Superfund Program
Proposed Plan

U.S Environmental Protection Agency
Region 2

Cornell-Dubilier Electronics Superfund Site

South Plainfield, New Jersey

September 2014

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the preferred alternatives to address the contaminated sediments, floodplain soils and groundwater within the Bound Brook corridor as Operable Unit 4 of the Cornell-Dubilier Electronics (CDE) Superfund site.

This Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA), in partnership with the New Jersey Department of Environmental Protection (NJDEP). EPA is issuing the Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The nature and extent of the contamination in the Bound Brook corridor and the remedial alternatives summarized in this Proposed Plan are described in greater detail in two documents: the *Remedial Investigation Report* and the *Feasibility Study Report for Operable Unit 4: Bound Brook*. These and other documents are part of the publicly-available administrative record file. EPA encourages the public to review these documents to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the site.

EPA in consultation with NJDEP will select a final remedy for each medium identified (contaminated sediments, floodplain soils, and groundwater) after reviewing and considering all information submitted during the 45-day public comment period. EPA, in consultation with NJDEP, may modify the Preferred Alternatives per media or select another response action presented in this Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented within this Proposed Plan.

MARK YOUR CALENDARS

Public Comment Period
September 30, 2014 to November 14, 2014
EPA will accept written comments on the Proposed Plan during the public comment period.

Public Meeting
October 21, 2014 at 7:00 P.M.
EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the South Plainfield Senior Center located at 90 Maple Avenue, South Plainfield, New Jersey.

For more information, see the Administrative Record at the following locations:

EPA Records Center, Region 2
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308
Hours: Monday-Friday – 9 A.M. to 5 P.M.

South Plainfield Public Library
2484 Plainfield Avenue
South Plainfield, New Jersey 07080
(908) 754-7885
Please refer to website for hours:
http://www.southplainfield.lib.nj.us/

EPA's preferred remedy includes excavation of floodplain soils and Bound Brook sediments containing polychlorinated biphenyls (PCBs) with off-site transportation and disposal. This action would include the excavation of an area adjacent to the former CDE facility where buried PCB-contaminated capacitors are present. EPA's preferred remedy also would address contaminated groundwater that discharges to Bound Brook, through hydraulic containment. Finally, EPA's preferred remedy would relocate a 36-inch waterline that traverses the former CDE facility in order to protect the integrity of the facility remedy and future remedies implemented in Bound Brook. In a 2012 Record of Decision (ROD) to address the site groundwater contamination, EPA evaluated alternatives for restoration of groundwater to meet Applicable or Relevant and Appropriate Requirements (ARARs) and concluded that no practicable alternatives could be implemented. (The selected remedy for groundwater relies primarily on institutional controls and long-term groundwater monitoring to prevent use of untreated groundwater as a source of drinking water.) Consequently, as part of the 2012 ROD, EPA invoked an ARAR waiver for the groundwater at the site due to technical impracticability (TI). The 2012 ROD deferred a TI determination for a small area of the groundwater plume that discharges contaminated groundwater to Bound Brook, because that part of the groundwater plume would be evaluated further as part of the remedy selection process for Bound Brook (this action). In addition to the groundwater action that is a component of EPA's preferred remedy presented in this Proposed Plan, EPA has also concluded that the groundwater ARAR waiver should be expanded to include the area deferred in the 2012 ROD, due to the technical impracticability of restoration of this groundwater.

SITE DESCRIPTION

Cornell-Dubilier Electronics, Inc., operated a facility at 333 Hamilton Boulevard, South Plainfield, New Jersey (former CDE facility), from 1936 to 1962, manufacturing electronic parts and components including capacitors. During site operations, the company released/buried material contaminated with PCBs and chlorinated volatile organic compounds (VOCs), primarily trichloroethylene (TCE), which resulted in contaminating the surrounding site soils. EPA also detected PCBs and VOCs in the groundwater and PCBs on nearby residential, commercial and municipal properties. Further EPA investigations have found PCBs and VOCs in the surface water and sediments of Bound Brook and downstream floodplain soils.

To address the impact of the site on the community early in the Superfund process and to effectively manage site complexities, the CDE site was divided into four operable units (OUs), shown on Figure 1. EPA signed a Record of Decision (ROD) in 2003 for Operable Unit One (OU1) that addressed residential, commercial, and municipal properties in the vicinity of the former CDE facility. In 2004, EPA signed a ROD for Operable Unit Two (OU2) that addressed contaminated soils and buildings at the former CDE facility. In 2012, EPA signed a ROD for Operable Unit Three (OU3) addressing contaminated groundwater. The final action linked to the CDE site is referred to as Operable Unit Four (OU4). For OU4, which is the subject of this Proposed Plan, EPA performed a 10-mile remedial investigation (RI) of Bound Brook. Bound Brook, located in Middlesex County, New Jersey, is a secondary tributary of the Raritan River. The headwaters of Bound Brook originate in areas of Edison Township. Bound Brook flows westerly through the Borough of South Plainfield and into Piscataway Township, where the water is dammed to form New Market Pond, and then flows through Middlesex Borough to the confluence with Green Brook. Green Brook flows to the Raritan River.

The RI results determined that site-related contamination is found within the Bound Brook corridor. The OU4 RI addresses all detected contamination found in the stream channel, adjacent floodplain soils, and tributaries. The OU4 RI also addresses the portion of the contaminated groundwater that was not addressed by the OU3 remedy (i.e., groundwater that discharges to Bound Brook). Additional figures depicting the scope of the Bound Brook investigation can be found in the Administrative Record for the site.

SITE HISTORY

The 26-acre property known as the former CDE facility is located adjacent to Bound Brook. Prior to CDE, the Spicer Manufacturing Company operated on the property from 1912 to 1929, manufacturing universal joints and other automobile components. CDE then manufactured electronic components at the facility, including PCB-containing capacitors, from 1936 to 1962. Much of the PCB-contaminated debris and soil found on site contained Aroclor 1254, suggesting that this was the primary PCB product during much of the company's operations, although Aroclor 1242 was also detected. ("Aroclor" is a PCB trade name that refers to specific chlorinated biphenyl mixtures.) In addition to PCBs, chlorinated organic degreasing solvents, primarily TCE, were used in the manufacturing process. As a result, the primary site-related chemicals of concern are PCB compounds and VOCs. After CDE departed from the facility in 1962, it was operated as a rental property for commercial and light industrial tenants.

In the mid-1980s, NJDEP investigated the presence of tetrachloroethylene (PCE), TCE, and other VOCs in residential wells on Pitt Street in South

Plainfield, to the south and west of the former CDE facility. NJDEP identified the former CDE facility, then known as the Hamilton Industrial Park, as a potential source of this contamination, but investigations at the time were inconclusive.

Testing by NJDEP in the early 1990s led to a request that EPA consider the site for potential emergency response actions, and between 1994 and 1996, EPA conducted sampling at CDE and detected elevated PCB concentrations. In March 1997, EPA ordered the property owner, D.S.C. of Newark Enterprises, Inc. (DSC), to perform a removal action to mitigate contaminated soil and surface water runoff from the facility. In response, DSC paved driveways and parking areas in the former CDE facility, installed a security fence, and implemented drainage controls.

The CDE site was placed on EPA's National Priorities List in July 1998.

Investigations in the late 1990s also found extensive Bound Brook contamination (discussed in detail below), and PCB contamination on properties near the facility. EPA's investigations found PCB-contaminated soil and interior dust on residential, commercial, and municipal properties in the vicinity of the former CDE facility. These findings led to a series of removal actions on nearby properties, performed by EPA and potentially responsible parties (PRPs), and led EPA to focus OU1 on a further investigation of nearby properties. In September 2003, EPA selected an OU1 remedy to address PCB-contaminated soils and interior dust at properties in the vicinity of the former CDE facility. The remedy required the excavation, off-site transportation, and disposal of PCB-contaminated soils, and property restoration. The OU1 remedy also called for interior dust cleaning at properties where PCBs were detected indoors. EPA began remediating the first OU1 properties in 2005; remediation work was substantially completed in 2014. As of February 2014, over 135 properties have been sampled as part of the OU1 remedy (including properties sampled during earlier phases of investigation), leading to remedial actions at 34 properties.

The OU2 RI began in 2000, and included the collection of soil, sediment, and building surface samples as well as installation and sampling of 12 shallow bedrock monitoring wells. Subsequently, EPA issued an OU2 ROD in 2004. The main components of the OU2 remedy included:

- demolition of buildings; excavation of an estimated 107,000 cubic yards of the most highly PCB- and VOC-contaminated soil;
- on-site treatment of excavated soils using low temperature thermal desorption (LTTD), followed by backfilling of excavated areas with treated soils;
- transportation of contaminated soil and debris not suitable for LTTD treatment to an off-site facility for disposal, with treatment as necessary;
- installation of engineering controls including a multi-layer cap or hardscape; and implementation of institutional controls.

In 2006, the OU2 remedial action began and was substantially completed in September 2012. While still in the planning stage, the Borough of South Plainfield has identified the property as part of a redevelopment zone, with the potential for commercial reuse consistent with the implemented remedy.

As previously mentioned, site-related groundwater contamination was initially investigated in 2000. EPA initiated the OU3 RI in 2008 by adding eight bedrock monitoring wells to the monitoring well network. These bedrock wells were installed to a depth of 150 feet below ground surface (bgs). A further expansion of the monitoring well network added 14 additional bedrock monitoring wells, four of which were cored for lithologic characterization and rock matrix diffusion sampling. The well depths ranged from 65 feet to 600 feet bgs, resulting in a monitoring network comprised of 34 wells with 137 discrete sampling intervals.

The OU3 RI revealed a complex groundwater flow regime in highly fractured bedrock, with high levels of VOCs and other compounds trapped within the pore spaces of the Passaic Formation (consisting of shale, mudstone and sandstone). The investigation also revealed several high capacity water supply pumping centers that exert significant control over the regional groundwater flow regime, several of which have been intermittently operational since the releases occurred at the former CDE facility. These hydraulic influences led to an extensive, area-wide VOC groundwater plume, and allowed for a wider distribution of contamination to the bedrock pore spaces.

EPA issued the OU3 ROD in September 2012. The remedy selected in the ROD included institutional controls and long-term monitoring of groundwater and vapor intrusion, and incorporated a waiver of groundwater ARARs due to technical impracticability.

The OU3 ROD also identified the potential for contaminated groundwater discharge to surface water at levels that would pose an unacceptable risk. Specifically, the OU3 ROD required further assessment of the potential for release of PCBs from the groundwater to surface water, and deferred a decision on contaminated groundwater that had the potential to discharge to the brook to the OU4 remedy.

OU4 CHARACTERISTICS

Previous Sampling Efforts and Results

In 1997, EPA collected soil, sediment and surface water, developing a preliminary characterization of a 2.4-mile stretch of the stream corridor near the former CDE facility. EPA also collected biota samples (small mammals, crayfish, forage fish, and edible fish) along Bound Brook and conducted sediment toxicity testing to support a preliminary ecological risk assessment (ERA). The ERA concluded that the structure and function of the stream ecosystem within Bound Brook and its corridor was at risk from chemical contamination. In response, on August 8, 1997, NJDEP issued an interim fish consumption advisory for Bound Brook and New Market Pond. The ERA conclusions are found in the 1999 *Final Report: Ecological Evaluation for the Cornell-Dubilier Electronics Site.*

Because most of the Bound Brook watershed is developed, with many industries and potential sources of contamination, EPA concluded that a study of the entire Bound Brook corridor would be necessary. EPA also addressed known source areas (e.g., the OU2 facility) first.

In addition to the preliminary Bound Brook sampling in 1997, a number of sampling activities took place between 1999 and 2008 that were incorporated into EPA's overall understanding of the site:

- In April 1999, NJDEP collected sediment samples from 33 locations in Spring Lake, Cedar Brook, and a second tributary stream between Maple Avenue and Cedar Brook. The samples were analyzed for PCBs and pesticides. Results in surface and subsurface sediments from Spring Lake and its tributaries were non-detect.
- In 1999, as part of the OU1 investigation, EPA collected samples from residential properties bordering the Bound Brook at Fred Allen Drive and Sillaci Lane to determine whether flooding may have resulted in PCB contamination at these properties. Sampling indicated that the residential properties were not affected, but that the neighboring floodplain soils did have PCB contamination.
- In 1999, buried debris was discovered in Veterans Memorial Park, primarily in the form of roofing materials and asbestos. Working with the Borough of South Plainfield, EPA tested the debris and soils in the park, concluding that the debris did not originate from the CDE operations but that low levels of PCBs (presumably deposited from flooding) were found in buried soils at the park. South Plainfield performed an extensive debris removal action under NJDEP direction, with the understanding that EPA would evaluate the PCB residues as part of its Bound Brook study.
- In April 2007, erosion exposed buried capacitor debris on the banks of the Bound Brook nearby the former CDE facility. In response, in the Fall of 2008, EPA conducted a removal action to armor the banks of Bound Brook with geotextile fabric and rip-rap adjacent to the former CDE facility and along the wetlands that border the former CDE facility property.
- During implementation of the OU2 remedy, soil sampling and test pits identified high levels of PCBs and buried capacitors along the edge of the OU2 remedy's southern and eastern boundaries, adjacent to the Bound Brook, indicating that buried capacitors were present throughout that area.
- In response to the conditions addressed in the 2008 removal action (armoring of the stream banks and the discovery of additional buried capacitors near the Bound Brook, EPA performed a follow-up investigation of sediments, surface water and biota, which updated the 1997 preliminary ERA. EPA collected additional fish and invertebrate (clam) samples in Bound Brook to reassess ecological risks and to "fingerprint" the PCB congeners[1]

[1] PCBs are a group of 209 different compounds. A PCB congener is any single, well-defined chemical compound in the PCB category. Environmental studies sometimes focus on specific PCB congeners (rather than "total PCBs") because different PCB congeners were used for different purposes, and certain PCB congeners have demonstrated more pronounced health effects in the environment.

within Bound Brook between the former CDE facility and New Market Pond. In addition, 12 sediment samples were analyzed for PCB congeners and considered in the reassessment. These sediment samples were co-located with some of the biota stations. The 2008/2009 Reassessment supported the 1997 conclusion that an ecological risk to fish and wildlife exists within the Bound Brook corridor, including Spring Lake. The reassessment also suggested that no improvement in sediment/biota conditions had occurred during the intervening 11 years.

All previous surface water, sediment, and soil sampling results from the Bound Brook were incorporated into the 2014 OU4 RI. In addition, the OU4 study area includes the stretch of Bound Brook that flows through the Woodbrook Road Dump Superfund site. The Woodbrook site is a former dump that accepted household and industrial waste as well as CDE capacitors. The Woodbrook site was listed on the NPL in 2003. Bound Brook sediment and surface water data collected during the investigation of the Woodbrook site were also incorporated into the OU4 RI.

<u>Site Overview</u>

A River Mile (RM) system was developed for the OU4 RI, with RM0 placed at the confluence of Bound Brook and Green Brook (Figure 1). This river mile system was used to position RI sampling locations, reference historical sampling locations, and describe the location of prominent site features. The upstream extent of the investigation area ended at RM8.3, the Talmadge Road Bridge on Bound Brook in Edison Township. The downstream extent is at RM (-1.6) nearby the Shepherd Avenue Bridge on Green Brook in Bridgewater.

The upland areas surrounding the OU4 study area contain a mixture of land uses including residential, commercial, industrial (including railroads), and recreational or undeveloped land.

Physical Characteristics of the Site

A few notable prominent site features in the OU4 study area include: Confluence of Bound Brook and Green Brook (RM0); New Market Pond dam (RM3.4); Confluence of Bound Brook and Cedar Brook (RM5.75); Twin Culverts (RM6.55) near the former CDE facility; Woodbrook site (RM7.4 to RM7.8); and, Talmadge Road Bridge (RM8.3).

A 1.6-mile stretch of Green Brook was included in the RI for potential site-related impacts. Green Brook has comparatively higher flows compared to Bound Brook and its sediment bed consists of coarse-grained material. The floodplain uses in this area are characterized as residential and public land, similar to the Green Brook's confluence with Bound Brook. Downstream of New Market Pond, Bound Brook is comparatively shallow and its bed consists of coarse-grained material. The brook flows through a residential neighborhood with some light industrial/commercial use surrounded by forested lands.

New Market Pond is a constructed impoundment that stretches from RM3.4 to RM4.1. The pond originally served as a mill pond and was constructed in the early nineteenth century. The pond was dredged in 1985-1986 to a projected depth of 3 feet on the eastern side, transitioning to 6 feet on the western end near the dam. During dredging, a sediment trap was constructed at the inlet to New Market Pond. Following dredging, the area surrounding the pond was developed into a park and the dam was rebuilt. Currently, New Market Pond covers approximately 17.6 acres.

For the next two miles upstream of New Market Pond, the brook is surrounded by industrial facilities (such as MRP Steel Fabrication & Engineering), cemeteries, and wetland areas. Debris fields (cinderblock, rip rap, rocks or other hard debris) are common in this stretch of the brook.

The confluence of Bound Brook and Cedar Brook occurs at RM5.75 in a wetland and parkland area known as Veterans Memorial Park. Approximately one-half mile upstream of Cedar Brook is Spring Lake. Spring Lake originally served as a mill pond in the nineteenth century and varied in shape through the years. The area of the current lake is 6.5 acres and is surrounded by parkland.

Two railroad bridges cross Bound Brook adjacent to the former CDE facility located between RM6.2 and RM6.55 at the twin culverts.

The former CDE facility is bounded on the northeast by Bound Brook and the former Lehigh Valley Railroad, Perth Amboy Branch (presently Conrail); on the southeast by Bound Brook and a property used by the South Plainfield Department of Public Works; on the southwest, across Spicer Avenue, by single family residential properties; and to the northwest, across Hamilton Boulevard, by mixed residential and commercial properties.

The land use becomes residential, recreational or open space upstream of the CDE facility. Several ball fields and recreational areas are also nearby in this area.

At RM7.4, Bound Brook passes an active South Plainfield municipal recycling and yard waste drop-off center. The upstream extent of the OU4 study area is the Talmadge Road Bridge located in Edison, New Jersey. In general, this area is surrounded by wetlands, forests lands, and urban areas.

Upstream of the former CDE facility, in addition to the Woodbrook site, three former facilities were identified outside the OU4 study area but near Bound Brook or a tributary: Tingley Rubber Corporation (a former manufacturer of rubber footwear), Gulton Industries, Inc./Hybrid Printhead (a former industrial site), and Chevron Chemical Company/Ortho Division (a former pesticide manufacturer).

