Shore. I have a question. If a farmer in that area is using wells for crop irrigation, how does that -- what is the ramifications of that on the properties?

MS. BAXTER: Okay. So when we were putting in the waterline, we had the residents sign a consent and we abandoned them, so there were a few residents that asked to keep their wells or irrigations for agriculture or whatever and I think the town allowed a few exceptions, but there is -- or at least there was a town ordinance that was passed that all these homeowners or businesses that were

connecting had to give up their wells and then they would be connected to the waterline. But, again, there was a few that were granted exceptions and could only use it for agricultural. They couldn't use it for drinking water.

MR. SHORE: So if somebody was using it for watering food crops, that's not an issue then?

MS. BAXTER: If they're using it I think that way, that would be an issue. I think if it was just for trees or some -- I think some people have trees that are growing on their yards or something like that, but if it's going to do that, I think they wouldn't be granted that exception.

MS. SEPPI: Do you have a response, sir?

MR. WATSON: Andrew Watson. An important thing that maybe they didn't explain well enough. So we are presenting the 1, 4-Dioxane contour map.

MS. SEPPI: Andrew is with the contractor --

MR. WATSON: Yeah, I'm one of the

environmental engineers. So some history on 1, 4-Dioxane. It's -- one of its properties, it's invisible in water, so it really, really likes water. It is very difficult to get out of water. Part of its properties as being invisible also made it too difficult to detect; that's why we didn't, you know, have the laboratory methods until recently to detect it. It's difficult to treat because it's hard to separate from water, so that's why the original plant wasn't designed to treat it. But if we presented some of the other figures showing the other contaminants, they're not that expansive. So by and large, they're contained pretty close to the landfill. So we're showing a very, very big plume, but in reality, like benzene, TCE, DEHP, they're all much smaller.

So your question about indoor air and, you know, Pompton Lakes, I believe, is chlorinated salt like PC --

MR. DRAG: PC, yeah.

MR. WATSON: PC. You're going to

have indoor air issues with that because it -- it is not invisible in water. It's going to want to leave. You're not going to have that 1, 4-Dioxane because of its properties. That's also why it's a super long plume because it's just going with the water, so that's important to recognize.

MS. METZ: Yeah, I think that's a good point.

MR. DRAG: So you're saying none of the other contaminants -- what is the current range of the other contaminants?

MR. WATSON: Much smaller.

MS. PARVIS: Much smaller. And in the remedial investigation report, there's a map --

MS. BAXTER: Yeah.

MS. SEPPI: Yeah, the remedial -- excuse me. The RI, remedial investigation, FS, feasibility study, is available on the EPA web page too. I mean, you know, if -- they're kind of technical documents, but if you have an affinity for it, you should, you know, take a look at them and read them. They really -- they have a lot of

information in them. Okay.

MS. BAXTER: It's easy to say --

MS. SEPPI: That's all right. If you don't mind, can I let everybody else go first? We'll come back to you.

UNIDENTIFIED MAN: Okay. Fine.

MS. SEPPI: Yes, ma'am, in the back?

MS. HOVEN: Janet Hoven. It just might be of interest to residents also to know that there are other sites in Chester that may not be an EPA site but there are test wells at the Simmonds -- old Simmonds Precision down by Bernie's on Oakdale Road and there was just recently more test wells drilling done over there at the 50 North Road site in Chester Borough and the adjoining site, Highlands Ridge Park in Chester Township, the old AT&T site. We have regular testing that's done there, also, and reports are generated. So it's not just here, to your concern, Eduardo, about whether or not there -- it could be found somewhere else. There are other locations in Chester where testing is going

on that's not related to --

MS. SEPPI: Right. They're testing there too, so there's testing going on all over.

Yes, sir?

MR. MAIER: Yeah. Kurt Maier. I just got the exempted wells for agriculture and outside that white line, does that mean we're safe?

MS. PARVIS: Currently?

MR. MAIER: I mean, it does cut through our property but the wells are beyond.

MS. PARVIS: Which property are you on?

MR. MAIER: Maier Brothers.

MS. PARVIS: Oh, you're the Maier Brothers. Yeah. So we have a well --

MR. MAIER: Across the street from us.

MS. PARVIS: We do. We have a well down here on a parcel that's clean and we have -- I think we have -- we have a well close to your property as well that's part of the monitoring.

MR. MAIER: We have a -- but they're all outside that white line.

MS. BAXTER: What's your connection to the waterline?

MR. MAIER: Yeah, we -- well, we had to to get the water --

MS. BAXTER: Right.

MR. MAIER: We were able to keep our wells for irrigation.

MS. BAXTER: Right. Okay.

MR. MAIER: And we do have, you know, crops other than trees, so -- but they're all outside that white line, so -- and we've got the property on the market right now for sale, so what you say tonight affects the value of that property.

MS. SEPPI: Right. I think DEP has the --

MR. HERZBERG: Mark Herzberg with the DEP. I was just going to say it might be helpful to explain the difference of exposure concerns for irrigation versus drinking. Looks like you've got --

MS. METZ: Right. So we were talking about the risk assessment consuming

two liters a day over, you know, a 26-year life span assuming someone lives in the same place 26 years, they bathe in that water, they use it for cleaning, they do everything. And with agricultural exposure, especially when you're talking about volatiles, it's a much different scenario. You're spraying the water, it would be dissipating into the air. You're not coming into contact with that water the same way you would if you were using it for a residential use; cooking with it, bathing in it, drinking it, so, you know, it's a much smaller exposure.

