Superfund Program
Proposed Plan

BoRit Asbestos Superfund Site

Ambler, Pennsylvania December 2016

INTRODUCTION

The United States Environmental Protection Agency Region III (EPA) is issuing this **Proposed Plan** to identify its **Preferred Alternative** for addressing waste, soil, and Reservoir sediment contamination associated with the BoRit **Asbestos Superfund** Site (Site or BoRit Site), located in the Borough of Ambler (Ambler), Whitpain Township and Upper Dublin Township, Montgomery County, Pennsylvania. The Site was finalized on the **National Priorities List (NPL)** in April 2009. The National Superfund Database Identification Number is PAD981034887. The public is invited to review and comment on the Proposed Plan, which provides an overview of the Site history, Site contamination and risk, summarizes remedial alternatives EPA is considering, and details the EPA's preferred remedial alternative and supporting rationale. To help the public better understand the plan, the attached Glossary provides a list of commonly used environmental terms that appear in **BOLD** when first used throughout this Proposed Plan.

The Preferred Alternative for this Site is capping of waste, contaminated soil, and Reservoir sediment with clean material and the implementation of associated operation and maintenance (O&M), and institutional controls. The Estimated Cost of the Preferred Alternative is $27.1 Million.[1] (Refer to page 46 for a detailed description of the Preferred Alternative).

The Preferred Alternative is based on the findings of the **Remedial Investigation (RI)**, which was finalized by the EPA in November 2013, the RI Addendum finalized in May 2015, and the **Feasibility Study (FS)** finalized in November 2016.

EPA will consider written and oral comments on the Preferred

Dates to Remember:

December 4, 2016 to February 1, 2017,
Public Comment Period for this Proposed Plan.

January 10, 2017 - 6:00 PM to 9:00 PM
Public Meeting
Ambler Borough Hall
131 Rosemary Avenue
Ambler, Pennsylvania

[1] Approximately $25.5M is anticipated to be incurred for the removal action. EPA has already incurred approximately $25.2M for construction of the cap as part of the ongoing removal action at the Site. An additional $1.6M is anticipated to finalize the remedial action.

Alternative presented in this Proposed Plan before the final selection of a remedial alternative. Then, EPA, the lead agency, in consultation with the Pennsylvania Department of Environmental Protection (PADEP), the support agency, will select a final remedy for the BoRit Asbestos Superfund Site in a **Record of Decision (ROD)**.

PUBLIC PARTICIPATION

This Proposed Plan is being issued as part of the public participation requirement under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)**, as amended, 42 U.S.C. § 9617(a), and Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP**), 40 Code of Federal Regulations (C.F.R.) § 300.430(f)(2). This document is issued by EPA, the lead agency for Site activities, with the support of the State. The function of the Proposed Plan in the remedy selection process for a site is to perform the following:

- Provide basic background information;
- Describe all the remedial alternatives evaluated;
- Identify EPA's Preferred Alternative and explain the reasons for its preference;
- Solicit public review of and comment on all alternatives described;
- Provide information on how the public can be involved in the remedy selection process; and
- Refer interested parties to the RI, FS, and other site-related documents contained in the **Administrative Record (AR)** file upon which EPA has relied to decide which alternative is preferred.

> For more information, see the Administrative Record at the following locations:
>
> Wissahickon Valley Library
> Ambler Branch
> 209 Race Street
> Ambler, PA 19002
>
> EPA Region III
> 1650 Arch Street
> Philadelphia, PA 19103
> (215) 814-3157 for appointment
>
> On the web at
> https://semspub.epa.gov

EPA and PADEP encourage the public to review and comment on this Proposed Plan for the Site. This Proposed Plan and additional Site information can be found in the AR at the locations listed to the right.

Interested parties may comment during the 60 day public comment period, which begins on **December 4, 2016** and closes on **February 1, 2017**. On **January 10, 2017**, EPA will hold a public meeting to discuss the remedial alternatives and proposed remedy. It will be held at the **Ambler Borough Hall** at **6:00 pm**.

SITE BACKGROUND

Site Location and Description

The BoRit Asbestos Superfund Site includes the following three adjacent **parcels** near the intersection of West Maple Street and Butler Pike in Ambler, Montgomery County, Pennsylvania **(Figure 1):**

- The Park parcel, located in Whitpain Township, is approximately 11 acres and contains a former asbestos disposal area (now the closed Whitpain Wissahickon Park);

- The Asbestos Pile parcel, located in Ambler, is approximately 6 acres and contains an approximately 3 acre asbestos waste pile in the middle of the property; and
- The Reservoir parcel, primarily located in Upper Dublin Township, is approximately 15 acres and contains a reservoir. The Reservoir is man-made and is not used for drinking water supply. Historically, the Reservoir was filled by a former pond on the Wissahickon Creek located northwest of Mount (Mt.) Pleasant Avenue. The water from the pond was regulated by a gate valve that allowed water to flow under Mt. Pleasant Avenue and connected to a 24-inch pipe that ultimately discharged into the Reservoir.

The Site also includes portions of Wissahickon Creek, Rose Valley Creek, and Tannery Run (Creeks) which flow adjacent to the three parcels.

Site History

The contamination at the BoRit Site is a result of disposal operations by the former Keasby & Mattison (K&M) Company. K&M produced asbestos products (including paper, millboard, electrical insulation, brake linings, piping, conveyor belts, high pressure packings, roofing shingles, and cement siding) from 1897 to 1962 at their Ambler, Pennsylvania facility. K&M ceased operations in 1962. A description of historical activities that occurred on each parcel follows:

Park Parcel

Starting as early as 1937, K&M disposed of an estimated 195,000 cubic yards (cy) of off-specification asbestos manufacturing products and other solid wastes on the Park parcel. Although used as a public park from at least 1973, the Park parcel was officially closed to the public in September 1984.

Asbestos Pile Parcel

Based on observations from a 1930s historical aerial photograph, K&M began disposing a slurry of spent magnesium and calcium, as well as waste asbestos products, in a former reservoir located in what is now known as the Asbestos Pile. Prior to the EPA Removal Action, the elevation of the waste in the Asbestos Pile parcel was approximately 20 to 30 feet above the surrounding land. By 1965, the Asbestos Pile parcel was vegetated. The property reportedly was first fenced in approximately 1986. For short periods of time in the 1980s and 1990s, portions of the Asbestos Pile parcel were used as a trash transfer station or trash storage location (including slag disposal) and for local Fire Department training.