The scope of the OU4 study area also included two major tributaries: the unnamed tributary near New Brunswick Avenue at RM4.7 and the unnamed tributary near Elsie Avenue at RM5.5.

Site Geology and Hydrogeology

The surficial geology of the OU4 study area is composed primarily of alluvial and glaciofluvial deposits, with some bedrock outcroppings in the stream bed. Downstream of New Market Pond, the stream bed is composed of mainly coarse-grained sediments. Weathered bedrock borders a band of alluvium material at RM3.5, centered along Bound Brook. Rock outcrops were visible along the banks of Bound Brook downstream of New Market Pond and near RM3. Glaciofluvial deposits lie to the north of the alluvium material. The band of alluvium deposits extends through RM5, with the stream beds consisting of fine-grained sediments accumulating behind the New Market Pond dam.

By RM6.0, the alluvial deposit narrows and is pinched out by glaciofluvial material and weathered shale, mudstone and sandstone. Rock outcrops of the Passaic Formation were visible in the field along the banks of Bound Brook near the former CDE facility, with the stream bed consisting of weathered, fractured bedrock. These formations dominate until RM6.2, when a thin band of swamp and marsh deposits appears. Upstream of the former CDE facility, the field along the banks of Bound Brook is a *phragmites*-dominated wetlands. The swamp and marsh deposits begin to expand at RM7.2, ultimately filling in the southern part of the OU4 study area by RM7.5 and thinning the zone of glaciofluvial material to the north. At RM7.5 the OU4 study area narrows to only include Bound Brook because the banks and tributaries were investigated under the Woodbrook Road site[2]. This stretch of Bound Brook flows through swamp and marsh deposits.

Groundwater to a depth of approximately 120 feet bgs has the potential to be hydraulically connected (discharging) to Bound Brook near the former CDE facility. The water table fluctuates seasonally, occurring in the unconsolidated deposits during periods of high recharge and in the underlying bedrock during seasonally low recharge. The groundwater encountered in the unconsolidated deposits is hydraulically connected to the shallow unconfined bedrock aquifer. Shallow groundwater is also hydraulically connected to surface water bodies including Bound Brook, Cedar Brook, and Spring Lake. Groundwater to a depth of 120 feet bgs moves north and east from the former CDE facility toward Bound Brook, and northwesterly toward the low-lying area at the confluence of Bound Brook and Cedar Brook. To the northeast of the former CDE facility, immediately across Bound Brook, groundwater flow is generally toward the west to a depth of 120 feet bgs, with groundwater discharging to Bound Brook, Cedar Brook and Spring Lake.

Measurements of groundwater elevations between 120 and 160 feet bgs and between 200 and 240 feet bgs indicated that the generalized direction of groundwater movement is to the north with the gradient generally trending northwest near the former CDE facility before turning to the north-northeast as a result of the influence of local pumping centers. Groundwater in water-bearing zones below 120 feet bgs is not hydraulically connected to surface water bodies.

EPA's investigation of the physical characteristics of the OU4 study area consisted of: probing sediments to evaluate sediment texture and unconsolidated sediment depth on transects spaced every 100 feet throughout the investigation;

[2] The 2013 ROD for the Woodbrook site addressed the upland areas but not the Bound Brook itself, which was left to be addressed as part of this phase of the CDE site.

analysis of sediment core samples for physical properties (*e.g.*, moisture content, bulk density, grain size, Atterberg Limits); bathymetric and side scan sonar surveys to map water depth and surface sediment texture in New Market Pond; cross-section surveys of Bound Brook; and the installation and monitoring of water level elevations in Bound Brook, its tributaries, and New Market Pond. Flow measurements were also collected on a monthly basis from various water level locations. These data and other datasets were used to set up and calibrate a hydraulic model and sediment transport model in support of the OU4 FS and allow characterization of net erosional/net depositional characteristics on an overall reach-by-reach (between surveyed cross-sections) basis.

NATURE AND EXTENT OF CONTAMINATION

Much of the contaminant mass present in OU4 was released decades ago (CDE was operating from 1936 to 1962) and has slowly dispersed into the environment through natural fate and transport processes. A summary of contamination within each of the major environmental media at OU4 is provided below.

Sediments

Analytical results indicated the presence of PCB contamination in the sediments of Bound Brook, generally extending from the upstream boundary of the former CDE facility to the dam at the downstream end of New Market Pond in Piscataway (a distance of approximately 3.3 miles along Bound Brook). PCB concentrations ranged from a maximum detection of 85 milligrams per kilogram (mg/kg) in the vicinity of the former CDE facility to approximately 4.4 mg/kg in New Market Pond. Concentrations downstream of the New Market Pond dam decreased markedly to approximately 0.23 mg/kg at Bound Brook's confluence with Green Brook; concentrations in Green Brook ranged from non-detect to 0.16 mg/kg. These findings are consistent with prior EPA sampling of Bound Brook.

PCB analyses of recently-deposited sediments confirmed that contaminated sediments were transported along Bound Brook and suggest that New Market Pond is acting as a sediment trap for solids and contaminants transported downstream. Sediment probing, radiological-dated surface sediment samples, and low resolution sediment cores also revealed that at least two isolated pockets of contaminated sediment are present just downstream of New Market Pond. These locations likely represent the first areas downstream of the New Market Pond dam where the flows and shear stresses decrease to a point such that fine-grained solids (and associated contaminants) in the water column have an opportunity to settle after flowing over the dam. Data from sediment core samples and recently-deposited sediment samples indicate a significant decreasing trend in PCB concentrations with increasing distance downstream of the New Market Pond dam.

Evaluation of PCB data from recently-deposited sediment samples revealed that the highest detected concentrations were located adjacent to the former CDE facility (24 mg/kg). Conversely, PCB concentrations averaged 0.53 mg/kg in samples collected upstream of the former CDE facility, ruling out the existence of an upstream source.

To evaluate the depositional history of sediment contamination in Bound Brook, a high resolution (finely-segmented; approximately 3-5 cm depth sampling intervals) sediment core was collected from a location in New Market Pond anticipated to be continuously depositional based on sediment probing data, observed flow regimes, and historical dredging records. The sediment samples from the high resolution core were analyzed for radionuclides to allow an approximate depositional year to be assigned to each segment. The depositional chronology of Total PCB (congeners) in the high resolution sediment core mirrors the history of the former CDE facility, which operated from 1936 to 1962. The absolute concentration of Total PCB in the high resolution sediment core peaks sharply circa 1956 to 66 mg/kg, and concentrations subsequently decline to 11 mg/kg in the core top sample. This chronology suggests that New Market Pond sediments in 1956 were characterized by PCB concentrations that were about a factor of 5 higher than the current surface sediment concentration.

EPA evaluates sediment sites for the potential that "natural recovery" may be reducing the risks posed by contaminated sediments over time. At Bound Brook, areas like New Market Pond may demonstrate natural recovery because sediments tend to deposit there over time, and newer, cleaner sediments may bury deeper, contaminated sediments. A comparison of current and historical surface sediment data (1997-2011) revealed little change in PCB concentrations over the past 14 years, suggesting that natural recovery is not currently occurring in Bound Brook, because newly deposited sediments are also contaminated. Because there is a demonstrated depositional pattern to New Market Pond, upstream sources associated with the CDE facility (such as the capacitor debris area and the groundwater, discussed below) appear to be continuing sources of contaminated sediments to the lower reaches of the stream. This observation is consistent with trends in the PCB concentrations observed in sediments deposited in New Market Pond over the past 20 years and detected in the high resolution sediment core.

Because areas of Bound Brook are net-depositional, by addressing sediments to a degree that no additional PCB contaminant load enters the system, natural recovery could be a component to a Bound Brook remedy. Based upon the rate of deposition estimated in the RI/FS, PCB concentrations can expect to decrease by 50 percent every 50 years (i.e., a “half-life” of 50 years) if clean sediments are entering the system and burying contaminated sediments. Consequently, if the current average PCB surface sediment concentrations are approximately 10 mg/kg in New Market Pond, after 50 years the PCB concentration would be reduced to 5 mg/kg; and after 50 more years, 2.5 mg/kg, etc.

The conceptual site model of sediment transport suggests that flood-borne contaminated sediments come to be deposited in the floodplains over time, but that the floodplains generally do not act as an ongoing source of PCB contamination to the stream channel.

Floodplain Soil

The OU4 RI included an investigation of Bound Brook floodplain and bank soils for contamination, via soil borings positioned on transects extending out from the brook and along gridded areas positioned near the confluence of Bound Brook and Cedar Brook. The highest PCB floodplain soil concentrations were detected downstream of the former CDE facility, in the floodplains between the confluence of Bound Brook and Cedar Brook (with PCB concentrations detected up to 70 mg/kg on the banks). The area of the Cedar Brook/Bound Brook confluence and a manmade dam between the former CDE facility and the confluence are the first significant depositional zones downstream of the former CDE facility. The RI data indicate that PCB soil contamination is being transported from the brook to the floodplains during flooding events.

The area surrounding the confluence of Bound Brook and Cedar Brook is also the location of Veterans Memorial Park in South Plainfield. Interim remedial measures conducted at the park by the Borough of South Plainfield in 2003 included excavation and off-site disposal of contaminated soil (followed by capping with clean topsoil) and institutional controls designed to limit public access to the floodplains between Bound Brook and Cedar Brook. In the surface soils at Veterans Memorial Park, the highest detected PCB concentration (2013 OU4 RI data) was 1.8 mg/kg; historically, surface soil concentrations at the park were reported as less than 1 mg/kg. Data from residential properties located near the park also characterizes surface soil PCB concentrations as less than 1 mg/kg.

Capacitor Debris

The OU2 remedy addressed total PCB concentrations greater than 500 mg/kg as principal threat waste (PTW). This material was excavated and either treated on-site using low-temperature thermal desorption (LTTD) followed by backfilling of the treated material or, for those materials not amenable to treatment, disposed of off-site. The CDE facility contained large disposal areas containing tens of thousands of discarded capacitor casings and parts contaminated with PCBs, which were excavated for off-site disposal. During the LTTD treatment process, intact capacitors and larger capacitor parts proved to be difficult to treat, and much of this material was sorted out of the soil and also transported off site for disposal. Remaining "low-level wastes" were left on-site under a multi-layer cap.

WHAT IS A “PRINCIPAL THREAT”?

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

The OU2 remedy encompassed the entire 26-acre developed CDE facility, which at the time of the ROD was a fully-occupied industrial facility, zoned for industrial/commercial use. It retains the same zoning today, and the expected future land use (per South Plainfield redevelopment plans) includes commercial use.

During the RI for OU2, capacitors were discovered in the floodplain/wetland area between the former CDE facility and the Bound Brook streambed. EPA concluded that these buried capacitors should be addressed separately, given the different potential land uses and exposure scenarios potentially available for floodplain soils outside of the boundaries of the former facility.

During the OU4 RI, near the boundary of the OU2 soil excavation and remediation area, deep soil borings were advanced to a depth of about 10 feet (300 cm) below grade at four locations at the top of the bank of Bound Brook. The deep soil borings were advanced to determine the vertical extent of capacitor waste previously observed in test pits excavated by EPA in 2008, with final boring locations adjusted for the limits of OU2 soil remediation and associated observations and OU2 post-excavation sidewall sampling results. A PCB concentration of 3,000 mg/kg, encountered in one of these borings, marks the highest PCB concentration detected during the OU4 RI. Moreover, capacitor waste was observed in the borings, confirming that waste is still present in the banks of Bound Brook adjacent to the former CDE facility. While the bank armoring and geotextile installed as part of the 2008 removal action are expected to minimize bank erosion, these are only temporary measures and this area is still considered an ongoing source of PCB contamination to Bound Brook.

Groundwater

The RI for CDE OU3 (site-related contaminated groundwater) revealed the potential for transport of contaminated groundwater from the former CDE facility to Bound Brook, based on stream elevation surveys, groundwater modeling, and consideration of current municipal pumping regimes. The OU4 RI characterized the potential for groundwater contaminants to impact Bound Brook via stream flow surveys and passive sampler (porewater and surface water) deployment and analysis. While the sediment beds in Bound Brook currently possess the largest contaminant inventory, the PCB load in groundwater discharging to Bound Brook near the former CDE facility will become a concern in the future as a potential source of recontamination of remediated sediments. Detected PCB surface water concentrations averaged approximately 75 nanograms per liter (ng/L) adjacent to the former CDE facility.[3] This average exceeds New Jersey's Surface Water Quality Criterion (fresh water, aquatic receptor) of 14 ng/L for total PCBs by a factor of 5. Most of the PCB loading to the water column occurs within one-tenth of a mile downstream of the twin culverts, with total PCB levels increasing from background levels of 4.8 ng/L to an average of 75 ng/L. Total PCB surface water concentrations are relatively constant downstream of the former CDE facility. A porewater contaminant mass flux to Bound Brook was estimated using a calculated groundwater flux and total PCB porewater (0-5 cm) concentrations. The total PCB mass flux increases by a factor of 20 above background in the same one-tenth of a mile interval. The detected presence of volatile organic compounds (VOC) in the porewater and sediments near the former CDE facility provided an additional line of evidence that contaminated groundwater is discharging to Bound Brook. Moreover, elevated total PCB concentrations in the surface water, porewater, and sediments coincide with total VOC porewater detections, suggesting that chlorinated solvents in the groundwater may be enhancing the mobility of PCBs due to co-solvency.

Municipal Water Line

Much of the utility infrastructure in South Plainfield dates from the early 20th century, with limited information about its construction or location. During the OU2 soil remediation work, a 36-inch-diameter municipal water line was uncovered. It is currently owned by the New Jersey American Water (NJAW). NJAW records suggest that the water line was installed in 1908. It is constructed of cast iron and runs across the limits of the former CDE facility from the southwestern corner to the northeastern corner of the property at a depth of approximately 3 to 5 feet bgs.

To protect the integrity of the water line, the OU2 soil excavation removed soil from around the pipe in small sections, with oversight by NJAW. Although the pipeline was not physically damaged during the excavation process, in February 2011, the pipe failed in an area outside the excavation, flooding the OU2 work area. The water was contained within the excavation and did not result in a release of contaminants from the area, and EPA worked with NJAW to dewater the

[3] Several passive samplers were installed directly in an outcropping bedrock fracture, yielding higher concentrations that were accounted for in the averaging.

excavation and repair the broken pipe.

Eventually, the aging of the infrastructure is likely to lead to additional leaks or a rupture in this pipe. The earlier pipe break was addressed with no long-term consequences, because the open excavation areas acted as a retention basin. This would not be true if, in the future, a pipe break or leak were to rupture the cap. Instead, the break could transport contaminated soils into Bound Brook, compromising the integrity of the OU2 remedy and releasing contaminants into OU4. This concern prompted the evaluation of alternatives to prevent, or substantially reduce the likelihood of a break in the future.

SCOPE AND ROLE OF ACTION

This is the final planned action for the site, addressing PCB-contaminated brook sediments and floodplain soil, capacitor debris, contaminated groundwater discharging to Bound Brook, and the municipal water line beneath the former CDE facility. The primary contaminants of concern identified in site soils were TCE and PCBs. (The RI documents the full extent of contaminants detected at the site.) These chemicals were released at the site in large quantities, as evidenced by the extent of the OU2 remedy, which required the excavation and treatment of PTW down to the top of the bedrock surface (approximately 15 feet bgs).

Bound Brook sediments were impacted by historical disposal of capacitors and process waste in the banks of the brook; erosion and transport of contaminated surface soils from the former CDE facility via storm run-off into the brook; and on-going discharge of impacted groundwater to the brook. Although the closure of the former CDE facility and recent remedial action at OU2 reduced the discharge of contaminants to the brook, a significant volume of contaminated sediment remains in the brook and capacitor debris remains buried in the banks adjacent to the former CDE facility. Impacted groundwater continues to discharge to the brook. Contaminated sediments have been carried downstream by surface water flows and have accumulated in low flow areas in the brook, in silt traps, and behind man-made dams and culverts along the brook. The thickest sediment deposits exist in an approximately 3-mile stretch between New Market Pond and the former CDE facility. The majority of the sediment contaminants are persistent and do not degrade readily under most conditions. While some of the contaminants may disperse through erosional forces in the brook (primarily under high flow conditions), estimates of contaminant half-lives from the high resolution sediment core collected in New Market Pond suggest that the sediment PCB half-life is on the order of 50 years, if the conditions associated with the last 20-30 years persist into the future. In general, for the cores examined, the highest concentrations of PCBs were measured at the top of the core, and burial via deposition of relatively “cleaner,” more recent solids was not observed.

Floodplain soils are also contaminated due to transport of contaminated sediment into the floodplains/wetlands surrounding Bound Brook during flooding. With uncontrolled sediment deposits in the brook, the potential remains for continued transport of contaminants to the floodplain soils. Degradation and dispersion of existing contaminants are likely to be minimal.

EPA’s findings indicate the presence of PTW in the form of capacitors and capacitor debris along the banks of Bound Brook nearby the former CDE facility.

Surface waters are contaminated primarily from resuspension of contaminated sediments in Bound Brook and erosion of the banks during flooding. Surface water sample results also indicate an impact from contaminated groundwater discharge in the vicinity of the former CDE facility. With uncontrolled sediment deposits in the brook, re-suspension and erosion would likely continue to impact surface water quality, along with groundwater discharge.

The 36-inch water line (discovered during the OU2 remedy implementation) that traverses the former CDE facility within the OU2 remedy cap and under Bound Brook will also need to be addressed to ensure that the current and future remedies are not compromised.

ENFORCEMENT

EPA identified potentially responsible parties (PRPs) for the site, including Cornell-Dubilier Electronics, Inc. (CDE), Dana Corporation, and Federal Pacific Electric Company (FPEC). In addition, D.S.C. of Newark Enterprises, Inc. (DSC), the current owner of the site property, has been named as a PRP.

Early in the cleanup process five administrative orders were issued to various PRPs for the performance of portions of removal actions required at the site. These included the site stabilization order issued to DSC in 1997 described above. In 1998, 1999, and 2000, EPA entered into a series of administrative orders with PRPs to implement removal actions at fourteen properties with PCB-contaminated soil.

The PRPs declined to undertake the site RI/FS, and to perform the OU1 and OU2 remedial actions. The Dana Corporation declared bankruptcy in 2006, and EPA reached a bankruptcy settlement in 2008.

Currently, CDE is a viable company with limited resources. The United States has entered into a consent decree with CDE, which has been lodged in federal court and is currently the subject of a motion to enter. DSC is also a viable company: as of September 15, 2014, the United States has lodged a consent decree with DSC in federal court, as well.