MS. SEPPI: Yes, ma'am, in the back.

MS. HERRIDGE: Deborah Herridge. I understand the health models that you're using to come up with the statistics for what the increased cancer risks could be under this circumstance or that circumstance like you just described. Have you ever done or followed any of the actual residents and done health studies of the actual residents? It's not a very large

area to determine cancer rates, things like that.

MS. SEPPI: I mean, I can respond to that. We do have agencies that do that type of work. Our sister federal agency would be the Agency For Toxic Substances and Disease Registry, ATSDR; they're part of CDC and then also the New Jersey Department of Health, so they are the people that do those types of studies, you know.

MS. HERRIDGE: So you don't do that in conjunction. You just do the modeling and sort of guessing based on previous statistics.

MS. SEPPI: So, yeah.

MS. HERRIDGE: You don't actually do the studies that would show --

MS. SEPPI: Right.

MS. HERRIDGE: My concern is with the dioxane that we were unable to test for before and didn't know what other things could there be that we don't know or aren't tested for, and it would seem to me that with all the work that we've done in coming

up with these models for health risks and whatnot that -- because there are not that many residents involved and actually doing an actual study of the residents might be helpful. Is that something that people here would have to reach out to another federal agency or is that something that can -- you can request or it can be done in conjunction with a --

MS. SEPPI: That request would need to come from you and that's kind of a epidemiological study and that would be what the other two agencies do. You know, I can certainly provide you the contact information if you wanted to reach out to them, but we can also check and see if they had done a health assessment maybe a few years back. That would be probably --

MS. BAXTER: Yeah. And I don't think they did.

MS. HERRIDGE: So this is more of a process question. When the EPA comes in and does these kind of cleanups and things like that, it doesn't automatically do the testing of residents? It just does

statistical modeling of what could be, not actually what is among residents?

MS. METZ: Yeah. So the Superfund program is a risk-based program. We'd have to demonstrate, according to statute, that there's an unacceptable risk at a site in order for us to spend federal dollars or have responsible parties to spend money to clean up the site. So that's why we do the modeling; to establish that under these conditions, at these levels in the groundwater, there could be this level of risk and that is enough to say we need to do something about that; we need to spend millions of dollars on it. So it's really just a hypothetical exercise. It's not taking into consideration this person living at this address on this road. That is -- that is more, like Pat said, on the epidemiological side which is not -- you know, as an environmental agency, that's not what we do. We're not a public health agency. But we certainly can put you in contact with people who know more about those types of studies and how you would go

about requesting one.

MR. JUDD: But the data that you plug into your models is real site data from monitoring wells next door to a house. So you're saying that there's groundwater, if you're sampling in the monitoring well, it's equivalent to the water in the well in a house.

MS. BAXTER: Yes.

MR. JUDD: So you're not knocking on the door sampling the well. You're sampling the site well instead and using those same numbers to make that model.

MS. PARVIS: Well, we should also mention that we use four of the plume numbers, which means the numbers we're using is if your house was unmonitored and drinking the groundwater in the most contaminated area which, of course, that's not the case, so that makes it extra conservative.

MS. SEPPI: Okay. Yes, sir?

MR. FOX: A couple questions. Does the outer white line --

MS. SEPPI: Your name, please?

MR. FOX: I'm sorry, Paul Fox. Does the outer white line on that chart represent the drinking water standard for 1, 4-Dioxane?

MS. PARVIS: Well, the outer line is 0.5 parts per billion. The new standard is 0.4, so yes.

MR. FOX: So that white line is above the drinking water --

MS. PARVIS: Well, so this is how much has changed. So in 2010, the New Jersey DEP Groundwater Quality Standard which was an interim criteria at the time, it was ten parts per billion. The 0.4 number actually came out after we completed our study. So that was promulgated officially in January of this year I believe is the latest publication of the New Jersey Groundwater Quality Standards. So that's how much the knowledge base has changed and how rapidly it's changing in regards to 1, 4-Dioxane.

For example, the State of New York does not have a standard at all for it yet. They're trying to come up with one. So the

0.5 is what the lab could technically detect during those years we set those samples up for analysis. Now the labs have to get down to about point two because the standard is point four.

MR. FOX: The stream on the other side of Parker Road that serves as probably a groundwater discharge as well as a runoff receiver, there's an online pond on that stream a little bit further down from the landfill, was there sediment sampling as well as fish sampling within that stream in the pond?

MS. PARVIS: We did sediment -- so we did sediment sampling -- are you talking about this one here?

MR. FOX: Yeah.

MS. PARVIS: You mean the pond here? No?

MR. FOX: No. Going down in the other direction toward the Black River.

MS. PARVIS: Oh, you mean this? You mean this stream?

MR. FOX: No.

MS. PARVIS: You can come up.

MR. FOX: Sure. There's a stream that runs down through here, feeds into this pond.

MS. PARVIS: That pond.

MR. FOX: And that then feeds down into the Black River. Was there any sampling of that?