Reservoir Parcel

The Reservoir parcel was used to provide process water for K&M facility operations. The Reservoir appears in 1921 and 1930 Sanborn Fire Insurance maps and a 1937 aerial photograph. The berm around the Reservoir was constructed of asbestos shingles, millboard, and soil. Asbestos product waste, particularly water pipe and tiles, were observed surrounding the Reservoir and the stream banks.

Regulatory History and Previous Investigations

The EPA and the Pennsylvania Department of Environmental Resources (PADER), now the PADEP, conducted sampling in late 1983 and in the Spring of 1984, respectively. Asbestos, specifically **chrysotile**, was identified as the primary contaminant on the BoRit Site. EPA performed a preliminary assessment of the Asbestos Pile parcel in March 1987. For approximately 20 years, PADEP regulated the parcel according to the applicable **National Emission Standards for Hazardous Air Pollutants (NESHAP)** regulations, which require the parcel to be fenced, have a vegetated cover, and have signs indicating the presence of asbestos, since asbestos containing material had not been covered with 2 feet of clean material.

In April 2006, EPA's Site Assessment Program conducted sampling and detected asbestos in the air, soil, surface water, and sediments at the Site. EPA re-evaluated the BoRit parcels prompting proposal to the NPL on September 3, 2008. The BoRit Asbestos Superfund Site received final listing on the NPL on April 9, 2009.

Removal Action

In December 2008, the EPA Removal Program initiated work to address the most immediate environmental concerns at the Site. Currently, all three parcels have either undergone or are currently undergoing an EPA Removal Action to cover **asbestos-containing material (ACM)** in accordance with the applicable NESHAP regulations. The Park and Asbestos Pile parcels are currently unused and vacant and the Reservoir parcel is currently being used as a waterfowl preserve. **Current conditions** refers to Site conditions post-removal action work. A summary of current conditions at the Site is provided below and in more detail under the description for Alternative WSS2 Capping.

The stabilization work by EPA's Removal Program was initially performed to address the issue of erosion of stream banks exposing ACM waste. All stream banks that border ACM waste disposal areas have been armored and a portion of Tannery Run has been routed through a pipe to prevent further erosion from the creek flow. The stabilization of the stream banks performed by the removal action is designed to prevent or minimize future contamination of surface water and sediment in the Creeks surrounding the Site and therefore also the floodplain soils. The cap on the stream bank portions of the Site includes the placement of 10 to 15 inches of clean fill and a layer of topsoil and vegetation as well as the placement of cable concrete mats (CCM), geocells, and erosion control mats, where warranted. In addition, the removal action cut back slopes on the Asbestos Pile to a stable 3 horizontal:1 vertical **gradient** and covered the Asbestos Pile and the Reservoir berm with **geotextile**, a minimum of 2 feet of clean material, and approximately 6 inches of topsoil to support a vegetative cover. In certain areas, the Reservoir berm includes up to 10 feet of soil cover. At the Reservoir, the removal action emptied the Reservoir, covered the Reservoir bottom with geotextile and a minimum of 2 feet of clean material, and refilled the Reservoir. In addition, some waste on the Park parcel has been consolidated into two waste cells located on the south end of the Park parcel and covered with geotextile, a minimum 2 feet of clean material, and approximately 6 inches of topsoil to support a vegetative cover. Other areas of the Park parcel will also be covered with geotextile, 2 feet of clean material, and approximately 6 inches of topsoil and then hydroseeded. Additional detail of areas where 2 feet of clean material was not placed on stream banks/slopes is provided under the description of Alternative WSS2: Capping.

Temporary **engineering controls (ECs)** have been implemented by the removal action to prevent Site access. Specifically, chain-link fences extend along the West Maple Street side of the Asbestos Pile parcel and the Reservoir parcel. A temporary chain-link fence is installed at the Park parcel along West Maple Street. Future use plans for the Park parcel include a public park and open space. Whitpain Township would maintain ownership of the Park parcel and oversee the administration of the public park. The Wissahickon Waterfowl Preserve (WWP) would maintain ownership of the Reservoir parcel and continue to use the property as a waterfowl preserve. The WWP plans to install amenities along West Maple Street that would promote birding and improve the aesthetic value of the area. Future use of the Asbestos Pile parcel is unknown at this time. The Asbestos Pile parcel is currently zoned as a Retail and Service Commercial District, by the Borough of Ambler. The Asbestos Pile parcel is in a Redevelopment Overlay District, which permits additional uses in those districts (i.e., hotel, grocery store, fitness center); however, after a review of the

Borough's zoning ordinance, it does not appear that the Asbestos Pile Parcel would meet the conditional use criteria for Transportation Oriented Development. The BoRit Site was not assessed for residential use during the RI.

Public Involvement Activities Prior to this Proposed Plan

Numerous community meetings have been hosted by EPA during various stages of the Site progress. The meetings have taken place in different locations throughout the area, as well as during meetings of the BoRit Asbestos Area Community Advisory Group (CAG). The CAG was established by the EPA and local community members to represent the interests of the communities surrounding the BoRit Site. The CAG is designed to serve as an ongoing vehicle for information-sharing, discussion and, where possible, consensus-building regarding agency decision-making efforts for the BoRit Asbestos Site. CAG meetings have been occurring since 2007 and currently are held the first Wednesday of every other month. If you are interested in learning more about the BoRit CAG, contact Gina Soscia at 215-814-5538 or soscia.gina@epa.gov. Additional information about the CAG is available at http://www.boritcag.org/. The CAG can be contacted via email at Info@BoRitCAG.org.

Whitpain Township, which owns the Park parcel, is currently in the long-term planning process for revitalization of the entire West Ambler community which surrounds the BoRit Site. As part of the neighborhood's overall revitalization, the Township has proposed reusing the BoRit Site as a public space that would include features such as open lawn, basketball courts, a playground, and a jogging trail among other possibilities. These proposed revitalization plans were presented to the community at a series of public meetings that took place between May 2012 and February 2013.

SITE CHARACTERISTICS

Key Site characteristics are summarized below. A detailed description of topographical and geographical Site features is documented in the RI and FS Reports which are included in the Administrative Record for this Site.

Topography and Drainage

Ambler, Whitpain Township, and Upper Dublin Township are situated in the Triassic Lowland section of the Piedmont physiographic province. Elevations within the vicinity of the Site vary from approximately 220 feet at the Asbestos Pile to approximately 170 feet in Wissahickon Creek. All elevations are referenced to the North American Vertical Datum 1988 (NAVD88). Although significant re-grading has occurred on the Site since 2009 as a result of EPA's Removal Program activities, the relative **topography** has not been significantly altered. The Asbestos Pile remains the highest point of land within the Site, and the Creeks are the lowest.