SUMMARY OF SITE RISKS

As part of the RI/FS, EPA conducted a baseline risk assessment 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 in the absence of any actions or controls to mitigate such releases, under current and future land uses. The baseline risk assessment includes a human health risk assessment (HHRA) and an ecological risk assessment (ERA).
The cancer risk and non-cancer health hazard estimates in the HHRA are based on current reasonable maximum exposure scenarios and were developed by taking into account various health protective assumptions about the frequency and duration of an individual's exposure to contaminants selected as chemicals of potential concern (COPCs), as well as the toxicity of these contaminants. Cancer risks and non-cancer health hazard indexes (HIs) are summarized below (please see the text box for an explanation of these terms).

The ERA, which served to update and refine the EPA's 1997 preliminary ERA and 2008/2009 Reassessment, consisted of a screening-level evaluation and baseline ERA and followed EPA's Ecological Risk Assessment Guidance for Superfund.

Human Health Risk Assessment

The area along the Bound Brook corridor, which is the subject of this assessment, includes parks, commercial properties and residences. Future land

WHAT IS RISK AND HOW IS IT CALCULATED?

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

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

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

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

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for noncancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one in ten thousand excess cancer risk;" or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6}, corresponding to a one in ten thousand to a one in a million excess cancer risk. For noncancer health effects, a "hazard index" (HI) is calculated. The key concept for a noncancer HI is that a "threshold" (measured as an HI of less than or equal to 1) exists below which noncancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a noncancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site.

use along the brook is expected to remain the same. The baseline risk assessment began by selecting COPCs in surface water, floodplain soil, sediment, fish and shellfish (*i.e.*, Asiatic clams and crayfish). The chemicals of concern (COCs), or those chemicals driving the need to remediate the site, are PCBs; also contributing to the risk are benzidine in surface sediment, and other compounds not considered to be site-related, such as heptachlor epoxide in fish fillet, and dieldrin and select metals (*i.e.*, antimony, iron, lead, manganese, and thallium) in floodplain soil.

The baseline risk assessment evaluated health effects that could result from exposure to contaminated media. Based on the current zoning and anticipated future use, the risk assessment focused on a variety of possible receptors, including current and future:

- Recreationists/Sportsmen: adults and adolescents (7-18 years old) who may wade, fish (but do not consume fish) or otherwise recreate in the study area and might be exposed through: dermal contact with surface water; incidental ingestion of and dermal contact with surface sediment and surface soil; inhalation of volatiles released from surface water; and inhalation of particulates released from surface soil.
- Anglers: adults, adolescents (7-18 years old) and children (0-6 years old) who may consume locally-caught fish or shellfish. While this was in addition to the exposures identified above for recreationists/sportsman adults and adolescents, it was assumed that children are only exposed through consumption of locally-caught fish or shellfish in the household.
- Outdoor Workers: adults who may work to maintain, repair, and/or clean culverts, spillways, bridges, and other structures in the study area and might be exposed through: dermal contact with surface water; incidental ingestion of and dermal contact with all sediment and all soil; inhalation of volatiles released from surface water; and inhalation of particulates released from all soil.
- Residents: adults and children (0-6 years old) who live within or near the 100-year floodplain areas and might be exposed through incidental ingestion of and dermal contact with all soil and inhalation of wind-generated particulates released from all soil.
- Commercial/Industrial Workers: adults who primarily work outdoors on commercial/industrial properties located within the 100-year floodplain areas and might be exposed through incidental ingestion of and dermal contact with surface soil and inhalation of wind-generated particulates released from surface soil.
- Construction/Utility Workers: adults who may perform short-term intrusive work for construction or utility installation, maintenance, or repair and might be exposed through incidental ingestion of and dermal contact with all soil and inhalation of mechanically-generated particulates COPCs released from all soil.

Because the study area is nearly ten miles long and the contamination is not homogeneous, multiple exposure units were established for the risk assessment. They are based upon physical features of the Bound Brook system, as well as historic PCB concentrations, and include: Green Brook, Bound Brook 1 (BB1), Bound Brook 2 (BB2), Bound Brook 3 (BB3), Bound Brook 4 (BB4), Bound Brook 5 (BB5 – adjacent to the former CDE facility), Bound Brook 6 (BB6) and Spring Lake (Figure 2).

The results of the HHRA indicate that there are significant cancer risks and non-cancer health hazards to potentially exposed populations in all exposure units from ingestion of fish and shellfish contaminated with PCBs. For the angler receptors (adult, adolescent and child), exposure to PCBs in fish and shellfish results in either an excess lifetime cancer risk that exceeds EPA's target risk range of 10^{-4} to 10^{-6} or an HI above the acceptable level of 1, or both. Additionally, PCB-contaminated soil in the floodplain presented unacceptable risk and hazard to the adult and child resident in BB3, BB4, BB5 and BB6. Exposure to PCBs in sediment in BB5 for the adolescent recreationist/sportsman also results in unacceptable non-cancer hazard.

EPA's statistical analysis of concentrations of PCBs in fish showed unacceptable risk and hazard associated with concentrations that ranged from 0.23 mg/kg in predatory fish from BB6 (associated with a non-cancer hazard of 8 for the child angler) to 18 mg/kg in bottom-feeding fish from BB1 (associated with a cancer risk of 2×10^{-3} and a non-cancer hazard of 40 for the child angler). In floodplain soil, the PCBs range from 41 mg/kg in BB5 (associated with a non-cancer hazard of 30 for the child resident) to 62 ppm in BB6 (associated with a cancer risk of 2×10^{-4} and a non-cancer hazard of 60 for the child resident). In sediment, the PCB concentration of 29 mg/kg in BB5 is associated with a non-cancer hazard of 2 for the adult and adolescent recreationalist/sportsman.

A complete discussion of the exposure pathways and estimates of risk can be found in the *Final Risk Assessment Report for OU4* in the Administrative Record.

Ecological Risk Assessment

The overall goal of the ERA was to evaluate whether adverse effects to ecological receptors (i.e., organisms and their respective habitats) are occurring or may occur as a result of exposure to one or more stressors, currently and in the future, in the absence of remedial action.

As noted above, the ERA, which served to update and refine the EPA's 1997 preliminary ERA and 2008/2009 Reassessment, consisted of a screening-level evaluation and baseline ERA and followed EPA's Ecological Risk Assessment Guidance for Superfund.

Appropriate assessment and measurement endpoints were selected based on the environmental setting (stream sediments and surface water and floodplain soils along the brook corridor) along with the ecological conceptual site models, which identified both aquatic and terrestrial receptors. The selected receptors and their endpoints are as follows:

- Aquatic life community (benthic invertebrate and freshwater fish): Long-term maintenance of survival, growth, and reproduction of the benthic invertebrate community and freshwater fish community.
- Semi-aquatic bird and mammal populations: Long-term maintenance of the survival, growth, and reproduction of semi-aquatic bird and mammal populations within several feeding guilds that inhabit/utilize the stream corridor.
- Terrestrial life community (plants and soil invertebrate): Long-term maintenance of a healthy and diverse plant community and long-term maintenance of survival, growth, and reproduction of the soil invertebrate community.
- Terrestrial bird and mammal populations: Long-term maintenance of the survival, growth, and reproduction of terrestrial bird and mammal populations within several feeding guilds that inhabit/utilize mainly the floodplains of the stream corridor.

A variety of wildlife species were selected as representative of semi-aquatic herbivorous, insectivorous, omnivorous, and piscivorous birds and mammals and terrestrial herbivorous, insectivorous, omnivorous, and carnivorous birds and mammals which have been documented or are likely to be present within the Study Area.

Three lines of evidence were used for the community-based assessments: 1) measured chemical concentrations in abiotic media compared with media screening concentrations protective of receptors in direct contact with those media, 2) measured chemical concentrations in biota tissue compared to critical body residues, and 3) sediment toxicity testing and estimated chemical concentrations in fish eggs compared to critical fish egg residues. Two lines of evidence were used for the population-based assessments: 1) food web accumulation modeling in conjunction with toxicity reference values and 2) estimated chemical concentrations in bird eggs compared to critical avian egg residues.

The following conclusions regarding the potential for adverse health effects from exposure to site-related chemicals of potential ecological concerns (COPECs) are made based on the evaluation of the multiple lines of evidence for each assessment endpoint:

- Protection of Benthic Invertebrates: Potential risk to benthic invertebrates may be associated with cis-1,2-DCE, PCBs and vinyl chloride in porewater; and vinyl chloride in surface sediment at EU BB5 and total PCBs in surface sediment in EUs BB2, BB3, BB4, BB5, and BB6.
- Protection of Aquatic Life (Fish): Cis-1, 2-DCE, vinyl chloride, total PCB congeners, and TCDD TEQ (PCBs) in porewater/surface water indicate a potential for adverse health effects in aquatic life. Total PCB Aroclor concentrations in predatory and bottom-feeding fish whole body tissue indicate a potential for adverse health effects.
- Protection of Semi-Aquatic Birds and Mammals: Dietary exposure to total PCBs Aroclors and TCDD TEQ (PCBs) in semi-aquatic insectivorous and piscivorous birds and piscivorous mammals may be associated with adverse health effects, particularly at EUs BB2, BB3, BB4, BB5, BB6, and SL. Dietary exposure to total PCBs Aroclors and TCDD TEQ (PCBs) in some semi-aquatic insectivorous mammals may be associated with adverse health effects, particularly at EUs BB2, BB3, BB4, BB5, and BB6.
- Protection of Terrestrial Plants and Invertebrates: It is not likely that PCBs in surface soil are associated with wide-spread

adverse health effects in terrestrial plants and invertebrates throughout the Bound Brook floodplains. Plant uptake of PCBs is considered to be negligible due to the large molecular weight and strong sorption of PCBs to organic matter and while accumulation in the tissues of soil invertebrates provides direct evidence of bioavailability, bioaccumulation alone is not an indication of adverse health effects.

- Protection of Terrestrial Birds and Mammals: Dietary exposure to PCBs based on site specific bioaccumulation in soil invertebrates may be associated with adverse health effects in terrestrial insectivorous birds and mammals.

A summary of the ERA for each receptor can be found in Table 1. A complete discussion of the exposure pathways and estimates of risk can be found in the *Final Risk Assessment Report for OU4* in the Administrative Record.

It is EPA's current judgment that the Preferred Alternative identified in the Proposed Plan is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Based on the site-specific human health and ecological risk assessment results, human health and ecological risk is shown for PCBs in fish throughout the entire study area. The sediments and floodplain soils are the primary source of the elevated fish tissue PCB concentrations. Furthermore, two source areas that pose an ongoing threat of release have been identified: groundwater discharging to surface water, and the capacitor debris identified in the banks of the brook adjacent to the site.

PCBs in sediments, soil and debris pose an unacceptable risk through direct contact. Other contaminants were also identified under the various recreational, residential and worker direct contact exposure scenarios and considered in the BHHRA, including benzidine, dieldrin, heptachlor epoxide, and select metals. However, given the extent of the PCBs found in these media, a response action that addresses PCBs is expected to address these other contaminants as well. These direct contact risks are predominantly in EUs BB3, BB4 and BB5, from New Market Pond upstream to the former CDE site.

PCBs were also the primary COPEC for ecological receptors for sediments and soil. In addition, the groundwater releasing to surface water, which acts as an ongoing source of PCBs to the brook, also discharges cis-1,2-DCE to porewater and surface sediment at levels that may pose unacceptable risk to benthic invertebrates in BB5.

Therefore, the following remedial action objectives (RAOs) address the human health and ecological risks posed by PCB-contaminated sediment, soil and debris, and releases of 1,2-DCE to surface water, at the site:

Sediment/Floodplain Soils (SS):

- Reduce cancer risks and non-cancer health hazards to acceptable levels for people eating fish and shellfish by reducing the concentrations of PCBs in the sediments of Bound Brook.
- Reduce direct-contact and recreational exposure risks to human receptors to acceptable levels by reducing the concentrations of PCBs in the sediments and floodplain soils.
- Reduce the risks to ecological receptors to acceptable levels by reducing the concentrations of PCBs and VOCs in the sediments and floodplain soils, allowing recovery of fish population.
- Reduce the migration of PCB-contaminated sediments and floodplain soils from upstream areas, including to areas below the New Market Pond dam.

Capacitor Debris (CD):

- Reduce or eliminate the direct-contact threat associated with contaminated soil and debris, including capacitors and capacitor parts in the capacitor debris area to levels protective of current and reasonably anticipated future land uses. The most conservative land use anticipated for the site would be a future recreational user.
- Reduce the risks to ecological receptors by removing or preventing direct contact with concentrations of PCBs in the capacitor debris area.
- Prevent contaminant migration to sediments and surface water.
- Remove, treat, or contain principal threat waste to the extent practical.

Groundwater Discharge to Surface Water (GW):

- Prevent migration of contaminated groundwater above acceptable surface water quality standards to the surface water and sediments.

Municipal Water Line (WL)

- Ensure protectiveness of the OU2 and OU4 remedies by mitigating the potential for failure of the municipal waterline present below the OU2 cap.

Remediation Goals

Sediments and Floodplain Soils - EPA has identified 1 mg/kg PCBs as the remediation goal for sediments and floodplain soil in the study area. This remediation goal is selected based upon the following information:

- For Bound Brook sediments, a site-specific, risk-based calculation of 10^{-6} incremental lifetime cancer risk associated with a human direct contact identified a remediation goal of 1 mg/kg. (The most conservative calculated remediation goal for direct contact concentration associated with a non-cancer hazard (that achieves an HI of 1) in sediments was 13 mg/kg.)
- EPA developed a site-specific "resident-parklands" land use, which identifies conservative and representative land use for exposure to the floodplains of OU4. This exposure scenario for a resident child would yield a 10^{-6} incremental lifetime cancer risk-based preliminary remediation goal (PRG) of 0.76 mg/kg, and a noncancer-based PRG of 2.6 mg/kg.
- New Jersey's promulgated nonresidential direct-contact cleanup criterion for PCBs is 1 mg/kg. While not an ARAR for the sediments, New Jersey has identified 1 mg/kg the appropriate standard for the floodplain soils.

Furthermore, EPA has identified 0.25 mg/kg PCBs as the remediation goal for sediments in the study area to address human consumption of fish tissue and ecological endpoints, to be achieved through active remediation to 1 mg/kg followed by monitored natural recovery. This remediation goal is selected based upon the following information:

- Potential cleanup values calculated for a 10^{-4} incremental lifetime cancer risk for human fish tissue consumption ranged from 0.21 to 0.38 mg/kg. Assuming recent stream deposition patterns continue, after remediation of areas exceeding 1 mg/kg, it is expected that natural recovery would reduce post-remediation sediment concentrations from 1 mg/kg to 0.25 mg/kg in two half-lives, or about 100 years.
- The ecological endpoints associated with PCB exposures generally support a remediation goal of 1 mg/kg and support an action that achieves a protective level in benthic invertebrates, semiaquatic birds and semiaquatic mammals over time, through natural recovery.

The NCP identifies a 10^{-6} risk level as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective. EPA has concluded that a 10^{-6} risk level cannot be attained through remediation, given the site's urban setting and the ubiquity of PCBs in the environment, but that a remedy that includes active remediation and natural recovery provides the best conditions for eventually achieving protective levels within EPA's risk range of 10^{-4} and 10^{-6} for the stream corridor.

Other COCs were also identified in sediments and floodplain soils that also contributed to ecological or human health risks, in particular dioxin-like PCB congeners and benzidine. The ecological risk-based remediation goal for total PCBs of 1 mg/kg was derived under the assumption that remediation of total PCBs will reduce the levels of PCB congeners with dioxin-like toxicity to a protective level as well. The 2014 resampling for benzidine found that this chemical was co-located with PCBs in a pattern that suggested it to be a site-related constituent, and that addressing total PCBs to 1 mg/kg would also address benzidine. A site-specific, risk-based remediation goal of 0.1 mg/kg has been identified for benzidine.

Groundwater - For discharge of groundwater to surface water, the remedial action objective leads to a preventive goal of eliminating the potential for PCB releases to surface water through a groundwater transport pathway. VOC transport to surface water is also occurring (primarily 1,2-cis-DCE, a degradation byproduct of TCE) , with some limited, localized exposure concerns, but the VOCs mobilize the PCBs, and it is the PCBs, and not the VOCs themselves, that are the primary concern of this component of the remedy. Thus, the remedial alternatives considered addressing both VOCs and PCBs, with the goal of eliminating PCB loading into stream sediments and surface water. Based upon site-specific modeling, even low levels of PCB releases through this pathway could result in unacceptable exposures in sediments and surface water if perpetuated over the long term. The remediation goal for this groundwater pathway would, therefore, be evaluated in the same way, by preventing releases to surface water that would result in sediment concentrations in excess of the sediment remediation goal for fish consumption of 0.25 mg/kg.

Capacitor Debris - This area is made up of floodplain soils located between the OU2 cap and

Bound Brook, so the remediation goal for addressing this area is the same as for the floodplain soils, 1 mg/kg PCBs. This area also contains large quantities of capacitor debris and has been identified as PTW, given the high concentrations of PCBs in close proximity to surface water. Based upon EPA's Guidance on Remedial Actions for Superfund Sites with PCB Contamination, for sites in industrial areas, PCBs at concentrations of 500 mg/kg or greater will generally constitute a principal threat, and this was EPA's PTW threshold for OU2. For sites in residential areas, principal threats will generally include soils contaminated at concentrations greater than 100 mg/kg PCBs. For the capacitor debris areas in the soils outside of the boundaries of the former facility, EPA is using the more conservative guideline of 100 mg/kg PCBs to define PTW for OU4, as opposed to the 500 mg/kg value used for OU2. The 100 mg/kg PTW threshold was also used for the Woodbrook site. The difference between 100 mg/kg and 500 mg/kg is expected to have little effect on the cost of the capacitor debris alternatives, because EPA expects that there is little difference in volumes between these two values.

SUMMARY OF REMEDIAL ALTERNATIVES

EPA has divided the OU4 remedy into four distinct components:

- Sediment/Floodplain Soils (SS) Alternatives - Areas of the Bound Brook and floodplains, inclusive of New Market Pond, with elevated PCBs.
- Capacitor Debris (CD) Alternatives – This area includes the area of the floodplain adjacent to OU2 (former CDE facility), a subset of the floodplain soils subject to special consideration because of the elevated levels of PCB contamination in the soil and capacitor debris in this area.
- Groundwater (GW) Alternatives - An area of contaminated groundwater conservatively estimated at 1,600 linear feet of stream channel near the former CDE facility where contaminated groundwater discharges to surface water.
- Waterline (WL) Alternatives - Options for addressing a municipal water line that passes under the OU2 cap with potential to threaten its long-term integrity, and the protectiveness of both OU2 and OU4 remedies.