MS. PARVIS: No, because we -- so these are the streams that are connected to the landfill that receive groundwater and runoff from this area; this stream here, this stream in both directions. There's a divide here and then this stream here. So we did not sample on this site. All your wells and everything were clean over here. So we did not -- we focused on the areas where we knew we had contamination.

MR. FOX: So there's really been no sampling of that stream or ponds.

MS. PARVIS: There's been no sampling on this side of Parker Road of any surface water volume.

MR. FOX: Really. Despite it's that close to the landfill.

MS. PARVIS: Well, you have to

realize that the results of the ecological risk are found in the ecological risk.

MR. FOX: You didn't sample that so you can't say that for that stream.

MS. PARVIS: The 1, 4-Dioxane, the number the EPA is currently using for surface water is 22,000 parts per billion. It is not found to be of ecological risk. It's a very different effect than it is on humans, so there was, you know, no reason to sample that.

MS. SEPPI: You said you had another question?

MR. FOX: I didn't finish. Just one more question, please.

MS. SEPPI: Oh, I'm sorry. Sure.

MR. FOX: Really, it's probably about 2011 when you started further investigating the dioxane contamination; is that accurate?

MS. BAXTER: Yeah. Yes. We did a comprehensive in 2011, yes.

MR. FOX: Okay. It's been seven years since then.

MS. BAXTER: Okay.

MR. FOX: There hasn't been any upgrade to the groundwater treatment plant to treat for dioxane?

MS. BAXTER: Not yet. This is what we're talking about tonight.

MR. FOX: We're still talking about it.

MS. BAXTER: I'm sorry?

MR. FOX: We're still talking about it?

MS. SEPPI: Yeah. This is why we're here tonight.

MS. BAXTER: Yeah.

MR. FOX: It seems like a long time.

MS. BAXTER: It is a long time. You know, I don't know if the state wants to say anything about that because they're operating the plant, but yeah. It's a long time.

MR. FOX: You know, you had mentioned a concern about increasing the capture area for groundwater, that it could essentially reduce discharges -- groundwater discharges into local streams.

Insofar as that treated groundwater is being discharged into the local streams, I don't see that's a concern.

MS. BAXTER: Well, the effluents to the --

MS. PARVIS: Well, currently the treatment plants cannot treat for 1, 4-Dioxane, so that has been discharging into the water and streams and that's one of the major upgrades that's proposed is to add 1, 4-Dioxane treatment. So, essentially, the water that currently goes into the stream is completely clean except for 1, 4-Dioxane.

MR. FOX: Yeah. I guess my only point is that somebody that fishes in that river, and I've done such since I was a kid, it seems like seven years is a long time to wrap our hands around that problem.

MS. BAXTER: We agree. We agree. And this is what -- we agree. It is a long time. Unfortunately, the whole process just takes -- it takes a long time. And, again, I don't know.

Mark, did you want to say anything

about the treatment plant and what the state's been doing to address that?

MR. HERZBERG: No, I don't think I have anything to say on that.

MR. FOX: Is there a discharge permit for that plant?

MR. HERZBERG: No.

MR. FOX: Is it in compliance with the dioxane levels?

MR. HERZBERG: I don't have the details on that.

MS. PARVIS: The plant is permitted and it is in compliance because there is no surface water criteria for 1, 4-Dioxane anywhere in the country, actually, because it has not been found to be of ecological risk. It -- obviously, if that surface water value is being used as a drinking water source for humans, then they would be using the 0.4 as a discharge criteria. But it is a permanent plant and they file discharge monitoring reports and it says that it was a proper facility to control all the drinking water.

MS. SEPPI: Becky, wait just a

second. I promised this gentleman he could go next.

MR. JAFFE: It's really very simple.

THE REPORTER: I'm sorry, your name again?

MS. SEPPI: Could you give your name again?

MR. JAFFE: Shelly Jaffe. You were talking about putting more pumping stations.

MS. BAXTER: Wells.

MR. JAFFE: Wells in, as well as upgrading the plant.

MS. BAXTER: Correct.

MR. JAFFE: What kind of time frame are we looking at for either or both of those items to be accomplished?

MS. BAXTER: To be implemented?

MR. JAFFE: Yeah.

MS. BAXTER: Okay. So, of course, funding is always an issue, but not thinking about funding, you know, we're planning on issuing this Record of Decision by September 30th of this year, no later

than that, and then we go on to the design phase, so that usually takes about at least a year, maybe two years to design the upgrade of the plant, to design the conveyance lines, the wells, we may have to do additional investigation to exactly figure out where we want to place the wells, these wells. So there's a little bit -- so the design itself takes a little time, about a year or two, and then after that, we bid out for a contractor and then the work gets started. So we're talking at least, I don't know, two, three years to get started, maybe four years.

MR. JAFFE: To accomplish --

MS. BAXTER: To get to construction.

MR. JAFFE: Right. I mean to accomplish, maybe like five? Four, five, six years?

MS. BAXTER: Hopefully, four, five, six years. I mean, the idea of -- I mean, this is really not a very complicated remedy. It's -- I think the hardest part is maybe just deciding where to put the

wells, but everything else is pretty straightforward. We will have to do a study to determine which methodology we're going to use to treat the 1, 4-Dioxane. We did one last year. There's other techniques out there that we're going to look at, so that's a thing we have to narrow down and we just have to design and spec it out. But it's not -- and then the OU2 is just long-term monitoring.