Site Geology and Hydrogeology

With the exception of the creek bottoms, the **stratigraphy** throughout the Site includes various unconsolidated materials (including historical fill, waste, and native soil) overlying bedrock of the Stockton Formation. The historical fill consists of placed soil (not native) containing mixtures of silt, sand, and gravel with minimal clay in some areas and occasional debris (concrete and brick). Historical fill was not present in the Asbestos Pile itself, although it was detected in the northern part of the property at the toe of the Asbestos Pile next to Tannery Run. The waste consists of ACM mixed in some locations with sand and silt. The ACM is primarily composed of chrysotile. In some locations, layers of fill are found inter-layered with waste. In the Asbestos Pile, many borings showed a very soft and moist fibrous waste product. Below the waste layer, native soil was detected overlying the Stockton Formation. The depth to the native soil ranged from 1.5 feet to 36 feet below ground surface (bgs). Borings at the monitoring well locations detected native soil at depths ranging from 2 to 20 feet bgs; native soil in these locations consisted of sand, silty sand, silts, and clays. Additionally, the upper two feet of floodplain soils were sampled and logged and consisted of medium sand, silt, clayey silt, and clay.

Where bedrock was encountered, the depth to bedrock ranges between 14 and 29 feet bgs. The highest bedrock elevation (182 feet NAVD88) occurs northeast of the Pile within the Asbestos Pile parcel. The lowest observed bedrock elevations occur at the bed of the Wissahickon Creek (approximately 170 feet NAVD88) and its two local tributaries. Depth to bedrock was not observed beneath the Reservoir or the Asbestos Pile, which itself is located in another former reservoir (possibly, originally a quarry); therefore, the depth to bedrock is expected to be deeper in these areas. The Stockton formation encountered on the Site is described as primarily reddish-brown medium-grained sandstone.

The shallow **groundwater** is found in the fractured upper bedrock, with discontinuous occurrences in the overburden material in the Park parcel near Wissahickon Creek and in the Asbestos Pile parcel. Groundwater in the shallow bedrock flows from northeast to southwest across the Park parcel, which suggests discharge to Wissahickon Creek. A local gradient also suggests a component of Site groundwater discharges to Rose Valley Creek. This gradient pattern is typical in the near-creek settings of the region. The shallow groundwater is expected to flow upward toward these discharge points. Multiple groundwater **synoptic** rounds of water level measurements were conducted as part of the RI field activities and as part of the post-RI activities. **Wet** and **dry synoptic events** to record water levels in Site monitoring wells were conducted in July and August of 2014, respectively during post RI activities. The **potentiometric** maps for those post-RI events are depicted on **Figures 2** and **3**, respectively, and show the same general northeast to southwest flow pattern observed during the RI. However, the contour for the dry event depicted in Figure 3 includes more of a north to south groundwater gradient in the northern part of the Park parcel. Figures 2 and 3 demonstrate that, in the southern half or deep portion of the Reservoir, the potentiometric surface approaches the Reservoir bottom. Figures 2 and 3 suggest that, in the southern half of the Reservoir, communication with groundwater might potentially occur. However, the location of groundwater seepage is influenced by changes in the potentiometric surface due to precipitation.

<u>Reservoir Hydraulics</u>

The surface water in the Reservoir is higher than the surrounding water table. To better understand the **hydraulics** of the Reservoir, several Site investigations were conducted and included the following:

- United States Army Corps of Engineers (USACE) hydraulic investigation;
- Reservoir Temperature Study; and
- August 13, 2014 Site Visit.

The USACE performed a hydraulic investigation on behalf of EPA to study the response of water levels in the Reservoir to storm events and to determine if any interaction existed between the Reservoir and shallow groundwater. Results of the hydraulic investigation indicated that with the exception of a few anomalies, all significant water level increases seemed to be directly correlated to rainfall. USACE concluded this correlation indicates that the only significant inflow to the Reservoir is likely to be rainfall. The USACE noted that the Reservoir experiences a slow loss of water between rain events, possibly due to a combination of evaporation and seepage to groundwater.

In July 2014, a temperature study was performed at the Reservoir to determine if locations existed within the Reservoir where inflow of groundwater may be occurring. The rationale for the study was that the detection of cooler isolated locations of water within a water body could be attributed to a cooler influent, such as groundwater. Results of the Reservoir temperature study showed several locations where cooler temperatures were clustered in the central portion of the study area. The temperature study was performed while the Reservoir was being drained and the shallow depth and relatively small volume of water in the study area could have led to a relatively quick increase in temperature of cooler influent and masked the identification of influent groundwater. Therefore, the Reservoir temperature study results should be considered in conjunction with the July and August 2014 synoptic event measurements and with the data and observations described in the RI Addendum Report and FS.

The only known inflow, other than rainfall, is the stormwater pipeline which runs along West Maple Street, and discharges into the Reservoir. The stormwater pipeline was observed to be nearly full of debris and dirt during a dye test conducted by EPA, during remediation of the Reservoir. The pipeline transmitted little flow to the Reservoir and has since been plugged by Whitpain Township. Additionally, during sampling conducted while the Reservoir was empty, it was noted that a clay layer exists in the eastern half of the Reservoir. However, the clay layer was not present in the western half (deeper area) of the Reservoir, possibly due to the limit of the hand auger. In addition, during the period when the Reservoir was empty, no major springs were observed.