The CD and GW alternatives address ongoing sources releasing to Bound Brook, so the SS alternatives assume that CD and GW alternatives have been implemented first. All costs are expressed as net present value. The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy with any potentially responsible parties, or procure contracts for design and construction.

Description of Sediment/Floodplain Soils (SS) Alternatives

Bound Brook sediments and floodplain soils outside the CD areas contain PCB concentrations ranging up to, and in very limited cases exceeding, 100 mg/kg nearby the former CDE facility. Because PCB levels in excess of 100 mg/kg are infrequent in sediment and floodplain soils, EPA considers these isolated areas "low-level threat" wastes, and considered removal and capping options, but not treatment.

The "Reaches:" The FS divided the study area sediments and their adjacent floodplains into sections, or "reaches," as follows:

- Reach 1A is upstream of the CDE facility in Bound Brook, and Reach 1B is upstream in Cedar Brook, including Spring Lake, in areas outside the limits of Bound Brook flooding.
- Reach 2 includes the section from RM6.55 to New Market Pond.
- Reach 3 includes New Market Pond.
- Reach 4 includes all the areas downstream of New Market Pond.

The RI showed that Bound Brook is characterized by shallow bedrock, relatively thin layers of unconsolidated sediment, and shallow base flow water depths; therefore, excavation or dredging options are more appropriate for contaminated sediment than capping. As discussed below, capping is considered for contaminated floodplain soils but EPA has concerns regarding the performance of a cap during flood events, and even under base flow drainage conditions in portions of the floodplain.

Furthermore, the areas of Middlesex and Somerset Counties adjacent to Green Brook, including the Bound Brook corridor, are stressed by a lack of stormwater drainage capacity. Under the Water Resources Development Act of 1996, the U.S. Army Corps of Engineers (USACE) and its non-federal sponsor, NJDEP, are implementing a long-term plan to address flooding in the area, through the Green Brook Flood Control Project.[4] The Green Brook Sub Basin includes portions of 13 municipalities and covers 65 square miles. In consultation with the Green Brook Flood Control Commission, USACE and NJDEP are implementing a multi-year project to mitigate flooding, including flood walls and levees, stream modifications, and dry detention basins. Modifications to Bound Brook above New Market Pond are in the early planning stages and still some years away; however, these stakeholders have indicated that capping would further reduce flood storage capacity, be detrimental to that project, and would likely not be supported by those stakeholders.

Three alternatives were considered:

- Alternative SS-1: No Action
- Alternative SS-2: Excavation/Dredging of Sediments and Soils with Monitored Natural Recovery
- Alternative SS-3: Excavation/Dredging of Stream Sediments, Excavation with Capping of Floodplain Soils, Dredging with Capping of New Market Pond, Limited Hotspot Dredging of Depositional Areas with Monitored Natural Recovery

Alternative SS-2 would rely on dredging or excavation to remove contaminated material, followed by restoration of disturbed areas. Alternative SS-3 would include dredging or excavation in certain areas combined with capping. Both alternatives would rely on monitored natural recovery (MNR) to aid in achieving remedial objectives.

Common Elements for SS Alternatives

The remedial alternatives, except Alternative SS-1 (no action), include long-term monitoring and institutional controls. The degree of monitoring that would be needed is different for each alternative. Alternatives SS-2 and SS-3 would both incorporate institutional controls, which are administrative and legal controls that help to minimize the potential for human exposure to contaminants, such as the fish advisory already in place. For Alternative SS-3, institutional controls consisting of restrictions on land use of capped floodplains soils would be implemented. If wastes are left on the site, or if the time required to achieve the RAOs is greater than five years, five-year reviews would be conducted to monitor the contaminants and evaluate the need for future actions.

The active remedies rely on monitored natural recovery to aid in achieving the remedial objectives that pertain to fish recovery. As noted previously, the remediation goal of 1 mg/kg PCBs is not adequate, on its own, to achieve a protective level for a 10^{-4} incremental lifetime cancer risk for fish consumption, which would require a target range of 0.21 to 0.38 mg/kg. EPA expects that, by addressing PCB-contaminated sediments and soils at levels in excess of 1 mg/kg and eliminating ongoing sources of contamination to the sediment (the CD areas and the groundwater discharging to Bound Brook), the OU4 remedial action, including natural recovery at the rates suggested by the high-resolution coring data, will reduce contamination in fish tissue to protective levels within a reasonable timeframe, conservatively estimated at 100 years.

Alternative SS-1: No Action

Capital Costs	$0
Operation & Maintenance Costs	
Periodic Costs (Monitoring)	$0
Total Present Value	$0
Construction Time Frame	0 years

Regulations governing the Superfund program require that the “no action” alternative be evaluated to establish a baseline for comparison to other alternatives. Under this alternative, EPA would take no action at OU4 to prevent potential exposure to sediment and soil contamination.

Alternative SS-2: Excavation or Dredging of Sediments and Excavation of Soils with Monitored Natural Recovery

Capital Costs	$187,300,000
Operation & Maintenance Costs	$0
Periodic Costs (Monitoring)	$30,000
Total Present Value	$177,600,000
Construction Time Frame	2 to 3 years

This alternative would remove contaminated sediment from Bound Brook and New Market Pond, and contaminated soil from the surrounding floodplain, thereby preventing human exposure and controlling impacts to the environment. Options considered for removing material consist of dredging sediments in the wet or diverting Bound Brook and excavating contaminated sediments "in the dry," coupled with conventional excavation of floodplain soils. The majority of the contaminated

[4] http://www.nan.usace.army.mil/Missions/CivilWorks/ProjectsinNewJersey/GreenBrookSubBasin.aspx

sediments, an estimated 34,000 cubic yards, are located between RM6.55 (the twin culverts) and New Market Pond. The majority of the contaminated floodplain soils, an estimated 150,000 cubic yards, are located near the OU2 facility, and near the confluence of Bound Brook and Cedar Brook, adjacent to and including portions of Veteran's Memorial Park.

Two methods were considered for removing contaminated sediments, dredging and excavation:

Stream Dredging: Contaminated sediment from the brook would be mechanically dredged through the use of cranes and environmental buckets, excavators, drag line, and other equipment mounted on amphibious vehicles operating in the brook. Floodplain soils would be excavated using conventional construction equipment with appropriate controls and modifications for wetland/soft soil areas (*i.e.*, track-mounted, low pressure or high floatation vehicles). Backfill would be placed in disturbed areas to restore the streambed and floodplain to pre-removal grades, to cover and isolate dredging residuals or remaining contaminants in the soil, to provide material for habitat restoration, and to restore surface water drainage patterns. Disturbed areas would be backfilled and regraded with material suitable for habitat restoration. Armoring would be provided as necessary to control erosion. Dredged sediments and excavated soils would be transported to a central processing site prior to shipment off-site for ultimate disposal. At the processing site, sediment and soil would be segregated based on the characteristics of the material as determined during the design phase. Sediment and floodplain soil would be processed as necessary for disposal. Processing steps would include dewatering to a moisture content required for additional processing or disposal of dredged solids. Either passive or mechanical dewatering could be used. Material characterized as hazardous or as Toxic Substances Control Act (TSCA) waste would be stockpiled separately from material classified as non-hazardous; material requiring processing prior to disposal would be stockpiled separately from material not requiring processing. The processed solids would be shipped to an off-site disposal facility.

Stream Excavation: This action would remove contaminated sediment from Bound Brook by dewatering the streambed and removing the contaminated sediment "in the dry." Conventional excavation would be used to remove contaminated floodplain soils. Surface water flow in Bound Brook would be temporarily diverted around the active work area to allow conventional excavation of sediments under relatively dry conditions ("in the dry"), rather than dredging. Excavation of the sediment in the dry allows greater control over sediment removal because of greater access, reduces the post removal processing requirements due to the lower moisture content of the sediment, and minimizes the potential for dredging-related sediment resuspension and contaminant migration. The brook would be divided into segments based on natural boundaries at the site (*e.g.*, culverts, bridges, dams, etc.). Working segment by segment, a pumping and pipeline system would be constructed to dewater the brook. Temporary coffer dams would be installed across the brook and the surface water pumped through a temporary pipeline around the active portion of the work. Following dewatering, contaminated sediments would be removed from the bed of the brook using cranes, conventional excavators, drag line, and other construction equipment. The excavated sediment would be characterized for disposal and shipped to an off-site disposal facility. Once excavation of a segment was completed, backfill would be placed in disturbed areas to restore the streambed to pre-excavation conditions and allow for habitat restoration in the brook.

Diverting the stream and excavating sediments allows for marginally better sediment management performance during the removal, and appears to be a better fit with several of the groundwater alternatives, and is also less costly. Stream diversion and excavation was assumed, for cost-estimating purposes for this alternative. However, it is possible that a combination of excavation and dredging would be used.

While it would be technically feasible to dewater New Market Pond and excavate the sediment in the dry, this approach has a number of drawbacks, including odors and fish kills. Capturing and releasing fish up or downstream of the pond would allow the spread of PCB-contaminated fish beyond the limits of the fish advisory and increase the likelihood of consumption of the contaminated fish. For this reason, hydraulic dredging is preferred as the process for removing the sediment in New Market Pond necessary to achieve the PCB remediation goal of 1 mg/kg. Hydraulic dredging is described in more detail below in Alternative SS-3.

This alternative comprehensively addresses streambed sediments from approximately RM6.55 (at the twin culverts) down to and including New Market Pond (Reaches 2 and 3). Two depositional area hotspots have also been identified, at RM2.48

and RM 3.03 in Reach 4, which exceed the remediation goals. These hotpots would also be addressed in this alternative, probably through dredging. Based upon the 100-foot spacing of transects during the RI, it is possible that other small depositional areas could be identified with further sampling. This Alternative includes a provision for further sampling to attempt to identify other hotspots, primarily in Reach 4, and assumes that other identified hotspots would also be removed.

This alternative includes the cleaning of the existing silt trap (located upstream of the inlet to New Market Pond). After completion of the active remedy, MNR is expected to further improve conditions in surface water and sediments such that concentrations of contaminants in fish tissue would improve to acceptable levels over time. Future maintenance of the New Market Pond silt trap is expected to be advantageous for long-term improvement of fish tissue, as this mechanism (along with New Market Pond itself) has proved to be effective at collecting contaminated sediments. Therefore, this alternative includes the periodic maintenance (through sediment dredging every five years) of the silt trap to aid in the effectiveness of MNR.

To minimize local truck traffic, the preferred method to transport soil and sediment off-site for disposal would be by rail. This would require locating a processing site with a rail spur or siding. The feasibility of constructing a dedicated rail spur at the designated sediment/soil processing site should be evaluated during the RD stage of the project. If a processing site is not available with rail access, trucks may be used.

Alternative SS-3: Excavation/Dredging of Stream Sediments, Excavation with Capping of Floodplain Soils, Dredging with Capping of New Market Pond, Limited Hotspot Dredging of Depositional Areas with Monitored Natural Recovery

Capital Costs	$165,700,000
Operation & Maintenance Costs	$638,445
Periodic Costs	$30,000
Total Present Value	$157,800,000
Construction Time Frame	2 to 3 years

This alternative would also rely on dredging or excavation for much of the contaminated material, similar to Alternative SS-2 (for example, the options for excavation or dredging of stream sediments from RM6.55 to New Market Pond would remain unchanged), but this alternative also combines excavation or dredging with capping in several discrete areas of OU4, as described below.

Hydraulic Dredging and Capping in New Market Pond: While stream excavation is preferred for most of Bound Brook, hydraulic dredging does represent a feasible option for New Market Pond (Reach 3). Approximately 67 percent (71,000 cubic yards) of the contaminated sediment exceeding the PCB remediation goal is located in New Market Pond. Under Alternative SS-3, hydraulic dredging would be used for partial removal of contaminated sediment in New Market Pond, coupled with construction of an engineered cap to isolate the remaining sediments from the environment. Partial removal would entail the removal of enough material from the pond to accommodate the cap thickness without causing additional flooding, followed by construction of a sub-aqueous cap to contain residual contaminants (assumed to be a 24-inch thick sand cap). The depth of dredging would be required to be approximately 6 inches greater than the planned thickness of the cap to maintain water depth. Use restrictions would be established for the capped areas to protect the areas from unnecessary disturbance and to provide for long-term access for cap inspection and maintenance.

Consolidation/Capping of Floodplain Soils: Typical upland isolation capping consists of a soil cap a minimum of 24 inches thick, although the cap thickness may increase based on site-specific conditions. Capping would not be suitable in the portions of the floodplain bordering the streambed because of the potential for disrupting normal surface water flow patterns and the need for extensive armoring to protect the cap during high flow conditions. However, capping may be an effective alternative in portions of the broad expanses of floodplain where contamination is laterally extensive (*i.e.*, the area near the confluence of Bound Brook and Cedar Brook). This would involve fully excavating approximately 15 acres of the floodplains near the stream channel (an estimated 90,000 cubic yards), and removing an additional 25,000 cubic yards of surface soils from the remainder of the floodplain to allow for capping. The total volume excavated would be 115,000 cubic yards.

Under this approach, approximately 23 percent (35,000 cubic yards) of the contaminated floodplain soil would be left in place under a soil cap. The capped area would cover approximately 17 acres. A minimum two-foot thick cap would be constructed over contaminants in the floodplain using standard construction equipment. The intent of the cap would be to isolate remaining contaminants in the soil from the environment and direct contact, not to control permeability or prevent leaching. The need for armoring of the isolation layer would be evaluated during the RD phase. Prior to capping, a surface water drainage plan would be developed for the area to ensure that the cap did not disrupt current flow patterns or that alternative drainage routes were available. Use restrictions would be established for the capped areas to protect the area from unnecessary disturbance and to provide for long-term access for cap inspection and maintenance.

The capping in New Market Pond and in floodplains would require long-term cap maintenance. A 30-year cap maintenance period has been used for cost-estimating purposes, but the caps would need to be maintained in perpetuity.

Depositional Area Monitored Natural Recovery: The OU4 RI identified significant areas within the brook where sediments contained contaminants at concentrations below remediation goals. For example, with few exceptions, remediation goal exceedances were not found in Reaches 1A, 1B and 4, and remedial action will not be required in these areas. However, discrete depositional areas were identified within these generally low concentration areas (at RM 2.48 and RM3.03), and contaminant concentrations in these discrete depositional areas were found to exceed remediation goals. Under Alternative SS-3, sediment hotspots in these discrete depositional areas would not be removed, but addressed by MNR.

Description of Capacitor Debris (CD) Alternatives

EPA defined principal threats for OU4 as soil and capacitor containing debris with concentrations of PCBs in excess of 100 mg/kg located within the floodplain along the Bound Brook banks of the former CDE facility. The FS identified seven remedial process options for the CD areas. EPA carried through to this Proposed Plan the three "best fit" remedial alternatives. EPA's "A Guide to Principal Threat and Low-Level Threat Wastes", November 1991, affirms EPA's preference for permanent remedies to treat PTWs, wherever practical.

Therefore, for CD areas, the capping alternative has not been carried forward, leaving only "no action" and treatment, excavation and disposal alternatives for the OU4 principal threat wastes. The alternatives under consideration consist of:

- Alternative CD-1: No Action
- Alternative CD-3: Full-depth Excavation, Thermal Desorption, and On-Site Burial of Residuals
- Alternative CD-4: Full-depth Excavation and Off-Site Disposal

Both excavation alternatives (CD-3 and CD-4) involve conventional excavation of the CD areas from the sloped banks of Bound Brook adjacent to the former CDE facility using the remediation goal of 1 mg/kg, followed by filling and regrading to restore the banks, and installation of an armored layer to prevent erosion during future flood events. The twin culverts in the Bound Brook channel will also be removed as part of these alternatives to allow access to suspected CD areas and to mitigate the erosional areas caused by the presence of the culverts. Confirmatory sampling would be employed to verify adequate removal, which is expected to be required throughout the entire length of the banks previously armored by an EPA removal action. The primary difference between the excavation alternatives would be the use of on-site treatment and placement of the treated waste below a cap in a disposal area located within the footprint of the former CDE facility (under the OU2 cap) for CD-3, as opposed to off-site disposal for CD-4.

Common Elements of CD Alternatives

All of the remedial alternatives except Alternative CD-1 include long-term monitoring and institutional controls to limit future land uses. The degree of monitoring that would be needed is different for each alternative. Institutional controls are administrative and legal controls that help to minimize the potential for human exposure to contaminants. For Alternative CD-3, institutional controls consisting of restrictions on land use of capped floodplain soils would be implemented. Similarly, for Alternative CD-4, restrictions on land use to prevent future residential use would be required. (Five-year reviews are already required for the OU2 and OU3 remedies.)

Alternative CD-1: No Action

Capital Costs	$0
Operation & Maintenance Costs	$0
Periodic Costs (Monitoring)	$0
Total Present Value	$0
Construction Time Frame	0 years

Regulations governing the Superfund program require that the "no action" alternative be evaluated to establish a baseline for comparison to other alternatives. Under this alternative, EPA would take no action at the site to prevent potential exposure to soil contamination or PCB-contaminated capacitor debris.

Alternative CD-3: Full-depth Excavation, Thermal Desorption, and On-Site Burial of Residuals

Capital Costs	$42,400,000
Operation & Maintenance Costs	$0
Periodic Costs (Monitoring)	$0
Total Present Value	$42,400,000
Construction Time Frame	1 year

Under this alternative, after excavation, PTWs with PCB concentrations greater than 100 mg/kg would be treated by an on-site treatment process such as low temperature thermal desorption (LTTD). The potential location of the treatment pad for the on-site treatment unit has not been selected at this time. The 26-acre facility has been designated a redevelopment zone by the Borough of South Plainfield, and EPA is supportive of putting the land back to productive use. Therefore, the location of the treatment facility may depend upon the status of the redevelopment project.