So, again, it's not a very complicated design. It's just we -- it just takes a little bit of time. It's not super complicated, so it shouldn't take that long to design.

MS. SEPPI: I'll get back to you. Sir, you were next.

MR. BARTOLI: Carl Bartoli. Couple of questions.

You show on this map this dotted periphery. The edges of the periphery here, is that where the dioxane level is permissible? In other words, it's below the level that's permissible?

MS. PARVIS: Well, that's -- so

that's the outer white line. It's outside of that, correct.

MR. BARTOLI: The second question is, have you measured the dioxane level coming out of the water treatment plant that's being basically discharged into these two streams here?

MS. PARVIS: Yes. The DEP analyzes that every month.

MR. BARTOLI: And what is the level?

MS. PARVIS: It's about, the average, twenty parts per billion.

MR. BARTOLI: So we have to get it down to four-tenths.

MS. BAXTER: No.

MS. PARVIS: Well, that's different. That's the groundwater standard. There is no surface water standard. And EPA will do five screening levels which is the only published numbers for 1, 4-Dioxane, 22,000 parts per billion, so it's because of its non-eco toxicity versus its toxicity to human beings.

MR. BARTOLI: Right. Now, I

realize that. But these waters wind up in the Raritan and North Branch and wind up in the reservoirs, you know, basically by Clinton and so forth. So, obviously, its dilution and more than dilution and -- but anyway, okay. Thank you.

MS. PARVIS: I get it. You know, it's when it doesn't have a criterion, there is no way to regulate that. And, you know, until somebody comes up with a solid number for 1, 4-Dioxane in surface water, what DEP is discharging is perfectly legal, so --

MS. SEPPI: Ma'am, in the back.

MS. BLACKWELL: Becky Blackwell again. I guess my question is surface water versus the consumption. That surface water is going right past us. Is there like a certain formula of how long will it take to leech into that or is that not? Am I being too naive, I guess? I'm not an engineer.

MS. PARVIS: Well, it really depends. Most of the wells are streamed hundreds and hundreds of feet deep, and if

you have a well close to the stream, in general, the groundwater is going up towards the land surface. So, you know, your well is down deeper and the groundwater is going up this way, it's not -- it wouldn't be going down. Only if you had a well really close to the landfill would you be seeing it going down into a well. In fact, people who are here, if you remember the former Millstone property division that they were going to build which is now Chester Park not far from here, the reason they didn't build it is because they installed some residential wells before they built the residences and they were very deep wells and they were contaminated from the landfill, so that's, you know --

MS. SEPPI: I think there was a woman in the back on this side that had a question. You had your hand up? No? Okay.

MS. HERRIDGE: Deborah Herridge again. So this engineer, you were describing how it's hard to extract the

dioxane from the water; that it sort of stays in the -- so my question is are there people that are on POET Systems in town and not on public water? And if so, how are those systems extracting that?

MS. BAXTER: Those POETs were -- they were gone and they were put on public waterline.

MS. HERRIDGE: Okay. So there's no more POET Systems for anyone. So anybody who had any kind of contamination in their well is now on public water.

MS. BAXTER: Correct.

MS. SEPPI: And just so you know the acronym, it's Point-of-Entry Treatment System, a POET.

MS. HERRIDGE: Right.

MS. SEPPI: Yes, ma'am?

MS. FRICKE: I'm Pat Fricke. I just was wondering where we could access this PowerPoint after we --

MS. SEPPI: Oh, that was going to be one of my closing statements. And, yes, I will give you that information. Well, I can give it to you right now.

MS. FRICKE: Okay.

MS. SEPPI: Once we have -- this is a final version, I'm assuming. Once Pam sends that to me in its final form and I think I already have it --

MS. BAXTER: No, you don't.

MS. SEPPI: That -- okay.

MS. BAXTER: No. Yeah, it was changed. No, it was changed when I gave it to you yesterday.

MS. SEPPI: Okay, fine. And then what we'll do is we'll post it on our web page which is a, you know, Combe Fill South EPA web page and also, if it's all right with the mayor, I will send it to you and maybe you could have it posted on your web page, also. So if anyone -- or you can just have a link or something so people can get to it, but I think it would be good for people to see it.

MS. FRICKE: Would that be at the epa.gov/superfund/combe-fill-south?

MS. SEPPI: That's it. That's what I said. If you just Google it.

Sir in the back?

MR. HANSBURY: Steve Hansbury. Just a very small point. You're listing the address for the Chester Library.

MS. SEPPI: I know. It says Kearny. I know. It's not Kearny.

MR. HANSBURY: So you know that.

MS. SEPPI: Yes, I found that out today. You were already gone. I sent you the email.

MS. BAXTER: Oh, yeah?

MS. SEPPI: I know. Because I'm reading it, I went how could the Chester Library be in Kearny?

MS. BAXTER: I thought I took it out. Okay.

MS. SEPPI: Yeah. Sorry about that, but yes.

MS. BAXTER: We'll make that correction.

MS. SEPPI: We'll make that before we get this final version to you. Yes.

Sir?

MR. DRAG: I'm sorry, Tim Drag. One last question.