Temple University Floodplain Study

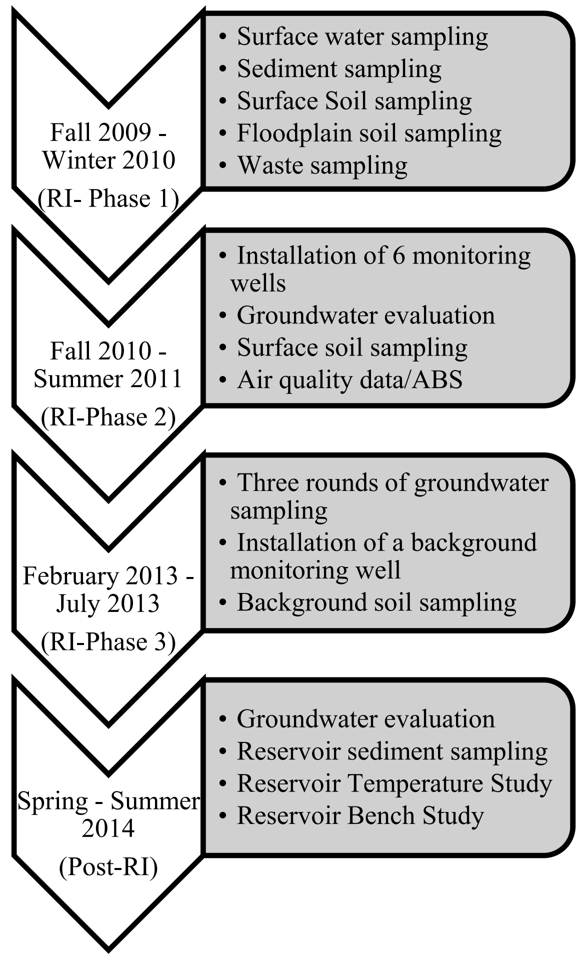
The Federal Emergency Management Agency (FEMA) identifies geographic areas prone to flood risks or flood hazard zones. Temple University's Center for Sustainable Communities (CSC) recently prepared a draft stormwater management plan for urban watersheds in southeastern Pennsylvania that presents the results of watershed studies conducted to update 1996 FEMA flood hazard zones at the BoRit Site, specifically the 100-year and 500-year floodplains. Although the CSC's study is not included as part of the RI for the Site, the extent of the 100-year floodplain updated by CSC is shown in **Figure 4**. The floodplain maps were finalized on August 1, 2016. CSC's floodplain maps delineate the 100-year flood zone to be an area surrounding the three creeks that intersect the BoRit Site: Wissahickon Creek, Rose Valley Creek, and Tannery Run. The northern area of the Asbestos Pile parcel extends into the 100-year floodplain. Relative to the 1996 FEMA maps, recent updates to the 100-year flood zone show the 100-year flood extent increasing in area to surround the entire perimeter of the Reservoir and extending northwest up West Maple Street. The CSC's stormwater management plan for Ambler area watersheds also provides Site-specific recommendations which include channelization for Rose Valley Creek in West Ambler to significantly reduce the 100-year floodplain immediately northwest of the Reservoir parcel.

Nature and Extent of Contamination

This Proposed Plan summarizes key findings of RI and post-RI activities. It is important to note the EPA Removal Program has been working at the Site before, during, and after RI and post-RI field work. However, the vast majority of samples collected as part of the RI and post-RI field efforts were collected prior to, or were not directly impacted by, ongoing removal action work. Therefore, the results summarized in this Proposed Plan represent **pre-removal conditions** or pre-Removal Program work baseline, i.e., un-remediated conditions.

The EPA initiated RI activities in a series of phases beginning in 2009. The first RI phase was performed in the Fall of 2009 and Winter 2010 when EPA collected surface water, sediment, surface soil, floodplain soil and waste samples. The second RI phase, which occurred in Fall 2010 and concluded in Summer 2011, included the installation of six groundwater monitoring wells, evaluation of groundwater at the Site, additional surface soil sampling, and the collection of air quality data, including **activity based sampling (ABS)**. In addition, ambient air samples were collected at least monthly at seven locations outside the perimeter of the Site from November 2010 to October 2011. The third RI phase, performed during February 2013 to July 2013, included three rounds of groundwater sampling, installation of a background monitoring well and background groundwater sampling, background soil sampling, and Reservoir seep sampling. Results of the RI are included in the Final RI Report.

To further characterize the Site and to better understand potential fate and transport of Site contaminants, additional data were collected after initial RI activities. These post RI activities included additional groundwater evaluations, a Reservoir Temperature Study, a Reservoir Bench Study, and Reservoir sediment sampling. The results of these activities are included in the RI Addendum Report.



Sampling results were screened against risk-based screening criteria:

Human Health

- Chemical contaminants in soil, sediment, groundwater, and surface water analytical data were screened against the EPA Region 3 ***Regional Screening Levels (RSLs)*** *for Chemical Contaminants at Superfund Sites*. RSLs are conservative values developed using EPA Superfund risk assessment guidance and are generic, i.e., they are calculated without site-specific information. RSL exceedances do not necessarily indicate the presence of unacceptable risk; they are used to help identify areas, contaminants, and conditions that require further evaluation;
- RI dioxin concentrations were expressed as dioxin total **toxicity equivalent quotients (TEQs)** using TEQ conversion factors based on the 2005 World Health Organization scheme. For dioxins detected in soil, the total TEQ was compared to the RSL for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD);
- Soil data for asbestos were screened against criteria in EPA's Office of Solid Waste and Emergency Response (OSWER) *Framework for Investigating Asbestos-Contaminated Superfund Sites*, dated September 2008. Soil sample asbestos concentrations were screened against a criterion of 1 percent asbestos. The 1 percent threshold is used in Occupational Safety and Health Administration (OSHA) regulations (29 C.F.R. § 1910.1001) and in EPA's NESHAP regulations to define ACM. The 1 percent screening value is not a risk-based value; studies have shown that soil with less than 1 percent asbestos can release sufficient asbestos fibers to air to present a risk to human health. ABS

air samples were screened against a **preliminary remediation goal (PRG)** of 0.04 fibers/cubic centimeters (f/cc) calculated by the EPA Region 3 toxicologist specifically for a raking/lawn maintenance scenario at the BoRit Site. This PRG is derived based on an assumed residential exposure using a time weighting factor (TWF) that assumes a resident would be exposed 4 hours a day, 50 days a year ([TWF] = 4hr/24hr x 50days/365days = 0.023). The starting age of exposure is assumed to be six years, with an exposure duration of 24 years. This ABS PRG was used to screen all personal ABS air data and is based on a target cancer risk of 1E-04 which means a 1 in 10,000 chance;

- The EPA Region 3 toxicologist also provided a screening level of 0.001 f/cc asbestos for **ambient air**. This screening level is derived based on an assumed residential exposure using a TWF that assumes a resident would be exposed 24 hours a day, 350 days a year ([TWF] = 24hr/24hr x 350days/365days = 0.96). The starting age of exposure is assumed to be birth (0 years), with an exposure duration of 30 years. This ambient air residential screening level is based on a target cancer risk of 1E-04 which means a 1 in 10,000 chance; and
- The **EPA's National Recommended Water Quality Criteria (NRWQC)** includes the 7 million fibers per liter (MFL) drinking water **maximum contaminant level (MCL)**, for fibers greater than 7 µm in length, as a surface water quality criterion for asbestos for the protection of human health. Although the Reservoir does not serve as a drinking water source, the EPA felt it was a conservative approach to use the NRWQC as a screening level for the Reservoir surface water and seep.