The process would begin with excavation of the contaminated soil and debris, using sheeting, coffer dams and other stream diversion techniques as necessary, followed by post-excavation sampling. The volume of material is estimated to be 31,900 cubic yards. LTTD is a physical separation process by which wastes are heated in thermal desorption units to volatilize water and organic contaminants. A carrier gas or vacuum system transports volatilized water and organics to the gas treatment system. Contaminants are removed through condensation followed by carbon adsorption or they are destroyed in a secondary combustion chamber or catalytic oxidizer. For treatment of the OU4 soils, the post-treatment target would be less than 1 mg/kg PCBs and treated material would be placed on site. Debris that could not be successfully treated would be disposed of offsite. For cost-estimating purposes, it is assumed that approximately 10 percent of the material excavated under this alternative would not need to be treated and could be placed under the cap without LTTD treatment.

Under Alternative CD-3, treated soil and debris would be consolidated into a single location (on the former CDE facility property, if appropriate) and capped with a multi-layer cap design similar to that used to remediate OU2. The FS estimate assumes that the material would be placed at the former CDE facility in a 10-acre area, which would result in a relatively thin layer (18 inches) of new waste spread over a wide area, to allow for proper drainage of the OU2 property.

This alternative would include capping and engineering controls and institutional controls to restrict land use, wetland restoration and long term Operation and Maintenance (O&M) of the cap. Since wastes would be left on-site, five-year reviews would be conducted to ensure the remedy is protective and evaluate the need for future actions.

Alternative CD-4: Full-depth Excavation and Off-Site Disposal

Capital Costs	$32,800,000
Operation & Maintenance Costs	$0
Periodic Costs (Monitoring)	$0
Total Present Value	$32,800,000
Construction Time Frame	1 year

Under this alternative, all CD waste would be excavated and disposed off-site at an appropriate disposal facility. The excavation would proceed as described above for Alternative CD-3; however, no on-site treatment would be conducted. Instead, all excavated material would be shipped off-site for disposal. As with Alternative CD-3, this alternative would include wetland restoration, institutional controls to restrict future land use and a five-year review.

Description of Groundwater (GW) Alternatives

The GW alternatives would mitigate the discharge of contaminated groundwater to Bound Brook adjacent to the former CDE facility. Contaminated groundwater (OU3) is present in the bedrock matrix (as demonstrated by results of bedrock porewater analyses performed during the OU4 RI) and is discharging to the brook. The OU3 RI results, combined with numerical modeling, indicate that contaminated groundwater identified in OU3 has the potential to impact conditions in Bound Brook for many decades or even centuries to come. The groundwater discharge has the potential to recontaminate remediated sediments in Bound Brook and cause unacceptable risks to ecological receptors.

Remediation of the contaminated groundwater source itself was evaluated in OU3 and was found to be technically impractical. Because groundwater restoration is impracticable, to be protective in the long term, the remedial alternatives should be able to prevent exposure to receptors in perpetuity by preventing contaminant migration from groundwater to surface water. This was a primary factor in the development and evaluation of the GW alternatives.

The alternatives under consideration consist of:

- Alternative GW-1: No Action
- Alternative GW-2: Monitoring and Institutional Controls
- Alternative GW-3: Hydraulic Control of Groundwater
- Alternative GW-4: Permeable Reactive Barrier (PRB)
- Alternative GW-5: Reactive Cap

Under Alternative GW-2, monitoring the sediment and water quality would be performed in Bound Brook in lieu of active remediation of groundwater discharges. Alternative GW-3 consists of a groundwater withdrawal and treatment system intended to capture and treat the portion of the contaminated groundwater that would otherwise discharge into the brook as contaminated porewater. Alternatives GW-4 and GW-5 are passive treatment systems. Alternative GW-4 consists of a PRB installed in a trench adjacent to the brook, and Alternative GW-5, a reactive cap installed in the bed of the brook.

Potential alternatives that were examined and determined to be impractical included damming the brook to create an impoundment deep enough to counteract the head of discharging groundwater (the inundation area would have a substantial deleterious effect on surrounding properties) and an impermeable cap in the streambed (models indicate the discharge would shift to a tributary to Bound Brook, where it would continue to cause an adverse impact on the water body). The concept of restarting the Spring Lake well field, which, when operating prior to 2003, created a downward gradient that may have reduced much of the discharge to surface water, was also considered but not retained. The owner of the well field, Middlesex Water Company, does not currently have a business interest in reactivating this system, which operated at a rate of as much as 2 million gallons per day, nearly 1,400 gallons per minute (gpm). In contrast, the pumping system required to achieve capture of the discharging groundwater, as discussed above in Alternative GW-3, would require only 25 gpm, and would be situated so that it will create the needed drawdown across the identified area, whereas the Spring Lake system would create a much larger drawdown, but not necessarily across the necessary capture zone.

Common Elements for GW Alternatives

The GW alternatives (with the exception of Alternative GW-1, No Action) each include long-term monitoring to evaluate groundwater and porewater quality associated with groundwater discharge to Bound Brook. Each of the alternatives also focus only on the portion of the contaminated groundwater that discharges through the bed of Bound Brook, since the rest of the groundwater plume was addressed in the OU3 ROD. Due to the long-term back-diffusion of contaminants from the bedrock matrix and the associated contaminated groundwater discharge, each of the GW alternatives would have to be operated and maintained for the same timeframe, which is expected to be on the order of hundreds of years. Alternatives GW-4 and GW-5 both employ passive treatment technologies to achieve remedial action objectives for the groundwater discharging to Bound Brook. The difference between the alternatives is the location at which the groundwater is treated – either in a vertical trench adjacent to the brook or at the point of discharge in the bed of the brook via a reactive cap. For Alternatives GW-4 and GW-5, the collected monitoring data would be used to evaluate the frequency of media replacement required in the PRB and reactive cap, respectively, in addition to evaluating achievement of remediation goals and assessing attenuation.

For all the GW Alternatives, five-year reviews would be conducted to ensure the remedy is protective and evaluate the need for future actions. A groundwater use institutional control, in the form of a New Jersey Classification Exception Area (CEA), is already required as part of the OU3 remedy, which addresses the area-wide site-related groundwater contamination. An OU4 groundwater remedy would necessitate the expansion of the planned CEA to include the OU4 area as well.

Alternative GW-1: No Action

Capital Costs	$0
Operation & Maintenance Costs	$0
Periodic Costs (Monitoring)	$0
Total Present Value	$0
Construction Time Frame	0 years

Regulations governing the Superfund program require that the "no action" alternative be evaluated to establish a baseline for comparison to other alternatives. Under this alternative, EPA would take no action at the site to prevent discharge of contaminated groundwater to Bound Brook.

Alternative GW-2: Monitoring, Institutional Controls

Capital Costs	$1,900,000
Operation & Maintenance Costs	$10,270,000
Periodic Costs (Monitoring)	$0

Total Present Value	$12,200,000
Construction Time Frame	1 year

This alternative consists of monitoring the sediment and water quality in Bound Brook in lieu of active remediation of groundwater discharges. Under Alternative GW-2, the effectiveness of MNR in achieving remedial action objectives for the groundwater discharging to the brook would be evaluated. Institutional controls such as the fish advisory already in place would be maintained to protect against human exposure in downstream areas of the brook.

Monitoring would be initially conducted on a quarterly basis, until baseline conditions are established. Once established, monitoring could be adjusted to a semi-annual or annual frequency, depending on the results. Monitoring would include the following elements: porewater sampling using passive samplers, the installation and sampling of groundwater monitoring wells along the length of the impacted section of the brook (including single- and nested, multi-depth wells), surface water grab samples, installation and monitoring of piezometers, and collection and analysis of sediment samples. Samples would be analyzed for PCBs and VOCs.

Alternative GW-3: Hydraulic Control of Groundwater

Capital Costs	$8,100,000
Operation & Maintenance Costs	$15,160,000
Periodic Costs (Monitoring)	$0
Total Present Value	$23,300,000
Construction Time Frame	1 year

This alternative would establish hydraulic control (containment) of the portion of the groundwater discharging from the former CDE facility to Bound Brook. Hydraulic control of groundwater is envisioned to entail installing three vertical extraction wells on the former CDE facility property, each to a depth of approximately 75 feet bgs, and pumping the wells at a combined rate of approximately 25 gpm. The groundwater extraction well depths and total flow rate are based on preliminary results of a MODFLOW groundwater extraction simulation performed as part of the OU3 RI, and would need to be refined during remedial design (RD).

Alternative GW-3 incorporates an on-site treatment system to treat the extracted groundwater. Although the final technology selection for an *ex situ* treatment system would be deferred to the RD phase, representative process options were selected and included oil-water separation, acidification to control scaling, sediment filtration, oxidation to treat organics, catalytic filtration for metals removal, carbon effluent polishing, neutralization, and discharge to a local municipal treatment works or Bound Brook.

It is expected that Alternative GW-3 would need to be operated for decades or potentially centuries, i.e., as long as contaminants in the bedrock matrix would prevent groundwater from meeting remedial action objectives in Bound Brook. A groundwater monitoring program would be established to monitor the performance of the hydraulic control remedy. Because of the duration of operation, the RD would need to include O&M requirements for the various treatment system components, and to optimize the design based on minimizing O&M costs (*e.g.*, use of solar power). The building housing the treatment components, as well as the piping connecting the various components of the system, would need to be designed for an extended operational life. Contaminant concentrations may fluctuate over time; therefore, this system would need to be flexible enough to allow for use of different technologies, as needed.

Alternative GW-4: Permeable Reactive Barrier

Capital Costs	$18,700,000
Operation & Maintenance Costs	$3,780,000
Periodic Costs (Monitoring)	$4,580,000
Total Present Value	$27,100,000
Construction Time Frame	1 year

Alternative GW-4 consists of a PRB in a trench located on or adjacent to the former CDE facility to intercept and treat contaminated groundwater prior to discharge to Bound Brook. A PRB passively treats contaminated groundwater as it flows through reactive media installed within the trench. Primary design factors for the PRB include: the depth to bedrock, the required depth and breadth of the groundwater capture zone, the residence time required for treatment of the contaminants to desired concentrations, and the treatment media to be installed. On the basis of preliminary modeling results and site conditions documented by the OU3 RI, it is anticipated that the PRB would be approximately 1,500 feet in length, running along the northeast and northwest boundary of the former CDE facility adjacent to the brook.

According to data collected during previous investigations in OU2 and OU3, bedrock is present at depths between 0 to 10 feet bgs at the former CDE facility. Groundwater modeling suggests that the PRB trench would need to be 50 to 75 feet deep to capture the groundwater discharging to the brook. To excavate a trench to that depth, controlled blasting would be used to create a rubble zone in the bedrock. After blasting, if the trench walls were stable, the rubble could be removed. If the trench walls were not stable, it might be necessary to backfill the trench (to stabilize the area) with a combination of treatment media and appropriately selected fill material. Unstable conditions in the trench could impact the cost of subsequent media change-outs and potentially, the effectiveness of the system.

Controlled blasting would increase the bedrock permeability and would be expected to modify the flow paths in the bedrock aquifer in a manner advantageous to the groundwater treatment objective by creating a zone of higher permeability around the trench which should encourage the flow of contaminated groundwater through the treatment media.

The reactive media in the trench would be selected based on the primary constituents of concern and a treatability study conducted during the RD. Because it is anticipated that groundwater will continue to discharge contaminants to the brook for decades or longer, the PRB would need to be designed to be maintained and operated over a very long period. Over time, the reactive media in the PRB would be consumed and require replacement.

During the RD, approaches to facilitate media replacement would be evaluated. These may include the use of panels, canisters, or reactors containing treatment media that can be inserted and removed readily; injection of treatment media into the rubble zone created by the blasting; or removing/replacing the rubble zone and directly backfilling treatment media into the trench. The selection of the appropriate option would be finalized based on conditions in the trench. Panels or canisters would allow for more ready replacement of spent media, but are likely to have less treatment capacity and require more frequent change-out. Backfilling the trench with the media would likely result in greater treatment capacity between change-outs, but each change-out would be more expensive and labor-intensive. Given the depth of the trench, cranes and booms would be required for either option. The need for equipment access over the life of the treatment process could affect development in a portion of the former CDE facility property. A monitoring program would be required to evaluate the effectiveness of the treatment and detect the need for reactive media replacement.

Alternative GW-5: Reactive Cap

Capital Costs	$13,500,000
Operation & Maintenance Costs	$3,230,000
Periodic Costs (Monitoring)	$5,370,000
Total Present Value	$22,100,000
Construction Time Frame	< 1 year

Alternative GW-5 consists of installation of a reactive media layer in the bed of Bound Brook to intercept and passively treat contaminated groundwater at the point of discharge. During RD, the optimal sequence for installation of the reactive cap in relation to the remediation of the soil and sediment, and the capacitor debris areas, would be determined.

Constructing a reactive cap could require diverting the water in the brook via coffer dams and a pipeline diversion system (using procedures similar to those discussed for SS-2) and over-excavating the streambed within the known discharge zone to an appropriate depth, such that the top of the reactive cap (including armoring layer) would be at the same grade as the current streambed. Bedrock outcrop areas could require blasting to accommodate the thickness of the reactive cap, although data from the remediation of OU2 suggests that the upper portion of bedrock is weathered and likely is rippable using conventional excavators.

The reactive material would be installed in manufactured ‘blankets’, with the reactive media sandwiched between two layers of filter fabric. Use of media blankets would facilitate regular removal and replacement of the reactive media. Following installation, the media blankets would be covered with a sand layer to allow habitat to be reestablished in the area. Armoring would be provided for the cap to protect it from erosion during high flows.

A pilot study would be required to determine the required cap thickness. Detailed measurements of the historical and current river flows would be required to establish locations within the cap alignment requiring additional armoring or additional thickness of the sand layer. Porewater flux monitoring, along with multiple rounds of groundwater monitoring, both for the pre- and post-treated groundwater, would be conducted as part of the pilot study.

Based on the results of particle tracking and sediment transport modeling conducted for the OU4 RI, the cap would likely be placed between RM6.2 and RM6.5 of Bound Brook, a distance of approximately 1,600 linear feet, from the twin culverts to the Lakeview Ave Bridge. The cap would encompass the entire width of the brook, extending up the side slopes, and would be anchored along the shore line.

It is anticipated that the reactive cap would need to remain in place in perpetuity. The life of the treatment media is subject to the contaminant load and the groundwater flux, and would require replenishment as part of its O&M cycle. A porewater monitoring program would be established to verify that the reactive cap is treating contaminants in the groundwater prior to discharge to surface water. Contaminant levels in the porewater would be evaluated during the RD to indicate when media change out is required. Alternative monitoring approaches may also be introduced during the RD to monitor system performance.

<u>Description of Water Line (WL) Alternatives</u>

Approximately 1,700 feet of 36-inch diameter ductile iron pipe crosses the former CDE facility property. This high pressure potable water transmission line was uncovered during excavation of OU2, and although it was not physically damaged during the excavation process, the water line ultimately developed a leak during that remedial activity. Although the pipeline was repaired, as the water lines ages, it is possible that it will leak again or break. Depending on the extent of the leak or break, the water could impact the integrity and protectiveness of OU2 soils remedy and release contaminants to Bound Brook thereby threatening the OU4 remedy.

To address this potential threat to the OU2 and OU4 remedies, the alternatives under consideration consist of:

- Alternative WL-1: No Action
- Alternative WL-2: Water Line Monitoring System, Replacement in Existing Easement As Necessary
- Alternative WL-3: Water Line Replacement in New Easement

Alternative WL-1: No Action

Capital Costs	$0
Operation & Maintenance Costs	$0
Periodic Costs (Monitoring)	$0
Total Present Value	$0
Construction Time Frame	0 years

Regulations governing the Superfund program require that the “no action” alternative be evaluated to establish a baseline for comparison to other alternatives. Under this alternative, EPA would take no action at the site to address the concerns associated with the existing high pressure water line below the former CDE facility property.

Alternative WL-2: Water Line Monitoring, Replacement as Necessary

Capital Costs	$500,000
Operation and Maintenance Costs	$100,000
Periodic Costs (Monitoring)	$4,100,000
Total Present Value	$4,700,000
Construction Time Frame	< 1 year

Alternative WL-2 consists of leaving the water line in its current location and installing a pipeline monitoring system to detect leaks in the segment of the pipeline crossing the former CDE facility property. Pipeline monitoring systems for single walled pipes, such as the existing water main, typically involve monitoring the pressure within the pipe. If the pressure drops outside of a designated range, an alarm sounds indicating a leak. The system can either be designed to automatically shut down the segment of the pipeline that the monitoring system indicates has a leak, or the decision on action can be deferred to a designated responder.

This alternative would require the following elements:

- Install a pipeline monitoring system to detect potential leaks in the water line.
- Install a control system that would allow the portion of the pipeline crossing the former CDE facility property to be shut down in the event of a leak.
- Install an alarm and emergency alert system to alert a designated person or team tasked with responding to a leak.
- Establish a program for addressing future leaks.
- Review the proposed development plans for the former CDE facility property to assess the ability to replace the pipeline in the future once the site has been developed.

This alternative assumes that pipeline leaks would lead to replacement of the water line in year ten of the estimate, in a location parallel to its current location crossing the former CDE facility property. At that time, it would take a number of months to design and construct a new pipeline in the event that was necessary due to a leak, during which time the main would need to remain in operation. This would necessitate temporary repairs to the pipeline which could impact operations on the property as well as expose site users to contaminants.

Alternative WL-3: Water Line Replacement in New Easement

Capital Costs	$8,900,000
Operation & Maintenance Costs	$0
Periodic Costs (Monitoring)	$0
Total Present Value	$8,900,000
Construction Time Frame	< 1 year

This alternative consists of relocating the existing water line to a new easement that does not cross the former CDE facility property. Alternative WL-3 would entail constructing a similarly sized, new pipeline in the public right-of-way (ROW). The new pipeline route would need to be determined during the RD; a proposed route was developed by New Jersey American Water (NJAW) for evaluation purposes. Modifications to the existing distribution system would be done as necessary to accommodate the changes to the system configuration.

This alternative would require addressing the following elements:

- Negotiations with the Borough of South Plainfield regarding construction of the pipeline in the public ROW.
- Negotiations with the owner of the railroad line (Conrail) regarding a jack and bore under their tracks at two locations.
- Evaluation to establish compliance with regulatory requirements for construction of the pipeline under Bound Brook.
- Modifications to the existing pipeline system to accommodate the proposed changes in the pipeline configuration.
- Abandoning the existing pipeline in place by disconnecting the pipeline from the water distribution system at both ends. The existing pipeline would be grouted closed at both ends.

EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan profiles the relative performance of each alternative within each component of OU4 against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. A detailed analysis of alternatives can be found in the FS.
Table 2 summarizes the estimated costs for each remedial alternative under consideration.

Sediment and Floodplain Soils (SS)

1. Overall Protection of Human Health and the Environment

Alternative SS-1, No Action, would not be protective of human health and the environment since it does not include measures to prevent exposure to contaminated sediment and soil.