THE REPORTER: I'm sorry, your

name?

MR. DRAG: Tim Drag. Drag. What a drag!

Are you guys capturing a hundred percent of the leachate from these sites including the north where you said there was pharmaceutical waste or is any of that leachate still going into the ground?

MS. PARVIS: Yeah, there's water going into the ground.

MR. DRAG: So you haven't -- so you haven't found a way to capture all of that leachate from going any further, so it's still technically polluting the ground.

MS. PARVIS: When the OU1 extraction system was constructed, it was not a leachate -- a collection system, it was just an overburden collection system. The original design was leachate collection, but we're talking twenty-something years ago.

MR. DRAG: I thought I saw something in the presentation early on where you said you were capturing the

leachate.

MS. METZ: That's our goal.

MR. DRAG: That's your goal. Do you anticipate being able to capture 100 percent of that leachate?

MS. BAXTER: Well, we'll find out. That's our goal.

MS. PARVIS: Yes, we're working on that.

MR. DRAG: Okay.

MS. METZ: But, you know, I think the waste is directly on top of the bedrock. As Patty explained, like, there's a lot of fracturing going on, so it is very complicated.

MR. DRAG: Okay.

MS. SEPPI: Any more questions? Yes, sir?

MR. FOX: This is Paul Fox. As far as the source removal goes, what sort of volume of material are you looking at removing from the landfill this go-around?

MS. SEPPI: Andrew, can you stand up?

MR. WATSON: Yes. Well, first of

all, we're obviously -- the landfill is going to be -- we're talking about a small portion of the former North Waste -- well, of the North Waste Cell. The DEP, 10 years ago, by and large, at least two-thirds of it, there's a portion of it I believe still in place that's contributing, you know, to a lot of pharmaceuticals that's contributing. To answer your question, we need to figure out the volume.

MS. BAXTER: Well, we can. We have it surveyed. We have it EPA surveyed.

MR. WATSON: Yeah, it's surveyed.

MS. PARVIS: Somehow I think it's 14,000, something like that.

MR. WATSON: Yeah, it was --

MR. ZIMMERMAN: It was a lower number than that.

MR. WATSON: It was a couple hundred.

UNIDENTIFIED MAN: Why wasn't it taken out the first time? Couldn't get to it or --

MS. BAXTER: The DEP decided not to excavate under the road.

MR. WATSON: Now, we should also mention the landfill and the North Waste Cell is capped, so in theory, you know, we have a, you know, a permeable cap over the landfill so that additional rainwater isn't getting into the landfill and they do have an active treatment system where they're extracting to that.

As we mentioned, part of our design -- you know, you asked the question can we get a hundred percent. Yeah, we'd love to get a hundred percent. The goal in '86 was to get a hundred percent but it's a challenging thing in practice. So what we're proposing is digging out the rest that we believe is pretty, you know, potentially hot source area, getting rid of that and then upgrading the system so that we can get a hundred percent.

MR. DRAG: But it's just a living, breathing project, meaning you do this work and you find out you caught 50 percent of the leachate, are you going to say, okay, well, now if we go in on this side, we can get another hypothetical ten percent and

then another ten percent? Or is this seven years later, you're going to come back and go, all right, now we're going to go and get the other seventy percent?

MR. WATSON: Well, part of the remedies are annual monitoring, long-term monitoring. Pam mentioned there was a five-year period, so it's not like -- you know, there is -- I understand the frustration of length of time going on with seemingly maybe not the results you would like, but there is a lot of investigation in trying to understand and improve and tweak the system.

MS. PARVIS: And as part of the design, we do pump test to simulate what it would be like if the treatment plant were running as it is planned on running. So we do these tests in advance to make sure we have the wells in the right location to capture the most leachate problem.

MR. DRAG: I think my concern is, is it going to be another seven years before you go back and try to fix what you're putting in now?

MS. BAXTER: No. Again, there will be a five-year review. After we do all the -- implementing the remedies, after construction completion, we do a five-year review. So five years later, we come back, we've got the data for five years and we see if the remedy is functioning as intended. So it's a process. Every five years, we go through that. But the thing is we don't wait till five. I mean, if we see something going on at year one or two, then yes, we're going to go and try to tweak it and do what we can. We don't wait till just five years. But the idea of primary review is that you have enough data to do this comprehensive study and so if there's a problem, then we'll fix it right away.

MS. METZ: And part of the reason we're making the OU2 remedy interim instead of a final remedy is we accept that we don't know the answers right now, so we're going to have to evaluate the data as we make adjustments and at some point in the future, propose a final remedy. So this

will not be the final remedy for the site.

MS. SEPPI: Yes, sir?

MR. BARTOLI: Carl Bartoli again. This pharmaceutical waste that you discovered, is it under the cap or is it outside the cap or at the periphery?

MR. WATSON: So all of -- all of the waste is under the cap. When DEP found, back in the early 2000s, it was outside the cap, part of that remedy was to excavate and then extend the cap over that, so all of the known waste is capped.

MS. SEPPI: Thank you. Yes, sir, in the back?

MR. FRICKE: Hi. Rusty Fricke. Just -- you probably can't answer this effectively but property values. So now you have a public forum and your property values -- and, obviously, somebody looking to come into town may feel differently. I'm just curious if you do studies or what you guys do if there's any -- if it's really completely out of your jurisdiction, I understand, but I'm just curious.