Ecological

- Soil screening - the primary screening values are USEPA Ecological Soil Screening Levels (Eco-SSLs). Secondary screening values are Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants and Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Letter Invertebrates and Heterotrophic Process. Tertiary screening values are USEPA Region 5 RCRA Ecological Screening Levels. There are no soil ecological screening levels for asbestos.
- Reservoir sediment screening – the screening levels for Reservoir sediment are USEPA Region III Freshwater Sediment Screening Benchmarks. The asbestos sediment ecological screening level is 5 percent (i.e., five times higher than that used for human health).
- Reservoir surface water and seep – the screening levels for Reservoir surface water and seep are USEPA Region III Freshwater Screening Benchmarks. The asbestos surface water ecological screening value is the lowest no observed adverse effect concentration reported for effects to growth, reproduction, and survival of aquatic invertebrates or fish and is based on all fibers (0.0001 MFL).

Special Note on Air Samples

ABS is a standard sampling method for asbestos in air to measure potential exposures experienced by a person performing a particular activity. ABS scenarios involve actors performing an activity that could disturb the soil and release asbestos, if present, to the air. Specific scenarios performed for RI sampling included raking, digging, hiking, and mowing. During various stages of the RI, soil samples were collected and analyzed, the results of which were used to select locations for ABS sampling. Air data were collected using personal air monitors worn by the actors in the breathing zone.

Ambient air sampling involved placement of stationary monitors throughout the community. Ambient air samples were collected from seven locations throughout the community at least monthly for a year during the RI, to determine ambient air conditions surrounding the BoRit Site. The sampling was conducted over a yearlong period to evaluate fluctuations in seasonal conditions.

Human Health PRGs for Asbestos

- Air during ABS sampling = 0.04 f/cc (Human Health)
- Ambient air = 0.001 f/cc (Human Health)

Summary of Park Parcel Contamination – Waste, Soil, and Air

Significant investigation findings of Park parcel media (pre-removal conditions) include the following:

- ACM waste up to 13 feet deep was found across the Park parcel covered with an average of 0.8 feet of surface soil in all but one boring. No native soil samples below the waste contained more than 1 percent asbestos; generally, concentrations of asbestos decreased two orders of magnitude from the waste layer to the native soil;
- Surface soil samples collected from planned ABS locations, prior to performing ABS, contained less than the soil screening level (1 percent) for asbestos; however, the air samples collected during ABS still exceeded EPA's defined Site-specific ABS air PRG of 0.04 f/cc. As mentioned previously, the 1 percent screening value is not a risk-based value;
- In addition to asbestos, the Park Parcel waste was found to contain volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) (mostly polynuclear aromatic hydrocarbons [PAHs] and phthalates) at concentrations above the RSLs. The number and concentrations of VOCs and SVOCs decrease sharply in the native soil samples, indicating that these organic contaminants were most likely deposited with the waste. The highest concentrations of PAHs were associated with a bucket of tar-like material found in one boring. Low levels of pesticides were also present in all Park parcel media but were well below the RSLs; and

- Inorganics (metals) exceeding the soil screening levels at the Park parcel include: aluminum, arsenic, cobalt, iron, lead, manganese, mercury, nickel, and vanadium. Aluminum, lead, and nickel were more commonly found in waste samples; however, they were observed at lower concentrations in the cover soil layer above the waste and in the native soil layer below the waste.

Summary of Asbestos Pile Parcel Contamination – Waste, Soil, and Air

Significant investigation findings of the Asbestos Pile parcel media (pre-removal conditions) include the following:

- The Asbestos Pile itself is composed of a slurry of magnesium and calcium, as well as ACM waste in thick layers. The ACM waste is present on the property surrounding the Asbestos Pile in thin layers. Asbestos exceeded the soil screening level of 1 percent in 73 percent of the soil samples. The average thickness of the waste material is 16.6 feet; however, 40.5 feet of ACM were encountered in the north central part of the Asbestos Pile. In the majority of the Asbestos Pile, little cover material existed above the ACM prior to removal action activities;
- PAHs exceeded the soil RSLs in soil characterization borings throughout all subareas of the Asbestos Pile parcel (fire training area);
- Metals exceeding the soil screening levels include: aluminum, arsenic, cobalt, iron, lead, manganese, nickel, and vanadium. There were minimal differences in the concentrations of metals found in cover, waste, and native soils within a single boring;
- Surface soil samples collected beneath fallen electrical transformers contained one polychlorinated biphenyl (PCB), aroclor-1260, in two of the three surface soil samples. One PCB detection exceeded the RSL;
- Samples from the fire training area contained six PAHs at concentrations exceeding their respective RSLs;
- The dioxin TEQ in each fire training area sample exceeded the RSL of 4.5 nanograms per kilogram (ng/kg);
- The soil samples from the two slag area sampling locations contained asbestos below the screening level, five PAHs exceeded the respective RSLs, and dioxin TEQ exceeded the RSL;
- Slag area soils contained aluminum, arsenic, chromium, iron, manganese, and thallium at concentrations greater than respective RSLs;
- All surface soil samples collected from the Asbestos Pile parcel ABS scenario locations prior to performing ABS contained asbestos at levels greater than the soil screening level of 1 percent; and
- Air samples collected during each ABS scenario conducted at the Asbestos Pile parcel exceeded the Site-specific ABS air PRG of 0.04 f/cc.

Summary of Reservoir Parcel Contamination – Waste, Soil, Air, Surface Water, Seep Water, and Sediment

Significant investigation findings of Reservoir parcel media (pre-removal conditions) include the following:

- The ACM waste is found in the berm of the Reservoir. Visible ACM was found in all borings in the Reservoir berm, except those along West Maple Street and isolated locations on the southern corner of the Reservoir and mid-way along the south side of the Reservoir. One native soil sample contained more than 1 percent asbestos. The asbestos in this sample is assumed to be contamination from surrounding waste;
- Organic compounds that exceeded the screening levels included PAHs in surface soil, cover/waste interface samples, and waste samples. There were no organic compounds at concentrations above screening levels in the native soil samples;
- Metals exceeding the screening levels for soils at the Reservoir parcel include: aluminum, antimony, arsenic, cobalt, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc;
- Asbestos was detected in nine Reservoir surface water samples collected from four locations at concentrations ranging from 1.9 million fibers per liter (MFL) to 640 MFL. Three Reservoir surface water locations had asbestos concentrations greater than the NRWQC of 7 MFL for asbestos. As previously noted, the Reservoir was subsequently drained as part of removal action efforts at the Site. Approximately 37.8 million gallons (MG) of Reservoir surface water were pumped, treated,[2] and discharged to Wissahickon Creek. Additional pumping was needed after each rain event and throughout removal action efforts;
- Asbestos detections in the seep samples were below the NRWQC of 7 MFL. Concentrations ranged from 1.5 MFL to 5.1 MFL;
- Three unfiltered surface water samples from the Reservoir exceeded the respective screening levels for metals including arsenic, chromium, and lead;
- No organic compounds exceeded the screening levels for surface water at the Reservoir;
- Asbestos was detected in 14 of 15 Reservoir sediment samples collected while the Reservoir was filled with water; however, no sediment samples exceeded the asbestos screening level of 1 percent. In 2014, Reservoir bottom sediment was re-sampled at or near the previously sampled locations after the Reservoir had been drained as part of removal action work at the Site. Sample results ranged from 0 to 0.75 percent asbestos;
- Three sediment samples collected from the southeast part of the Reservoir exceeded the screening level for one PAH: (benzo(a)pyrene). For the 2014 Reservoir sediment investigation, four VOCs (including 2-butanone (MEK), 4-methyl-2-pentanone (MIBK), acetone, and carbon disulfide) and two SVOCs (diethyl phthalate and dimethyl phthalate) were detected. However, no organic compounds exceeded the respective screening levels;
- Metals exceeding the screening levels for sediment at the Reservoir include: arsenic, chromium, and vanadium. In the 2014 Reservoir investigation, chromium and arsenic were the only metals to exceed the respective screening levels; and

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[2] Reservoir surface water was treated by pumping surface into settling tanks and then running water through a filtration process that progressed from sand filters to a filter size of 1 micron before discharging to Wissahickon Creek. Discharge sampling was conducted per National Pollutant Discharge Elimination System (NPDES) permit requirements.

- The surface soil collected at the ABS location prior to performing ABS did not exceed the soil screening level (1 percent) for asbestos. The air samples collected during the ABS scenario did not exceed the Site-specific ABS air PRG of 0.04 f/cc.

Summary of Site Groundwater Contamination (pre-removal conditions)

Asbestos was detected at low levels in samples from five of the six on-Site groundwater monitoring wells located within the disposal areas sampled during RI Phases 2 and 3; however, all concentrations were less than the MCL of 7 MFL. It should be noted that during the last round of groundwater sampling for Phase 3 of the RI, asbestos was detected from only two of the six on-Site groundwater monitoring wells and at lower levels compared to previous sampling rounds.

Organic compounds found in groundwater at concentrations exceeding the RSLs were also found in the ACM waste material. Fifteen of the sixteen VOCs detected in groundwater samples were found in two of the six on-Site wells. Of these compounds, 1,2,3-trichlorobenzene, carbon tetrachloride, chloroform, tetrachloroethene (PCE), and trichloroethene (TCE) were found at concentrations exceeding the respective RSLs in monitoring well (MW) MW-02, located at the southwest corner of the Park parcel. All of the compounds exceeding RSLs are common solvents used for many industrial processes. Three of these compounds (carbon tetrachloride, PCE, and TCE) were also found in the **upgradient** off-Site (i.e., off-Site is defined as areas outside the Site boundary as depicted on **Figure 1)** monitoring well MW-07 at concentrations that exceed the RSLs and also at concentrations greater than the on-Site wells. One VOC found in Site groundwater, trichlorofluoromethane (CFC-11), was not detected in any soil sample or in the upgradient off-Site monitoring well.

PAHs were found above soil RSLs in many samples; however, they were not detected in shallow bedrock **aquifer** monitoring wells. One SVOC, bis(2-ethylhexyl)phthalate, was detected in groundwater at concentrations above the RSL for one round of sampling only (November 2010). This compound was also detected in Site surface soil and ACM waste samples.

No pesticides or PCBs were detected in shallow bedrock groundwater samples.

Total and dissolved metals and cyanide (inorganics) were analyzed in monitoring well groundwater samples. Metals that exceeded the RSLs in samples analyzed for both total and dissolved metals included arsenic, barium, cadmium, cobalt, manganese, and thallium. Metals that exceeded the RSLs in samples analyzed for total metals included aluminum, chromium, cyanide iron, and vanadium. The only inorganic that exceeded its respective RSL exclusively for dissolved metal samples was selenium.

Summary of Site Creeks Contamination (pre-removal conditions)

Asbestos was not detected in sediment from heavy depositional areas, i.e., those with greater than 6 inches of sediment, in Wissahickon Creek; however, asbestos was detected at levels below the screening level of 1 percent in normal depositional areas (less than 6 inches of sediment). No asbestos was detected in sediment from Rose Valley Creek or Tannery Run.

Although two VOCs were detected in Wissahickon Creek sediment, both were found at concentrations below RSLs. Several SVOCs were detected in sediment from each creek; however, only benzo(a)pyrene exceeded the screening level in sediments from each of the three creeks. An upstream sample in Wissahickon Creek also contained benzo(a)pyrene at concentrations exceeding the RSL, indicating a potential upstream source for SVOC contamination.

Pesticides were found in sediments from the three creeks; none exceeded RSLs. PCBs were detected in Wissahickon Creek sediments and Rose Valley Creek sediments; however, no PCBs were detected above RSLs.

Three metals (arsenic, chromium, and manganese) exceeded the soil RSLs in Wissahickon Creek sediment samples. Chromium concentrations exceeded the RSL in all samples. One of the samples that exceeded the arsenic RSL was the upstream sample, indicating that an upstream source for arsenic may exist, or naturally-occurring concentrations of arsenic exceed RSLs.

Asbestos was detected in four surface water samples from Wissahickon Creek and exceeded the NRWQC of 7 MFL for asbestos in surface water from two locations. Asbestos was not detected in surface water from Rose Valley Creek or Tannery Run.

Seven VOCs were detected in Wissahickon Creek surface water, and one VOC was detected in Rose Valley Creek and Tannery Run surface water. None of the VOCs were detected at concentrations above the surface water screening levels.

Three SVOCs, all PAHs, were detected in one surface water sample from Wissahickon Creek. Concentrations of dibenzo(a,h)anthracene and indeno(1,2,3-cd)pyrene exceeded the RSLs. No SVOCs were detected in surface water from Rose Valley Creek or Tannery Run.

One pesticide was detected in surface water from each creek. None of the pesticide concentrations exceeded screening levels.

The total chromium concentration in surface water samples from Wissahickon Creek and Tannery Run exceeded the screening level. Note that the RSL for chromium is based on hexavalent chromium (i.e., Cr^{+6}), a more toxic form of chromium than is expected to be present in surface water at the Site. Also note that samples were analyzed only for total chromium and did not include an analysis of specific forms of chromium, such as trivalent or hexavalent chromium.