Alternatives SS-2 and SS-3 would reduce the cancer risk to be within EPA's risk range and noncancer hazards to be at or below a hazard index of 1 for direct contact and, coupled with MNR, to reach protective levels for fish consumption and environmental protection within reasonable period of time; therefore, they are protective. Alternative SS-2 (Dredging/Excavation of Sediments, Excavation of Soils) would mitigate the exposure risks in Bound Brook, Green Brook, and the associated floodplain areas through the removal of contaminated sediment and soil. Alternative SS-3 (Dredging/Excavation with Capping) would mitigate the exposure risks in Bound Brook, Green Brook, and the associated floodplain areas through the removal of contaminated sediment and soil combined with capping and the use of MNR for depositional area hotspots. For both alternatives, surface water quality would be improved by the removal of the contaminant source and the cleaning of the existing silt trap (located upstream of New Market Pond).

Alternative SS-3 would leave contaminants in place, isolated underneath a barrier cap in New Market Pond and in portions of the floodplain soils that do not immediately border the brook. This alternative would be protective only if the caps were maintained in perpetuity.

Alternative SS-3 would rely on MNR to address two known, and possibly other, depositional areas containing concentrations of PCBs exceeding remediation goals in Reach 4. More broadly, Alternatives SS-2 and SS-3 remediate sediments that exceed 1 mg/kg PCBs, and would rely on MNR to further reduce sediment and surface water concentrations to levels that will allow fish tissue to recover to protective levels.

2. Compliance with ARARs

Except for Alternative SS-1, the alternatives would comply with ARARs regarding remediation and filling in floodplains, work in wetland areas, waste management, air quality, and storm water management, and would meet NJDEP’s chemical-specific ARAR for PCBs in soils, based on non-

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment evaluates whether and how an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that are legally applicable, or relevant and appropriate to the site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, the community, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

residential direct contact. Both SS-2 and SS-3, which include placement of material within the brook, would need to be implemented in compliance with the Clean Water Act, 33 U.S.C. § 404(b)(1) and 40 CFR Part 230, which require that disturbance to aquatic habitat be minimized to the extent possible. Compliance with the substantive elements of New Jersey Flood Hazard Control Act (FHCA) Rules (NJAC 7:13-10 and 7:13-11) including those addressing placement of material in the flood hazard area and impacts to the riparian zone would also be required. Alternative SS-2 would comply with the FHCA. Alternative SS-3 calls for the removal of one foot of the floodplain areas to be capped and the placement of two feet of capping and cover; the FHCA Rules may necessitate additional removal (e.g., to a depth equal to the placed material, two feet) to allow for capping.

3. Long-Term Effectiveness and Permanence

Alternative SS-1 is neither effective in the long-term nor a permanent solution to controlling the contaminants in the brook sediment and floodplain soils.

Alternative SS-2 would remove the contaminated sediment in the brook and surrounding contaminated soils to meet the remediation goal of 1 mg/kg. It is both permanent and effective in the long-term in controlling contaminants in the brook and surrounding floodplain, as well as in improving surface water quality. Alternative SS-3 would similarly remove contaminated sediment in the brook and soil along the banks of the brook in likely scour areas. Alternative SS-3 would also remove surface soils in the remainder of the floodplain and leave deeper contaminants in place and rely on capping to be protective over the long term. Capping would occur where surface water modeling indicates that erosional surface water stresses would not occur during flood events. For Alternative SS-3, long-term protectiveness requires capping be maintained in perpetuity, with monitoring and regular maintenance, to prevent direct contact. In addition, monitoring and maintenance of the cap would be required to allow for MNR to achieve the fish consumption remediation goal of 0.25 mg/kg, because elevated PCB concentrations remaining in the floodplain could, with the failure of the cap, become a source of PCBs to the remediated brook sediments.

Alternatives SS-2 and SS-3 require that the fish advisory stay in place while concentrations of PCBs decline in fish tissue, to be protective in the long term.

For both alternatives, surface water quality would be improved by the removal of the contaminant source and the cleaning of the existing silt trap (located upstream of New Market Pond). Future maintenance of this silt trap may prove advantageous for long-term improvement of fish tissue, as this device, and New Market Pond, have proved to be effective at collecting contaminated sediments and are expected to continue to do so.

For Alternative SS-3, capping in New Market Pond is protective over the long term by installation of armoring in the areas of the pond, near the dam/outfall, where there is currently evidence of erosional stresses. As with capping in the floodplain, long-term protectiveness of capping in New Market Pond is dependent upon the monitoring and periodic maintenance of the cap. Please refer to the "implementability" criterion, below, for a discussion of maintenance dredging in New Market Pond.

4. Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative SS-1 does not include any treatment and would not reduce the toxicity, mobility, or volume of contaminants associated with the OU4 study area. The remaining alternatives would permanently reduce the volume and mobility of contaminants in the brook and floodplain soils by their removal and appropriate disposal. The alternatives do not require treatment, though treatment may be required prior to land disposal (stabilization/solidification, and/or, if necessary based on the characteristics of the sediment, thermal destruction).

5. Short-Term Effectiveness

Alternative SS-1 does not present any short-term risks to site workers or the environment because it does not include any active remediation work.

Among the sediment remediation techniques, dredging presents a greater risk of material being released during the removal process, although the risk is small and can be controlled by the use of silt curtains and silt fences downstream of active operations. Diverting the stream to allow for excavation of sediments poses a risk of localized flooding and the associated potential redistribution of contaminants, in the event that heavy precipitation exceeds the bypass system's capacity to divert the flow in Bound Brook. Both methods would disrupt existing ecosystems in the wetlands and greenbelt spaces during removal operations; however, mitigation techniques are available to allow these areas to recover. Both the active alternatives (Alternatives SS-2 and SS-3) would have similar risks to remediation/construction projects of similar size and scope, including the potential for exposure to low levels of a range of contaminants, working on or around heavy equipment, working in water/wet environments, disruptions of ecosystems in the brook and in surrounding forested areas, increased construction-related traffic, quality of life impacts to nearby residents (noise, odors, lights), localized flooding during construction, and the potential spread of contaminants in the brook from dredging or runoff from excavation or an accidental release during construction.

In all cases, it is anticipated that these risks could be mitigated through the use of engineering controls, safe work practices, and personal protective equipment (PPE).

6. Implementability

Because Alternative SS-1 would not entail any construction, it would be easily implemented.

The two remaining alternatives were developed based on industry-standard construction techniques and would be technically feasible to implement. However, because of the size of the remediation area and the number of parties that own property within the limits of the designated OU4 study area identified in the FS, it may be difficult to negotiate necessary access with all parties involved. Furthermore, for Alternative SS-3 in areas that require capping, deed notices or restrictive covenants would be need to be secured from property owners to assure the maintenance of the caps in perpetuity.

Some restrictions may affect the implementability of capping of floodplains as part of Alternative SS-3. In the FS, EPA estimated that capping could be implementable on 17 of the 32 acres of floodplains with contaminated soil at concentrations exceeding remediation goals. For this to be implementable and cost effective on those 17 acres, the FS assumes that 1 foot of surface material would be removed followed by the placement of a 1-foot sand layer as a contact barrier, plus a 1-foot organic soil layer to allow for ecosystem re-establishment. While technically feasible, it may not be implementable as planned in the FS. The loss of even a small amount of flood storage caused by the addition of capping material could have adverse effects in this urban setting that is already plagued with flooding problems. Capping may prevent the remedial action from meeting the FHCA expectation of "no net fill" in a wetland, or of restoring the existing habitats when the action is complete. These issues could be resolved by simply excavating additional material to allow for one-to-one capping and filling; however, if this change were to be required, given the estimated depth of PCB-contaminated soils of 3 feet and the removal of 2 feet, installing and maintaining (in perpetuity) the cap over a relatively thin layer of PCB-contaminated soil would influence the cost difference between the two alternatives, as discussed below.

Much of the 17 acres that could be capped under Alternative SS-3 is used for active or passive recreation in Veterans Memorial Park, and a remedy that relies of capping in this area may face municipal opposition based on concerns that use restrictions might not be sufficiently protective, Capping also be opposed by stakeholders in the Green Brook Flood Control Project, as it may impede later USACE/NJDEP flood control actions.

Similarly, implementability of capping in New Market Pond may also be limited. Its estimated that 1 foot of material would be hydraulically dredged (contrasted with the 2.5 feet dredged to achieve complete removal in Alternative SS-2), followed by the placement of a 6-inch thin sand cap. Areas near the dam/outfall would also require an armoring layer of stone, also estimated at 6 inches. If, during design, the volumes of material at depth were found to be less than predicted, there would be no advantage to capping, and maintaining in perpetuity, a relatively thin layer of PCB-contaminated sediment at depth instead of removing it.
In addition, given Piscataway Township's periodic dredging of New Market, installing a thin layer cap would impose restrictions on the Township and expose the cap to risk of damage.

7. Cost

The present value costs are $187.3 million for Alternative SS-2 and $165.7 million for Alternative SS-3. The costs for each alternative were developed on the basis of preliminary engineering designs to meet the RAOs. The largest single cost item for Alternative SS-2 is the cost of off-site disposal, at $45.4 million. This cost conservatively assumes that 10 percent of the excavated or dredged material will require disposal at a TSCA or RCRA subtitle C hazardous waste landfill, and that the remaining material can be sent to a subtitle D nonhazardous waste landfill.

The primary cost difference between Alternatives SS-2 and SS-3 is the additional removal and off-site disposal costs for removing the additional volumes as part of Alternative SS-2. The cost of cap installation and maintenance, even in perpetuity, is somewhat less than the capital cost of complete removal and disposal. As discussed above, if additional excavation were to be required to allow for a one-to-one placement of a cap under Alternative SS-3, Alternative SS-3 the cost difference between Alternative SS-2 and SS-3 would be lessened substantially.

Capacitor Debris (CD)

1. Overall Protection of Human Health and the Environment

Alternative CD-1 (No Action) would not be protective of human health and the environment since it does not include measures to control the release of contaminated soil and debris buried in the side slope of the former CDE facility/bank of Bound Brook. Alternatives CD-3 and CD-4 are protective since the contaminated materials would be completely removed from the side slope and surrounding area to meet the 1 mg/kg remediation goal, with reconstruction afterwards to restore habitat. The contaminated materials would either be treated and buried on the former CDE facility (Alternative CD-3) or hauled off site to a landfill for disposal (Alternative CD-4). Both of these alternatives would remove a risk to human health and the environment and a potential source of contamination to Bound Brook.

2. Compliance with ARARs

Except for Alternative CD-1, the alternatives would comply with ARARs regarding remediation and filling in floodplains, work in wetland areas, waste management, air quality, and storm water management, and would meet NJDEP's chemical-specific ARAR based on non-residential direct contact for PCBs in soils As with the soil/sediment component, compliance would need to be established with the Clean Water Act, 33 U.S.C. § 404(b)(1) and 40 CFR Part 230, as well as the substantive elements of New Jersey Flood Hazard Control Act Rules (N.J.A.C. 7:13-10 and 7:13-11).

3. Long-Term Effectiveness and Permanence

Alternative CD-1 is neither effective in the long-term nor a permanent solution to controlling the contaminants buried in the side slope of the former CDE facility. This area is subject to erosion that would result in material contaminating Bound Brook.

Both Alternatives CD-3 and CD-4 would completely remove the capacitor debris and in a manner that addresses risks to human health and the environment, and achieve the remediation goal of 1 mg/kg for floodplain soils.

4. Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative CD-1 does not include treatment and would not reduce the toxicity, mobility, or volume of contaminants in the CD areas. Alternative CD-3 would result in treatment of the majority of excavated material to reduce its toxicity prior to placement of the material on the former CDE facility (assuming it could be implemented successfully, as discussed below). Alternative CD-4 would not require treatment as a principal component, and would only treat a limited amount of the waste material if required to allow for disposal in a landfill.

5. Short-Term Effectiveness

Alternative CD-1 does not present any short-term risks to site workers or the environment because it does not include any active remediation work. Alternatives CD-3 and CD-4 would have similar risks to general construction activities such as working around/on/with heavy equipment and hauling equipment, and working near water. In addition, short-term risks would include the potential for exposure to a range of contaminants at potentially high concentrations, the potential for a construction-related release of contaminants to the brook, disruption of wildlife in the brook and in surrounding wetland/floodplain areas, increased construction traffic, and impacts to those living or working adjacent to the remediation area (noise, odors, lights).

On-site thermal desorption and placement of the treated material under the OU2 cap presents an additional risk for Alternative CD-3 beyond those associated with Alternative CD-4 due to the additional effort and processes associated with this alternative.

6. Implementability

Because Alternative CD-1 would not entail any work, it would be easily implemented. Alternatives CD-3 and CD-4 are based on industry-standard construction techniques and are technically feasible to implement.

Based upon EPA's experience with LTTD during the OU2 remedy (treating essentially the same material) there are several additional implementability concerns with Alternative CD-3. For example, inability of the treatment system to reduce contaminants to acceptable levels when treating capacitors and capacitor parts was a frequent problem during the implementation of the OU2 remedy. The material in the "capacitor disposal area," the central disposal area on the facility, was not treated at all; rather, it was removed for off-site disposal because it was predominantly debris and not contaminated soil. The CD areas of OU4 are relatively close to this disposal location, and the OU4 RI sample results suggest that at least part of the CD areas have similar characteristics. Furthermore, during the OU2 LTTD treatment, the unit was unable to meet the treatment criterion when processing soils containing capacitor parts, leading to additional handling costs to remove the capacitors from the soils before treatment. While it is possible that a change in LTTD treatment temperature or residence time may address this issue, such changes would result in operational costs substantially greater than the assumed industry standard ($150/ton was used in the FS).

Air emissions from an on-site treatment system may present an additional implementability challenge for use of LTTD. However, during the OU2 remedy, EPA did not encounter significant difficulties with air emissions.

As with the other remedial components, Alternatives CD-3 and CD-4 incorporate an assumption of access/leasing of property for a central processing location to handle the excavated material. During the OU2 remedy, EPA successfully operated the LTTD unit at the former CDE facility property; depending upon the status of the redevelopment of this facility, some limited space may be available for use. However, if this were not possible, siting such a facility elsewhere may be more challenging. Also, the likely siting location for a treatment facility under Alternative CD-3 would be at the rear (southeast) of the facility, a location slightly lower in elevation and more prone to flooding in a severe flood event.

Alternatives CD-3 and CD-4 would disrupt wetland ecosystems adjacent to Bound Brook during removal operations; however, these could be restored following remediation. Moreover, the ecosystem would be improved as a result of the remedial action.

7. Cost

The present values for the CD alternatives are $42.4 million for Alternative CD-3 and $32.8 million for Alternative CD-4. The costs for each alternative were developed on the basis of preliminary engineering designs to meet the RAOs. These costs are predominantly associated with the capital costs of implementing the remedy. The costs of maintaining the treated soils and debris under the cap for Alternative CD-3 after implementation would be incremental to the cost of maintenance of the OU2 remedy. The difference in cost of on-site treatment versus off-site disposal is relatively small ($150 per ton for on-site treatment, $165 per ton for off-site disposal without treatment); the substantial cost savings associated with off-site disposal is associated with additional costs of siting the temporary treatment unit. Moreover, as discussed above under the implementability criterion, the Alternative CD-3 assumption of a per ton rate of $150 may not be achievable for 100 percent of the CD material, particularly the soil containing capacitor debris. Additional costs might be incurred for off-site disposal of contaminated material that could not be treated.

Under Alternative CD-4, EPA conservatively assumed, for cost-estimating purposes, that 10 percent of the CD material would require off-site treatment by incineration prior to disposal. Based upon experience with the capacitor disposal area addressed as part of the OU2 remedy, it is possible that none of the CD material would actually require incineration under TSCA, resulting in a reduction in the cost of Alternative CD-4 from $32.4 million to $30.6 million.

Groundwater Discharge to Surface Water (GW)

1. Overall Protection of Human Health and the Environment

Alternative GW-1 (No Action) would not be protective of human health and the environment since it does not include measures to prevent the continuing discharge of contaminated groundwater to Bound Brook. Alternative GW-2 would monitor the impact of the discharge of contaminated groundwater to Bound Brook and rely on MNR to address the impacts; based upon site-specific modeling of this release, it is uncertain whether MNR can sufficiently mitigate this release to achieve protectiveness. Alternatives GW-3 (Hydraulic Control), GW-4 (Permeable Reactive Barrier), and GW-5 (Reactive Cap) are protective of human health and the environment in the portion of Bound Brook affected by groundwater discharge, through containment or groundwater/pore water treatment prior to discharge to surface water. Remediation of the groundwater source was assessed in the OU3 ROD and found to be technically impracticable given site conditions.

2. Compliance with ARARs

Except for Alternative GW-1, the alternatives would comply with location-specific ARARs regarding remediation and placement of fill in floodplains, construction work in wetland areas, waste management, air quality (monitoring and emission limitations, as needed), storm water management, and discharge water quality limits. Under Alternatives GW-3, GW-4 and GW-5, surface water quality would be improved, though at this time it is not possible to predict when chemical-specific water quality ARARs will be met. Alternative GW-2 would have no impact to the ongoing discharge of PCBs at concentrations greater than surface water quality standards.

3. Long-Term Effectiveness and Permanence

Alternative GW-1 is neither effective in the long-term nor a permanent solution to controlling the ongoing release of contaminants to the brook from the groundwater. Alternative GW-2 relies solely on natural recovery that would occur within the sediments after release of contaminants from groundwater to surface water, and is not expected to be effective due to the long-term, ongoing release of contaminants from the bedrock matrix.

The remaining groundwater alternatives would contain and/or treat the contaminated groundwater discharging to Bound Brook and would require regular O&M of system components for decades to hundreds of years. Alternative GW-3 (hydraulic containment) requires active pumping and treatment to be effective, and requires the greatest level of O&M over time – both to manage operations of the pumping system as well as the operation of the groundwater treatment system. In addition, periodic equipment replacement and repair costs are likely to be somewhat greater when compared to Alternatives GW-4 and GW-5.

Alternatives GW-4 and GW-5 are passive treatment systems that could operate with limited oversight except for monitoring of the reactive media; however, the reactive media would require periodic replacement based on the rate of contaminant flux into the brook. The need for replacement across the length of the PRB or reactive cap could be difficult to assess through monitoring, because the rock matrix on both sides of the PRB would be contaminated.