MS. BAXTER: I think it's out of

our jurisdiction, but I do want to make a couple points. When we put in the waterline, we put in fire hydrants, so everything would increase the property value, so you didn't have that before, so that was significant and -- I'm sorry? Oh. So, but we don't do an assessment of what it's worth now. I mean, I could only just assume that if we have contamination under control, that that shouldn't really affect the property values and that's kind of what we're trying to do.

MS. SEPPI: Yes?

MR. BARTOLI: Just a general question. I believe there's another Superfund site off Parker Road behind the Fairmount Fire Station there. I think that's in Washington Township there. Does that have any effect on this or --

MS. SEPPI: Do you know the name of it?

MS. BAXTER: Oh, Cleveland.

MS. SEPPI: It's not a Superfund.

Oh, so it's a state lead? Can the state come up?

MR. HERZBERG: Yeah. Mark Herzberg. So not every contaminated site can go through the Superfund program or process. Pam explained this process of ranking them and that was handled through state programs. Similarly, it has a groundwater plume contaminated from that, some similarities in terms of the major fractures that run through that area, a waterline that was put in to service probably a couple hundred homes around that area and a great deal of work in excavating certain portions of the site and more that needs to be done. But, yeah, there are, as I think the comment was made, other sites around town, former industrial sites, former landfills, gas stations. Every town's got a list of sites.

MS. SEPPI: I can tell you that in New Jersey, this always astounds me, you know, it's a relatively small state and very, very industrial, we have more Superfund sites than any state in the whole country. And I like to think it's because we're so proactive in getting it cleaned

up. Yeah. But we have about a hundred and 14 now, 115.

MS. BAXTER: Yeah, about 114.

MS. SEPPI: Yeah, out of about 14 -- 13, 1400 throughout all the states.

Okay. Any more questions?

Well, this has really been very informative. I mean, we've had lots of good questions and comments tonight. And, you know, so Pam will be working hard now in making her decision and, you know, taking a look at all the comments when we get the transcript from Susan. And what I'll do is when -- you know, we'll let you know when the Record of Decision is out and, you know, we'll send out -- and if there's anybody signed in with an email, you know, I can send it out directly to them or I'll send it to the town but, you know, we'll get the word out about that. It will also be on our web page, but look for it around the end of September, right, Pam?

MS. BAXTER: Yeah. It wouldn't be past September 30th.

MS. SEPPI: Right. That's the end of our year, September 30th, the end of our fiscal year. So remember, if you still have any more comments, if you think of anything when you go home, don't hesitate to email or snail mail Pam. Her information is on the website.

MS. BAXTER: And those who came in and didn't sign in, would you please sign in in the back? Thank you very much for coming.

MS. SEPPI: Thank you very much. Thank you.

(Thereupon, the meeting concluded at 8:54 p.m.)

REPORTER'S CERTIFICATION

I, SUSAN R. CHASTEK, Certified Court Reporter and Notary Public of the State of New Jersey, do hereby certify that the foregoing is a true and accurate transcript of the proceedings as taken stenographically by and before me at the time, place, and on the date hereinbefore set forth.

I DO FURTHER CERTIFY that I am neither a relative nor employee nor attorney nor counsel of any party in this action and that I am neither a relative nor employee of such attorney or counsel, and that I am not financially interested in the event nor outcome of this action.

SUSAN R. CHASTEK, CCR, RMR
Certificate No. 30XI00079100

Dated: August 31, 2018

Attachment D
Written Comments

From: Liz Holtz [mailto:lizholtz02@gmail.com]
Sent: Monday, August 27, 2018 3:17 PM
To: Baxter, Pamela <baxter.Pamela@epa.gov>
Subject: Combe Landfill questions

hi -

Thank you for coming to Chester Twsp last week and taking the time to go over the Combe Landfill issues. I do have a couple of questions pertaining to the water line and subsequent testing.

- When the water line along Parker / School House was established, my understanding was that our water is coming from a new well on Parker Rd that ties into the existing Washington Twsp wells that are used for public water. We get our water bill from the WTMUA. Per the water testing reports on their website, they are not testing for the new 1,4-dioxane contaminant. Are there any plans to test for it? Attached is the most recent report.

- When the water line was established, homeowners were told that could not keep their existing wells as capping off only some wells would shift the groundwater and wells that were not previously contaminated could become contaminated. The reason given was this was largely due to the bedrock in the area - there was no way to predict which way the water might flow. I understated that there are 100+ monitoring wells in the perimeter areas established by the EPA. Are those wells testing for the 1,4-dioxane? If not, are there plans to test them?

- To add to that question, why are there no plans to extend the areas of testing to State Park Rd? If the last time their water was tested was in the 1980's, it certainly seems like they're due. I recall from the meeting that part of the treatment plan was to almost triple the pump capacity of the aquifer - and is necessary to do so to improve containment of the contaminated groundwater. The logical conclusion is that the water has potentially spread outside the original testing area. There are many local streams within the Parker Rd perimeter that flow towards State Park Rd. It was made clear at the meeting that homeowners can't easily get their water tested for this containment from local testing companies themselves. I understand that the stance of the EPA is that State Park Rd is out of the established range, but EPA should provide the testing to homeowners, even if it is just to establish peace of mind.