Summary of Site Floodplain Soil Contamination (pre-removal conditions)

No shallow floodplain soil samples (0 to 3 inches) contained more than the screening level of 1 percent asbestos; three soil samples collected from the deep floodplain soils (6 to 24 inches) exceeded 1 percent asbestos. Asbestos was not detected above the screening level of 1 percent on the west side of Wissahickon Creek or in creek banks following EPA's Removal Program bank stabilization. The higher concentrations of asbestos in the deeper samples at these locations indicate that material deposited during more recent flooding events contained less asbestos.

Four feet of asbestos waste were encountered in the Tannery Run stream bank boring; although, the grab sample of the waste did not contain greater than 1 percent asbestos. The vertical extent of the waste in this location was not determined; however, subsequent to sampling, the stream bank was stabilized as part of EPA's Removal Program activities.

Metals exceeding the RSLs in floodplain soils included aluminum, arsenic, chromium, cobalt, iron, manganese, and vanadium.

Shallow floodplain soil samples contained five PAHs at concentrations exceeding soil RSLs. The highest concentrations of PAHs were in the most upstream floodplain soil samples. Three PAHs were also detected at concentrations exceeding RSLs on the west side of Wissahickon Creek.

Summary of Off-Site Air Sampling for Asbestos (pre-removal conditions)

ABS: Residential Areas and Walking Trails –Soil samples were collected prior to the ABS samples in the residential areas and walking trails. All soil samples collected were non-detect or contained less than 1 percent asbestos (soil screening level); asbestos was detected below the screening level of 1 percent in one residential and one walking trail soil sample with all others being non-detect. Personal and perimeter air samples were also collected during the raking activities at eight residential areas, during mowing activities along Wissahickon Creek, and during hiking activities along the walking trail. All ABS air concentrations were below the Site-specific ABS Air PRG of 0.04 f/cc. ABS results were based on **phase contrast microscopy equivalent (PCME)** air concentrations.

EPA conducted confirmatory ABS (post-removal conditions) at residences along West Maple Street and the Mercer Hill area in September 2016. EPA is currently awaiting the results.

Ambient Air - Ambient air sampling was conducted at least monthly at seven locations outside the perimeter of the Site from November 2010 to October 2011, 98 samples in total were collected to provide a representative data set for the area surrounding the Site. Each ambient air sampling event was 24 hours in duration. Asbestos was not detected in 95 of 98 samples (based on PCME air concentrations). In the three samples where PCME asbestos was detected, concentrations were below the Site-specific ambient air PRG of 0.001 f/cc at two locations (0.00075 and 0.00079 PCME structures per cubic centimeter (s/cc)) and just above the PRG at a third location (0.0012 PCME s/cc).

It should be noted that Sample CM01-AA-HD12, which reported an asbestos concentration slightly above the PRG, was collected in September of 2011 on the west bank of Wissahickon Creek directly across from the western corner of the Reservoir (Reference RI Report, Figure 3-11 for sample location). The slight exceedance of asbestos ambient air PRG in this sample is most likely associated with removal action **excavation** activities conducted on the Site during September 2011, which included stream bank stabilization of Wissahickon Creek adjacent to the Asbestos Pile, excavation of ACM on the Asbestos Pile, and Rose Valley Creek Reconstruction.

An understanding of the nature and extent of contamination at the Site is useful in considering whether the ACM waste, contaminated soil, and Reservoir sediment are source materials constituting a principal threat. 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 acts as an origin for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The National Contingency Plan (NCP) establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 C.F.R. Section 300.430(a)(iii)(A)). The waste material at the BoRit Superfund Site is considered a principal threat waste. The waste material is the source for asbestos and acts as a source for direct exposure when these materials are encountered.

Conceptual Site Model (CSM)

Note that the CSM reflects the pre-removal conditions, i.e., un-remediated conditions. A CSM essentially tells the story of when and where a site was contaminated, what media were affected, how and where the contamination migrated (**pathways**), and who and what is or can be potentially harmed from the contamination (**receptors**). In addition, a CSM provides a framework for assessing risks from contaminants, developing remedial strategies, determining source control requirements, and identifying methods to address unacceptable risks. Development of the CSM is an evolving process; as more is learned about a site, the CSM is modified to reflect that knowledge. A CSM has been developed for the BoRit Site based on pre-removal conditions and accounts for the Site's history (e.g., past uses), physical characteristics (e.g., topography and hydrogeology), and results of various investigations. **Figure 5** presents a flow diagram of the CSM that illustrates potential **migration** of contaminants from source material to receptors for consideration in the development of remedial alternatives.

<u>*Asbestos*</u>

Primary Source - Asbestos is the dominant environmental concern at the BoRit Site. The primary source of contamination, most significantly the chrysotile asbestos-containing waste, comprises the waste layer and contaminated soil found in the Park parcel, the berm of the Reservoir parcel, and the pile area of the Asbestos Pile parcel. The asbestos contamination is the result of historical disposal practices at these three Site parcels.

Receptors – People who would most likely be exposed to asbestos via air inhalation under potential future land use scenarios (recreational, non-residential) include:

- On-Site maintenance workers maintaining each of the BoRit Site parcels;
- On-Site commercial workers carrying out activities associated with developing/maintaining recreational use of the BoRit Site parcels;
- On-Site and off-Site recreational visitors including adults and children; and
- Off-Site residents.

The most conservative exposure receptor at all three on-Site parcels is the maintenance worker.

Potential ecological receptors include both **terrestrial** receptors, such as plants, soil invertebrates, insectivorous birds, and insectivorous mammals, and aquatic receptors, such as fish, aquatic invertebrates, piscivorous birds, and piscivorous mammals and aquatic receptors.

Primary Release/Transport Mechanisms - Based on pre-removal conditions, the primary release/transport mechanisms for the ACM and soil contamination include airborne dust generation (due to soil disturbances) and surface runoff. Once airborne, asbestos fibers will be transported through advection of air currents until they settle out. The magnitude of airborne asbestos generated depends on multiple factors, including the intensity of the soil disturbance, the asbestos content of the ACM and soil, and nature of the ACM (e.g., friability) and soil (e.g., moisture content). Although many areas of landfilled waste were at one time covered by fill/soil, that cover eroded in some areas. In summary, prior to removal action work, several asbestos-containing areas across the Site were not covered, and, therefore, airborne dust generation (due to disturbances of ACM and contaminated soil) and surface runoff mechanisms existed under pre-removal conditions.