Under Alternative GW-4, the PRB could not be placed precisely where it may best serve its purpose, but can only be placed where it can be best installed given surface obstructions. By contrast, if implemented while the stream bed is being excavated or dredged under Alternatives SS-2 or SS-3, the reactive cap associated with Alternative GW-5 could be placed where needed to intercept and treat discharging groundwater/pore water.

In addition, while the mass of VOC and PCB contamination within the bedrock matrix is substantially higher in concentration at the former CDE facility, there is substantial contaminant mass that has migrated, under the brook itself and north of the brook. The reactive cap is expected to be more effective than the PRB because it would receive and treat the pore water from any recharge point (i.e., from the north or south side of the brook or from beneath it), whereas the PRB will only treat the mass flux that passes through it from the south.

Changes in pumping operations at the local municipal well fields could impact the need for, and requirements of, all three of the groundwater remediation systems (GW-3 through GW-5); the timing or impact of these changes cannot be assessed at this time. Given that groundwater source remediation was found to be technically impracticable under current site conditions, the three alternatives represent reasonable long-term solutions for addressing the release of contaminants to Bound Brook.

4. Reduction of Toxicity, Mobility, and Volume through Treatment

Alternatives GW-1 and GW-2 do not incorporate treatment and hence would not reduce the toxicity, mobility, or volume of contaminants associated with the OU4 Study Area. Alternatives GW-3, GW-4 and GW-5 would not address the source of the discharge in the groundwater but would either eliminate the discharge of, or treat, the contaminated groundwater discharging to Bound Brook. Under Alternatives GW-3 through GW-5, the amount of contaminants that would be treated is small compared to the mass of contaminants found in the bedrock matrix at the former CDE facility; however, each alternative would treat the mass of contaminants currently discharging to Bound Brook. Mobility and volume are not affected under any of the alternatives.

5. Short-Term Effectiveness

Alternatives GW-1 and GW-2 do not present any short-term risks to site workers or the environment because they do not include any active remediation activities.

Alternative GW-3 would involve installing extraction wells, a pumping system and an *ex situ* treatment system for contaminated groundwater. These are common remedial construction activities that pose minimal risk to site workers and the surrounding environment, though the treatment facility would need to be sited, preferably on the former CDE facility. Alternative GW-4 would involve controlled blasting in an urban setting for construction of a PRB. Blasting has the potential to impact surrounding structures and utilities, which presents greater short-term risks in comparison to the other alternatives. Alternative GW-5 involves construction in the brook similar to, and presumably at the same time as the sediment removal work, although limited bedrock removal would likely be necessary. Based upon EPA's experience with the top surface of the bedrock during the OU2 remedial action, typical excavation equipment can be used to scrape off the bedrock surface that would need to be removed to install the reactive cap.

Other activities required as part of implementation of Alternatives GW-3, GW-4, and GW-5 would pose risks similar to those of remediation/construction projects of the same size and scope. These risks would include the potential for exposure to low levels of a range of contaminants, working on or around heavy construction equipment, working in water/wet environments, disruption of wildlife in the brook and in surrounding forested areas, increased construction traffic, impacts to those living or working directly adjacent to the remediation area (noise, odors, lights), and the potential spread of contaminants in the brook during removal of bedrock for Alternatives GW-4 and GW-5.

It is anticipated that these risks could be mitigated through the use of engineering controls, safe work practices, and personal protective equipment.

6. Implementability

Because Alternative GW-1 would not entail any work, it would be easily implemented.

Alternatives GW-2 and GW-3 would present the fewest technical challenges because they comprise monitoring networks and withdrawal systems that are routinely implemented, generally with few problems. The primary implementability hurdle associated with Alternative GW-3 would be securing land for a permanent, long-term treatment works. The treated water is expected to be discharged to surface water, and meeting discharge requirements is not expected to be difficult. Alternative GW-4 is technically more challenging to implement because of the site conditions that must be addressed to construct a deep trench and install the reactive media. Alternative GW-5 is expected to be more technically implementable than Alternative GW-4, even though it requires some bedrock removal from the bed of Bound Brook and the deployment of a reactive cap in the brook.

Both Alternatives GW-4 and GW-5 pose long-term implementability challenges, because the reactive media used to treat the dissolved-phase contaminants will eventually be exhausted and need to be replaced. Under Alternative GW-5, measuring breakthrough would be difficult, because it would entail measuring across a treatment unit placed in a surface water body; however, measuring breakthrough for Alternative GW-4 would be even more challenging, because the bedrock matrix on both sides of the PRB would contain elevated concentrations of the contaminants of concern. Replacing the spent treatment material, whether in the PRB trench or in the streambed, is expected to be challenging; the reactive cap may be less difficult because the cap, which would be installed in overlapping blankets of treatment material, can be more easily accessed for removal and replacement, being at the surface, than the PRB material placed in a 75-foot deep trench.

7. Cost

The costs for the three active GW alternatives are \$23.3 million for Alternative GW-3, \$27.1 million for Alternative GW-4, and \$22.1 million for Alternative GW-5. Capital costs, operation and maintenance costs, and periodic costs were developed for each alternative. The costs for each alternative were developed on the basis of preliminary engineering designs to meet the RAOs.

For Alternative GW-3 (hydraulic containment) the largest component of the cost, an estimated present worth of \$15.2 million, would be the O&M of the treatment works. For Alternatives GW-4 and GW-5, the costs for O&M (\$3.8 million and \$3.2 million, respectively), attributable to monitoring performance of the passive treatment operations, would be similar. The costs (\$4.6 million and \$5.4 million, respectively) of periodically replacing the treatment media would also be similar. The long-term O&M and periodic maintenance for the three active remedial alternatives would be needed in perpetuity; a 30-year time frame was used for all these costs, for cost-estimating purposes.

As discussed previously, under the "long-term effectiveness and permanence" and "implementability" criteria, EPA is uncertain how long it will be before breakthrough occurs for Alternatives GW-4 and GW-5. For cost-estimating purposes, it is assumed that one complete replacement of reactive media would occur during the 30-year period. This would certainly be the case if replacement were called for under Alternative GW-4, because replacing only part of the reactive media within the trench is not practical; for Alternative GW-5, it is expected that breakthrough would not occur uniformly, and it would be cost-effective to replace small sections of the reactive cap as needed, rather than replacing the entire cap.

When comparing Alternatives GW-4 and GW-5, a significant difference in the capital costs is from the cost of disposal. Alternative GW-4 requires a larger quantity of bedrock to be removed, and the rock removed from the trench in Alternative GW-4 includes portions of the on-site bedrock, where the rock matrix is saturated with high concentrations of VOCs and PCBs. For cost-estimating purposes, this material is assumed to require disposal at a TCSA or RCRA subtitle C facility. By contrast, the bedrock material scraped from the streambed to allow for installation of the reactive cap as part of Alternative GW-5, while still subject to rock-matrix diffusion, is expected to contain lower concentrations of contaminants and to be acceptable for disposal at a RCRA subtitle D facility. If either of these assumptions is incorrect, then the capital costs of these two alternatives would be closer (either Alternative GW-4 would be less expensive or Alternative GW-5 would be more expensive).

Water Line (WL)

1. Overall Protection of Human Health and the Environment

Alternative WL-1 would not be protective of human health and the environment since it does not include measures to detect or prevent water leaks on a century old waterline that could impact the OU2 soil remedy area. Alternative WL-2 (Water Line Monitoring, Replacement as Necessary) would allow for early detection of a leak but would not prevent a leak or break and the resulting impact on the OU2 soil remedy area and, if already implemented, the OU4 remedy, because overland flow of soils from the former CDE facility would necessarily result in releases to surface water. Alternative WL-3 (Water Line Relocation) would eliminate the potential risk associated with the pipeline crossing the OU2 soil remedy area by relocating it off the former CDE facility property. This alternative provides the greatest protection of human health and the environment by permanently moving the water line.

2. Compliance with ARARs

Under current conditions, all of the alternatives would comply with ARARs. Alternative WL-1 has the greatest potential to adversely impact water quality ARARs since a future leak is likely and may not be detected in a timely manner. Alternative WL-2 would allow for early detection and response to future leaks, and may prevent future violations of water quality ARARs, depending on the severity of the leak and the speed of detection/response. Alternative WL-3 would prevent future violations of water quality criteria; construction activities would need to address water quality and floodplain ARARs.

3. Long-Term Effectiveness and Permanence

Alternative WL-1, the No Action Alternative, is neither effective in the long-term nor a permanent solution to preventing potential leaks in the pipeline from impacting the OU2 soil remedy area. Alternative WL-2 would provide a method of detecting leaks, allowing for a more rapid response to a leak; however, it would do nothing to stop leaks from occurring and impacting the OU2 soil remedy area or OU4; neither would it protect against a catastrophic leak (*i.e.*, a burst pipe which would result in recontaminating the brook and requiring an additional remediation event). Alternative WL-3 would be effective over the long-term and would present a permanent solution because it removes the water line from the former CDE facility property.

4. Reduction of Toxicity, Mobility, and Volume through Treatment

None of the alternatives provide treatment, or have any impact on the toxicity, mobility or volume of contaminants in the OU4 Study Area, or elsewhere.

5. Short-Term Effectiveness

Alternative WL-1 does not present short-term risks to site workers or the community because it does not include any construction activities. Alternatives WL-2 and WL-3 would present similar risks to remediation/construction projects of similar size and scope, such as the potential for exposure to low levels of a range of contaminants, working on or around heavy construction equipment, and increased construction traffic on roads near the former CDE facility.

The scale of the risk would be comparatively higher for Alternative WL-3 because it entails a larger construction project. Alternative WL-3 would present the following additional risks and impacts: work around an active rail line, disruption of wildlife in the brook and in surrounding wetland/floodplain area, the potential spread of contaminants in the brook, and working in water/wet environments. In all cases, it is anticipated that these risks could be mitigated through the use of engineering controls, safe work practices, and PPE.

6. Implementability

Because Alternative WL-1 would not entail any work, it would be easily implemented. Both Alternatives WL-2 and WL-3 are based on industry-standard construction techniques and are feasible to implement; however, Alternative WL-3 is technically and administratively more complex due to the extensive amount of work that would be performed in the public ROW, the need to jack and bore under two active rail lines, the need to cross under Bound Brook, and modifications to the existing water distribution system. The majority of work for Alternative WL-2 would be conducted on the former CDE facility property, which would limit the impact on the public; however, it would require the cooperation of the property owners/developers, and the replacement water line may also affect the rail line. Under Alternative WL-2, if the monitoring program were to alert EPA and NJAW, the water line owner, of an imminent failure, NJAW and EPA would work together to quickly resolve the issue; a temporary pipeline and booster systems would need to be constructed elsewhere to allow the pipeline to be shut down. The water line would then be replaced with a new line parallel to the old water line.

7. Cost

The present value for WL-2 is \$4.7 million, and for Alternative WL-3, \$8.9 million. The cost of Alternative WL-2 includes replacement of the water line ten years into the future; if replacement were needed earlier or later, the costs could be higher or lower. Capital costs, operation and maintenance costs, and monitoring costs were developed for each alternative. The costs for each alternative were developed on the basis of preliminary engineering designs to meet the RAOs.

The remaining two criteria were considered for all alternatives per component of the OU4 remedy.

8. State acceptance

NJDEP is expected to concur with EPA’s preferred alternatives.

9. Community acceptance

Community acceptance of the preferred alternatives will be evaluated after the public comment period ends.

Principal Threat Waste

The remedial alternatives being evaluated for the site would address - soil and capacitor debris contaminated at concentrations greater than 100 mg/kg PCBs as principal threats at the site.

PREFERRED ALTERNATIVE

EPA's Preferred Alternatives for the site are:

Sediments and Floodplain Soils (SS):
Alternative SS-2, Excavation/Dredging of Sediments and Floodplain Soils with Monitored Natural Recovery.

Capacitor Debris (CD):
Alternative CD-4, Excavation and Off-site Disposal of Capacitor Debris.

Groundwater Discharge to Surface Water (GW):
Alternative GW-3, Hydraulic Control of Groundwater.

Water Line Replacement (WL):
Alternative WL-3, Water Line Replacement in New Easement.

In addition, the agency would invoke an ARAR waiver for the area of groundwater addressed by this action.

The preference for the Preferred Alternatives are based upon these factors:

Soils and Sediments Alternatives

While Alternatives SS-2 and SS-3 would similarly remediate sediments with concentrations that exceed 1 mg/kg PCBs, and allow MNR to further reduce sediment and surface water concentrations to levels that would allow fish to recover to protective levels, Alternative SS-2, which would remove floodplain soils within the Bound Brook corridor in excess of 1 mg/kg of PCBs, would also be more protective over the long term. Under current conditions, Bound Brook sediments are generally more contaminated than the neighboring floodplains. The floodplain is a depositional area relative to most of the stream channel, and probably does not act as a significant source of PCBs to the sediments under current conditions. However, under Alternative SS-3, which would remove the contaminated sediments above 1 mg/kg PCBs but also leave higher PCB concentrations in part of the floodplain under a cap, and rely upon natural recovery to reach a protective value for fish consumption, even a temporary breech of capped floodplain soils could allow these soils to recontaminate the sediments. Of the 17 acres of floodplains where capping is feasible, cost-effectiveness would be achieved by building up a cap above the current surface contour, which would face technical and administrative challenges, discussed above, that may make it not implementable as currently developed in the FS (with one foot of surface removal to make way for two feet of capping). If excavating enough material prior to capping to maintain the current ground surface were required, Alternative SS-3 would not be substantially different in cost than Alternative SS-2. Capping in New Market Pond may also be subject to similar limitations.

The SS alternatives conservatively assume that the contamination will consistently be found as deep as three feet bgs. While this is a reasonable assumption in an FS, the RI data indicate that most of the contamination is in the top one to two feet of the floodplains, which are the depths that would need to be excavated to make room for capping under Alternative SS-3. If this is the case, Alternative SS-2 would be more implementable than Alternative SS-3 because of the technical challenges of capping a relatively thin layer of contamination and maintaining that cap in perpetuity.

Surface water quality would be improved by the removal of the contaminant sources and sediments with PCB concentrations in excess of 1 mg/kg, including the cleaning out of the existing silt trap located upstream of New Market Pond. Future maintenance of this silt trap may prove advantageous for long-term improvement of fish tissue, as this device (and New Market Pond) have proved to be effective at collecting contaminated sediments and are likely to do so in the future

Capacitor Debris Alternatives

Based upon EPA's earlier experience with treating site wastes through LTTD, using this treatment method for the CD area would face technical challenges, impairing implementability. EPA's preference for off-site disposal is primarily based upon these likely implementation difficulties, and cost.

Groundwater Alternatives

EPA's preference for hydraulic containment of the groundwater is based upon an expectation that this proven technology will be more reliable than the reactive cap, and can be implemented more quickly (the reactive cap cannot be installed until the sediment remedy is being implemented for that reach of the brook). Hydraulic control is also preferred over the PRB because it has the capacity to treat all the contaminant mass that currently reaches the brook, whereas the PRB could only address contaminant mass that passes through the treatment zone flowing from the south.

EPA is proposing to extend the ARAR waiver for the federal and state drinking water and groundwater standards (MCLs and NJ GQC) previously invoked for groundwater at this site due to technical impracticability to include the area of groundwater that discharges to Bound Brook, see figure 3.

Water Line Alternatives

The preference to move the water line is based upon an expectation that the existing line will eventually fail and, at the time of failure it would need to be replaced either in the same location as contemplated in Alternative WL-2, or in a new route as contemplated as in Alternative WL-3. The potential for catastrophic failure, which would harm the protectiveness of the OU2 remedy, and, if implemented, the OU4 remedy, is not worth the deferred cost. In addition, the opportunity to install a new water line under Bound Brook in conjunction with the sediment excavation is expected to be beneficial to the overall cost-effectiveness of the remedy.

The Preferred Alternatives provide the best balance of trade-offs among the alternatives with respect to the evaluation criteria. Based on the information available at this time, EPA believes the Preferred Alternatives will be protective of human health and the environment, and will comply with ARARs to the extent practicable. The Preferred Alternatives would meet the statutory preference for the use of remedies that involve treatment as a principal element.

COMMUNITY PARTICIPATION

EPA encourages the public to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted there.

The dates for the public comment period, the date, location and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan. Written comments on the Proposed Plan should be addressed to the Remedial Project Manager Mark Austin at the address below.

EPA Region 2 has designated a public liaison as a point-of-contact for the community concerns and questions about the federal Superfund program in New York, New Jersey, Puerto Rico, and the U.S. Virgin Islands. To support this effort, the Agency has established a 24-hour, toll-free number that the public can call to request information, express their concerns, or register complaints about Superfund.