Respectfully,
Liz Holtz
5 Parker Rd., Chester

From: Wendell Miyaji [mailto:wmiyaji@att.net]
Sent: Friday, September 07, 2018 4:56 PM
To: Baxter, Pamela <baxter.Pamela@epa.gov>
Subject: Combe Fill South Landfill comments - Miyaji

Dr. Baxter,

Please find attached my comments in support of the Proposed Plan for the Combe Fill South Landfill.

Thank you,

Wendell Miyaji

7 September 2018
Dr. Pamela Baxter
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, NY 10007
by email: baxter.pamela@epa.gov

Re: Combe Fill South Landfill Superfund Site, Chester Township, New Jersey

Dear Dr. Baxter:

First, let me thank and commend you and the Environment Protection Agency for the wonderful efforts to help protect the health and well being of my family, friends, and neighbors in Chester Township, New Jersey as well as the opportunity to comment herein. Although I was out of town and unable to participate in the presentation to the Township on August 22, 2018, I have since had the opportunity to review the proposed plan, the Power Point presentation and some of the study documents prepared for you by Henningson, Durham & Richardson.
Until now I was not aware of the Combe Fill South Landfill Site and its deleterious impact on our community. As I am sure you expect, the discovery that the eight groundwater contaminants that continue to flow away from the landfill deeply concern me. The increased cancer risks and elevated blood lead concentration levels in young children is doubly disturbing.

Given the conclusions of the Human Health Risk Assessment, “remediation is necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants from this Site”, I unequivocally endorse the immediate adoption and implementation of this Superfund Proposal Plan.

As the record indicates, the Agency is proposing to adopt the aggressive remedial alternative for Operable Unit 1 - “Upgrade OU1 Ground Water Extraction Treatment System, Additional groundwater extraction and source removal with Long Term Monitoring/Institutional Controls”.

However, the Agency appears to be proposing the middle ground remedial alternative for Operable Unit 2 - “Long-term monitoring/institutional controls”. As the plan indicates that the OU2 remedy is interim and dependent on additional monitoring, I would ask that the Agency continue to provide regular communications to the public as to the status of the additional supporting data obtained during the groundwater and surface water monitoring for OU2 and provide for additional public comment prior to the adoption of the Record of Decision for OU2. Once again, thank you for providing a vehicle to participate in this proceeding and best wishes for successful resolution of these issues at the Combe Fill South Landfill.

Sincerely,
Wendell Miyaji
Wendell Miyaji, PhD
3 Winding Way
Chester, NJ 07930

APPENDIX 4
Administrative Record Index File

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

08/10/2018 **REGION ID: 02**

Site Name: COMBE FILL SOUTH
CERCLIS ID: NJD094966611
OUID: 01/02
SSID: 0256
Action: OU1 ROD Amendment / OU2 ROD

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name/Organization:	Author Name/Organization:
503389	8/10/2018	ADMINISTRATIVE RECORD INDEX FOR OU1 RECORD OF DECISION AMENDMENT AND OU2 RECORD OF DECISION FOR THE COMBE FILL SOUTH SITE	2	Administrative Record Index		(US ENVIRONMENTAL PROTECTION AGENCY)
40122	09/23/1986	Memorandum to Mr. Christopher J. Daggett, Regional Administrator, U.S. EPA, Region II, from Mr. James R. Marshall, Acting Director, Emergency & Remedial Response Division, U.S. EPA, re: Record of Decision for the Combe Fill South...	68	Memorandum	DAGGETT,CHRISTOPHER,J (US ENVIRONMENTAL PROTECTION AGENCY)	MARSHALL,JAMES,R (US ENVIRONMENTAL PROTECTION AGENCY)
40121	Undated	Report: Responsiveness Summary. Completion of Remedial Investigation/Feasibility Study, Combe Fill South Landfill. Chester and Washington Townships-Morris County. New Jersey.undated.	24	Report		
96226	04/17/2006	EXPLANATION OF SIGNIFICANT DIFFERENCES, COMBE FILL SOUTH LANDFILL SUPERFUND SITE, CHESTER TOWNSHIP, MORRIS COUNTY, NEW JERSEY	195	Report		(US ENVIRONMENTAL PROTECTION AGENCY)
238718	06/30/2011	CLOSEOUT REPORT, OPERABLE UNIT 1, REMEDIAL ACTION FOR THE COMBE FILL SOUTH LANDFILL SITE	67	Report	(US ENVIRONMENTAL PROTECTION AGENCY)	(NJ DEPT OF ENVIRONMENTAL PROTECTION)
528389	08/08/2018	NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION CONCURRENCE ON THE PROPOSED PLAN FOR OU1/OU2 FOR THE COMBE FILL SOUTH SITE	2	Publication		(US ENVIRONMENTAL PROTECTION AGENCY)

550182

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

08/10/2018 **REGION ID: 02**

Site Name: COMBE FILL SOUTH
CERCLIS ID: NJD094966611
OUID: 01/02
SSID: 0256
Action: OU1 ROD Amendment / OU2 ROD

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name/Organization:	Author Name/Organization:
538163	8/10/2018	REMEDIAL INVESTIGATION REPORT FOR OU2 FOR THE COMBE FILL SOUTH SITE	277	Report	(US ENVIRONMENTAL PROTECTION AGENCY)	(HENNINGSON, DURHAM & RICHARDSON ARCHITECTURE AND ENGINEERING PC)
538165	8/10/2018	REMEDIAL INVESTIGATION REPORT FOR OU2 - APPENDICES A THROUGH BB FOR THE COMBE FILL SOUTH SITE	2901	Report	(US ENVIRONMENTAL PROTECTION AGENCY)	(HENNINGSON, DURHAM & RICHARDSON ARCHITECTURE AND ENGINEERING PC)
550140	8/10/2018	REMEDIAL INVESTIGATION REPORT FOR OU2 - APPENDIX CC - BASELINE HUMAN HEALTH RISK ASSESSMENT FOR THE COMBE FILL SOUTH SITE	209	Report	(US ENVIRONMENTAL PROTECTION AGENCY)	(HENNINGSON, DURHAM & RICHARDSON ARCHITECTURE AND ENGINEERING PC)
550141	8/10/2018	REMEDIAL INVESTIGATION REPORT FOR OU2 - APPENDIX DD - SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT (SLERA) FOR THE COMBE FILL SOUTH SITE	490	Report	(US ENVIRONMENTAL PROTECTION AGENCY)	(HENNINGSON, DURHAM & RICHARDSON ARCHITECTURE AND ENGINEERING PC)
538162	8/10/2018	FEASIBILITY STUDY REPORT FOR OU2 FOR THE COMBE FILL SOUTH SITE	370	Report	(US ENVIRONMENTAL PROTECTION AGENCY)	(HENNINGSON, DURHAM & RICHARDSON ARCHITECTURE AND ENGINEERING PC)
503388	8/10/2018	PROPOSED PLAN FOR OU2 FOR THE COMBE FILL SOUTH SITE	21	Publication		(US ENVIRONMENTAL PROTECTION AGENCY)

APPENDIX 5
State Letter of Concurrence

State of New Jersey
Department of Environmental Protection
P.O. Box 420
Trenton, New Jersey 08625

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

CATHERINE R. McCABE
Commissioner

September 28, 2018

Ms. Angela Carpenter, Acting Director
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
Region II
290 Broadway
New York, NY 10007-1866

Re: Combe Fill South Landfill Superfund Site
Record of Decision
Operable Unit 1 Amendment, Operable Unit 2 Interim
DEP PI# G000004005
EPA ID# NJD094966611
Chester Township, Morris County

Dear Ms. Carpenter:

The New Jersey Department of Environmental Protection (DEP) completed its review of the "Record of Decision, Amendment -- Operable Unit 1, Interim -- Operable Unit 2, Combe Fill South Superfund Site, Chester, Morris County, New Jersey" prepared by the U.S. Environmental Protection Agency (EPA) Region II in September 2018 and defers concurrence on the selected remedies until treatment technologies are further evaluated for 1,4-dioxane contamination in groundwater at the site during Remedial Design, and a specific method and cost for the Remedial Action is developed.

DEP agrees that adding deep extraction wells at the site to improve hydraulic control of groundwater contamination from the landfill and adding treatment for 1,4-dioxane is supported by the recent RI/FS and should be included as a selected remedy in the Record of Decision for the site. This is notable because 1,4-dioxane contamination, one of several emerging contaminants in the region and nationally, from a landfill source will be included in a Record of Decision selected remedy for active treatment to restore an aquifer for the first time.

Further, DEP supports the Remedial Action Objectives and Preliminary Remediation Goals included in the Record of Decision for the site. Specifically, DEP agrees that including federal and state Maximum Contaminant Levels and state Groundwater Quality Standards as Remediation Goals will support restoration of the groundwater resource impacted with 1,4-dioxane contamination from the landfill.

DEP recommends deferring the work proposed in the North Waste Cell area until additional borings and groundwater conditions are analyzed, and after the proposed expansion and upgrade in treatment begins. Past groundwater well results have shown improved conditions in the area since the initial North Waste Cell work. Also, the lack of contamination in the one boring drilled in the North Waste Cell area further supports conducting delineation of any potential remaining landfill waste prior to implementing a Remedial Action at this location and disrupting the existing landfill cap. While this point may not have been explained in full at the recent public meeting on August 22, 2018, it warrants continued scrutiny by both agencies during the Remedial Design.

DEP appreciates the opportunity to participate in the decision-making process to select an appropriate remedy for this site. As we continue to expand our collaborative efforts with EPA Region II's Emergency and Remedial Response Division, DEP looks forward to future cooperation to select a treatment technology for 1,4-dioxane to ensure protection of the groundwater resource and residential and public drinking water supplies.

If you have any questions, please call me at 609-292-1250.

Sincerely,

Mark J. Pedersen
Assistant Commissioner
Site Remediation & Waste Management Program

C: Kimberly O'Connell, Acting Chief, New Jersey Remediation Branch, EPA Region II
Kenneth J. Kloo, Director, Division of Remediation Management, DEP
Edward Putnam, Assistant Director, Publicly Funded Response Element, DEP
Frederick A. Mumford, Section Chief, Publicly Funded Response Element, DEP