For further information on the Cornell –Dubilier Electronics Superfund site, please contact:

Mark Austin
Remedial Project Manager
(212) 637-3954
austin.mark@epa.gov

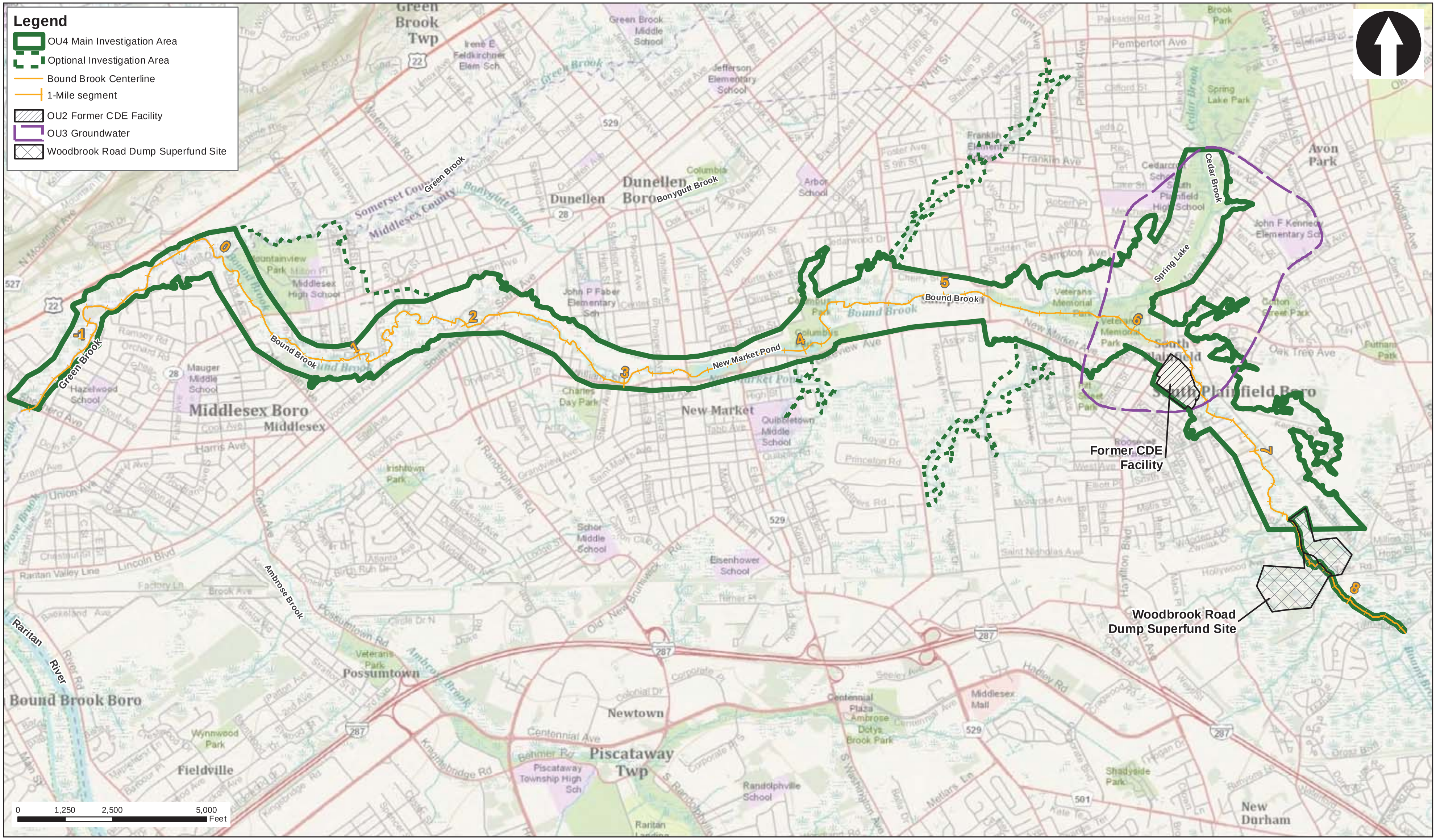
Patricia Seppi
Community Relations Coordinator
(212) 637-3639
seppi.patricia@epa.gov

Written comments on this Proposed Plan should be addressed to Mr. Austin.

U.S. EPA Region 2
290 Broadway 19th Floor
New York, New York 10007-1866

The public liaison for EPA Region 2 is:
George H. Zachos Regional Public Liaison
Toll-free (888) 283-7626, or (732) 321-6621

U.S. EPA Region 2
2890 Woodbridge Avenue, MS-211
Edison, New Jersey 08837-3679

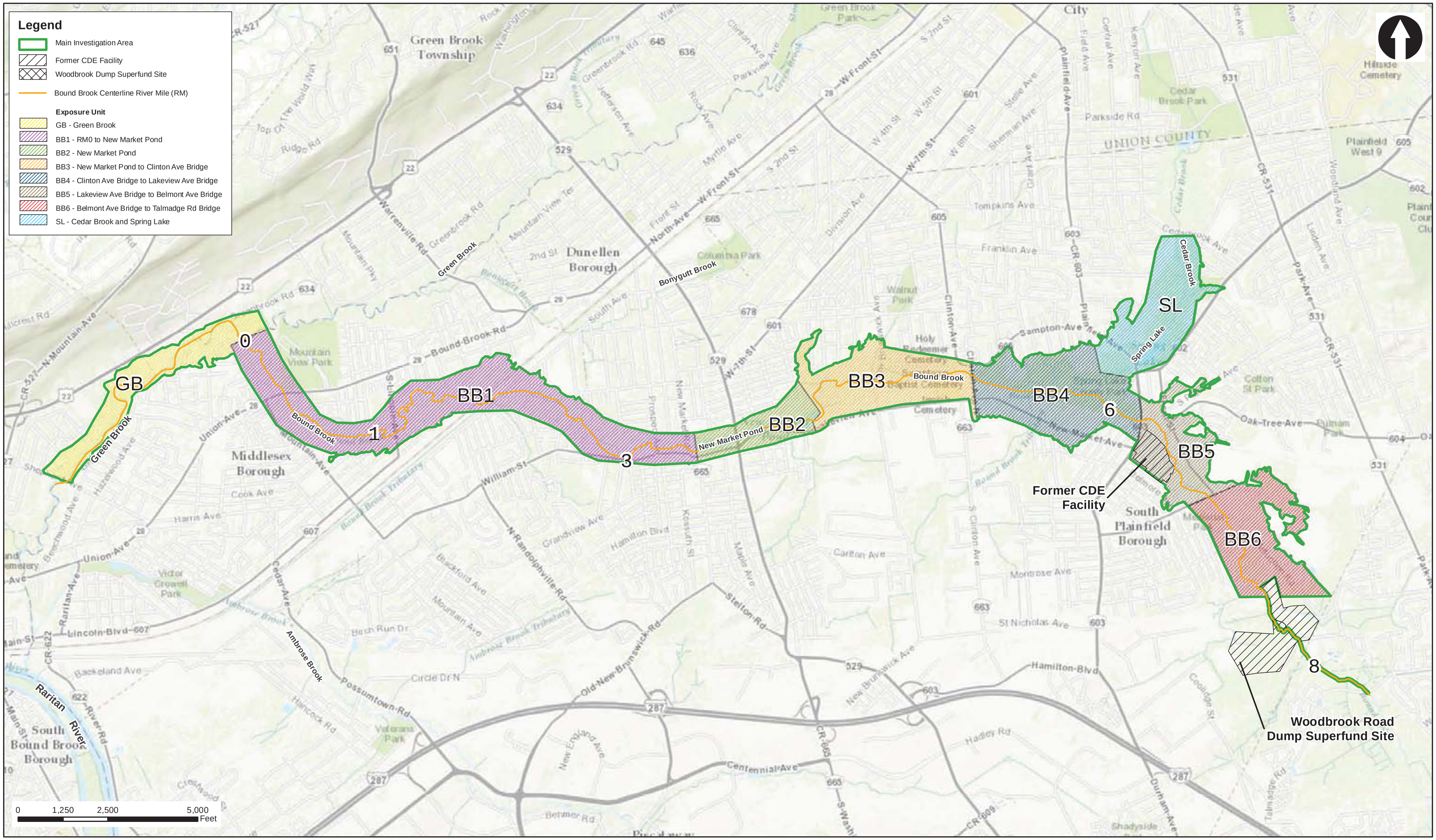


Cornell-Dubilier Electronics
Superfund Site
South Plainfield, New Jersey

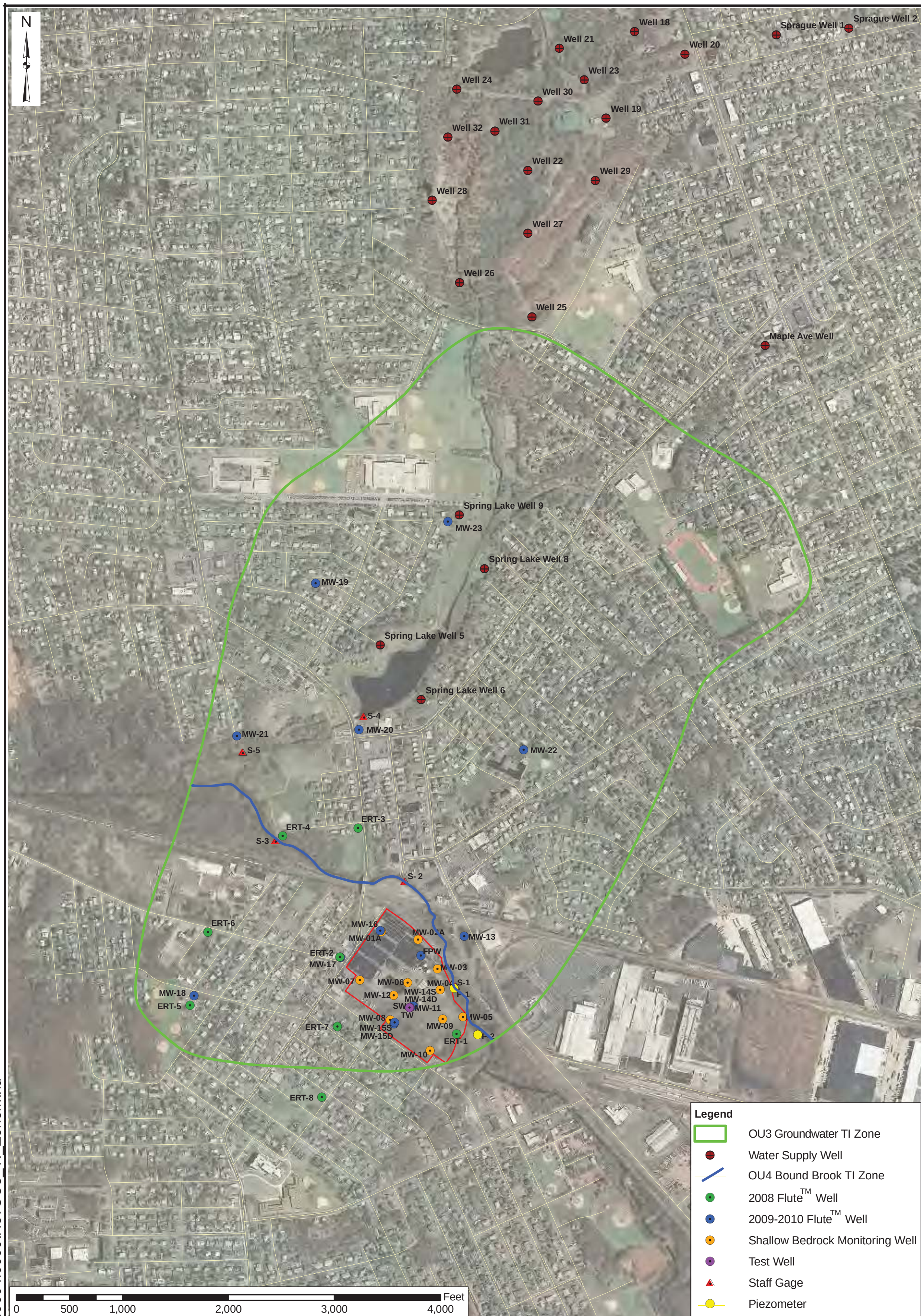
Operable Units (OU2, OU3, and OU4)
of the Cornell-Dubilier Electronics Superfund Site
Bound Brook OU4 RI/FS

2013

Figure 1



	Cornell-Dubilier Electronics Superfund Site South Plainfield, New Jersey	**Exposure Units for the OU4 Risk Assessment** *Bound Brook OU4 RI/FS*	2014 Figure 2



ARCADIS MALCOLM PIRNIE

Cornell-Dubilier Electronics Superfund Site

South Plainfield, New Jersey

OU4 TI ZONE

Figure 3

G:\GISMOD\06739004.0000\RevOU3_TI_Zone.mxd

Table 1

SUMMARY OF ECOLOGICAL RISKS[1]

Cornell-Dubilier Electronics Superfund Site

Feasibility Study

Receptor		Line of Evidence		Exposure Unit							
				EU BG	EU BB1	EU BB2	EU BB3	EU BB4	EU BB5	EU BB6	EU SL
Benthic Invertebrates		Surface sediment concentrations			Total PCBs	Total PCBs	Total PCBs	Total PCBs	Vinyl chloride Total PCBs	Total PCBs	
		Porewater concentrations [2]							cis-1,2-DCE Vinyl chloride Total PCBs		
		Tissue concentrations	Asiatic clam	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs		Total PCBs
			Crayfish							Total PCBs	
		Sediment Toxicity		N/A	Toxic	Toxic	Toxic	N/A	Toxic	N/A	N/A
		PCB Bioaccumulation		N/A	Bioavailable			N/A	Bioavailable	N/A	N/A
Aquatic Life		Surface water concentrations [3]		Total PCBs							
		Porewater concentrations [2]							*cis*-1,2-DCE Vinyl chloride Total PCBs		
		Tissue concentrations	Predatory fish	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs
			Bottom-feeding fish	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs
			Predatory fish eggs								
			Bottom-feeding fish eggs								
		Fish Condition Factor		NA	Good	Good	Good	Good	Good	Good	Good
Semi-Aquatic Wildlife Receptors	Herbivorous Birds	Food web exposure	Wood duck								
	Insectivorous Birds	Food web exposure	Mallard								
			Red-winged blackbird								
	Piscivorous Birds	Food web exposure	Great blue heron	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs		
			Belted kingfisher	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs TCDD TEQ (PCBs)	Total PCBs	Total PCBs
		Fish egg concentrations	Based on predatory fish	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)
			Based on bottom-feeding fish	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs
	Herbivorous Mammals	Food web exposure	Muskrat								
	Insectivorous Mammals	Food web exposure	Raccoon								
			Little brown bat	TCDD TEQ (PCBs)	TCDD TEQ (PCBs)	TCDD TEQ (PCBs)	TCDD TEQ (PCBs)	TCDD TEQ (PCBs)	TCDD TEQ (PCBs)		TCDD TEQ (PCBs)
	Piscivorous Mammals	Food web exposure	American mink	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs TCDD TEQ (PCBs)	Total PCBs	Total PCBs TCDD TEQ (PCBs)	Total PCBs	Total PCBs
Terrestrial Plants and Invertebrates	Plants	Surface soil concentrations						Total PCBs	Total PCBs	Total PCBs	NA
	Soil Invertebrates	Surface soil concentrations						Total PCBs	Total PCBs	Total PCBs	NA
		PCB Bioaccumulation		N/A		N/A	N/A	Bioavailable	N/A	N/A	N/A
Terrestrial Wildlife Receptors	Wildlife	Surface soil concentrations		Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	NA
	Herbivorous Birds	Food web exposure	Mourning dove								NA
	Insectivorous Birds	Food web exposure	American robin				Total PCBs	Total PCBs	Total PCBs	Total PCBs	NA
	Carnivorous Birds	Food web exposure	Red-tailed hawk								NA
	Herbivorous Mammals	Food web exposure	Eastern gray squirrel								NA
	Insectivorous Mammals	Food web exposure	Short-tailed Shrew					Total PCBs	Total PCBs	Total PCBs	NA
	Carnivorous Mammals	Food web exposure	Red fox								NA

Notes:

1. For site-related contaminants (*i.e.*, PCBs and chlorinated solvents) only
2. Although porewater samples were only collected from EUs BB4, BB5, and BB6, exceedances occurred at EU BB5
3. Surface water data were evaluated system-wide

cis-1,2-DCE = *cis*-1,2-dichloroethene

NA = not available

N/A = not applicable

Exposure Unit (EU) Abbreviations:

GB = Green Brook (RM -1.58 to 0)

BB1 = Bound Brook (RM 0 to 3.43)

BB2 = Bound Brook (RM 3.43 to 4.09)

BB3 = Bound Brook (RM 4.09 to 5.22)

BB4 = Bound Brook (RM 5.22 to RM 6.18)

BB5 = Bound Brook (RM 6.18 to 6.82)

BB6 = Bound Brook (RM 6.82 to RM 8.31)

SL = Spring Lake

Table 2
COMPARATIVE ANALYSIS OF ALTERNATIVE COSTS
Cornell-Dubilier Electronics Superfund Site
Feasibility Study

Alt.	Description	Capital Costs	Present Value of Capital Costs	Present Value of O&M	Present Value of Periodic Costs	Total Present Value
Sediment and Floodplain Soil RAA						
SS-1	No Action	$ -	$ -	$ -	$ -	$ -
SS-2	Excavation/Dredging of Sediments and Soils	$ 187,300,000	$ 177,600,000	$ -	$ 30,000	$ 177,600,000
SS-3	Excavation/Dredging of Sediment, Limited Excavation and Capping of Floodplain Soil, Limited Dredging and Capping in New Market Pond, and MNR of Depositional Areas	$ 165,700,000	$ 157,100,000	$ 638,000	$ 30,000	$ 157,800,000
Capacitor Debris RAA						
CD-1	No Action	$ -	$ -	$ -		$ -
CD-2	Surface Excavation, Capping, and Containment	$ 20,000,000	$ 20,000,000	$ 550,000	$ 50,000	$ 20,600,000
CD-3	Full Depth Excavation, Thermal Desorption, and On-Site Burial of Treated Materials	$ 42,400,000	$ 42,400,000	$ -	$ -	$ 42,400,000
CD-4	Full Depth Excavation and Off-Site Disposal	$ 32,800,000	$ 32,800,000	$ -	$ -	$ 32,800,000
Groundwater Discharge to Surface Water RAA						
GW-1	No Action	$ -	$ -	$ -	$ -	$ -
GW-2	Monitoring and Institutional Controls	$ 1,900,000	$ 1,900,000	$ 10,270,000	$ -	$ 12,200,000
GW-3	Hydraulic Control of Groundwater	$ 8,100,000	$ 8,100,000	$ 15,160,000	$ -	$ 23,300,000
GW-4	Permeable Reactive Barrier	$ 18,700,000	$ 18,700,000	$ 3,780,000	$ 4,580,000	$ 27,100,000
GW-5	Reactive Cap	$ 13,500,000	$ 13,500,000	$ 3,230,000	$ 5,370,000	$ 22,100,000
Water Line RAA						
WL-1	No Action	$ -	$ -	$ -	$ -	$ -
WL-2	Water Line Monitoring System, Replacement in Existing Easement as Necessary	$ 500,000	$ 500,000	$ 100,000	$ 4,100,000	$ 4,700,000
WL-3	Replace Pipeline in New ROW	$ 8,900,000	$ 8,900,000	$ -	$ -	$ 8,900,000

Notes:

1. Estimated costs based on an ENR CCI of 9664 (January 2014). All costs are in constant (non-inflationary) dollars. The Present Value was calculated based on discount rate of 7%..

2. A 30-year operating period was assumed for the groundwater control alternatives although it is anticipated that some of the systems will need to operate for decades, if not longer, to ensure compliance with ARARs. For Alternative GW-3, the treatment plant equipment would require replacement in year 30; for Alternative GW-4, the reactive media in the PRB would require replacement in year 15 and in year 30; and for Alternative GW-5, the reactive cap media would require replacement in year 15 and in year 30. Actual time frames may vary.

3. O&M costs associated with the water line are expected to be borne by NJAW as part of normal operating costs and are not included in this estimate. Under Alternative WL-2, leakage monitoring costs are included in the cost estimate. Initial costs would include installation of a leak detection system and SCADA warning system. Pipeline replacement was assumed to occur in year 10.