Exposure Media - Air is the primary exposure **medium** for asbestos released via airborne dust generation for human receptors and some ecological receptors (e.g., burrowing mammals), based on pre-removal conditions. Results of the ABS raking scenarios performed at the Park and the Asbestos Pile parcels indicate that, even when the soil concentration of asbestos is less than 1 percent, the ABS activity can release sufficient asbestos into the air to exceed the Site-specific ABS preliminary remediation goal (PRG) for air.

Asbestos was found in the surface water and sediment of Wissahickon Creek under pre-removal conditions, indicating that asbestos fibers were directly eroded from Site soils by normal or flood stream flow or adsorbed to fine particles that were eroded from Site soils and washed into the Creeks via surface run-off from precipitation events.

The asbestos fibers in water will travel downstream with the currents until they can settle out. During flooding events, sediment with entrained asbestos fibers can be re-distributed and washed onto floodplain soils. Pre-removal action concentrations of asbestos were found to be higher in deep floodplain soils than in shallow floodplain soils, indicating that, over time, less asbestos has been deposited during flooding events. Asbestos fibers deposited in the floodplain during flooding events could become airborne if disturbed after the floodplain soil has dried.

For some ecological receptors, soil, surface water, and sediment are the primary exposure **media** for asbestos transported via surface runoff, based on pre-removal conditions. Ecological receptors, such as terrestrial plants/invertebrates and fish, are exposed to these media via direct contact while other ecological receptors (e.g., wildlife) are exposed via ingestion. Human exposures to asbestos in surface water and sediment are likely to be minor relative to soil.

Based on pre-removal conditions, a related transport mechanism/pathway that could occur at the BoRit Site is the release of asbestos fibers from the sediment at the Reservoir bottom to Reservoir surface water after the sediment has been disturbed. The Reservoir bench study results demonstrate that, even when asbestos concentrations in sediment are less than 1 percent screening level, a disturbance of the sediment results in high surface water concentrations for an extended period of time. Examples of sediment-disturbing activities include re-filling the Reservoir after it has been drained or has otherwise dried out, impact of the natural freeze-thaw cycle, and aquatic animal activities. While exposures to Reservoir sediment and surface water are not of concern for human receptors, sediment-disturbing activities may be an important source of exposure for aquatic ecological receptors.

Groundwater has a limited potential to be an exposure media of asbestos via groundwater flow transport. Low levels of asbestos in five Site shallow bedrock aquifer monitoring wells (detected in different wells during the four rounds of groundwater sampling and generally not repeated at any one well) indicate that asbestos fibers can flow with groundwater through the bedrock fractures. However, although detected in groundwater, the concentrations of asbestos were below the drinking water standard of 7 MFL. At the Site, much of the bedrock is overlain by silty and clayey sands, silts, and clays, which inhibits the migration of asbestos to groundwater in the bedrock aquifer.

The possibility of hydraulic communication between groundwater and Reservoir surface water could potentially suggest a pathway to pass asbestos contamination between Site groundwater and surface water. However, the limited extent of that communication, coupled with the low concentrations of asbestos detected in Site groundwater, indicates that this is not a significant transport mechanism/pathway for asbestos at the Site.

Non-Asbestos Contaminants

Primary Source - Other contaminants detected in the ACM waste based on pre-removal conditions include VOCs, SVOCs, pesticides, and metals. In addition, three specific potential sources of contamination were investigated. These consisted of the fire training area on the Asbestos Pile parcel, the former transformers on the Reservoir and Asbestos Pile parcels, and the slag area on the Asbestos Pile parcel. The presence of dioxins was observed at the fire training area, and PCBs were noted at the location of the transformers.

Receptors -– People who would most likely be exposed to Site-related contamination via ingestion or dermal contact with soil, sediment, or surface water under potential future land use scenarios (recreational, non-residential) include:

- On-Site maintenance workers maintaining each of the BoRit Site parcels;
- On-Site commercial workers carrying out activities associated with developing/maintaining recreational use of parcels comprising the BoRit Site; and
- On-Site (including Creeks) recreational visitors including adults and children.

Potential ecological receptors include both terrestrial receptors, such as plants, soil invertebrates, insectivorous birds, and insectivorous mammals, and aquatic receptors, such as fish, aquatic invertebrates, piscivorous birds, and piscivorous mammals.

Primary Release/Transport Mechanisms/Exposure Media - The primary release/transport mechanism based on pre-removal conditions for the non-asbestos contamination present in ACM and soil is from surface runoff due to precipitation events. Although not the primary contributor to the shallow bedrock aquifer VOC contamination, there may be dissolution of VOCs from infiltrating precipitation and eventual migration to groundwater. Primary exposure media include soil, groundwater, surface water, and sediment.

VOCs - Because VOCs are present below the land surface, surface water runoff is not an issue. However, VOCs are highly mobile and would be expected to dissolve in precipitation that infiltrates the waste and travel with the infiltrating water to the native soils and groundwater below. Based on pre-removal conditions, nine VOCs were found consistently in one on-Site shallow bedrock monitoring well, MW-02, which is located on the **downgradient** edge of the Park parcel (See Figure 2 for well locations). Samples from MW-07, an upgradient off-Site well that was installed and sampled twice during the RI, had detections of five of those same VOCs: carbon tetrachloride, cis-1,2-dichloroethylene (cis-1,2-DCE), methyl tert-butyl ether (MTBE), PCE, and TCE. Although the waste in the Park parcel may contribute to the VOCs found in MW-2, the upgradient groundwater contamination detected in MW-07 is believed to be a main contributor to VOC contamination in the shallow bedrock aquifer.

Seven VOCs were detected in the surface water of Wissahickon Creek and one VOC was detected in the surface water of Rose Valley Creek and Tannery Run based on pre-removal conditions. The presence of VOCs in creek water also appears to be from upstream sources. One VOC, TCE, was detected in the most upstream surface water sample collected from Wissahickon Creek approximately 500 feet north of the Site boundary. VOCs dissolved in the surface water can be expected to volatilize and travel downstream with the surface water and therefore do not easily partition to the fine-grained mineral or organic sediments.

SVOCs - SVOCs generally adsorb to soil and organic material and therefore do not easily desorb with infiltrating precipitation. SVOCs in surface soil and waste can erode from the upland areas and enter streams adsorbed to fine-grained soil and organic matter. Pre-removal conditions for creek sediment samples detected SVOCs in all samples. However, the source of SVOCs in Site creek sediments is likely from upstream sources on the Creeks, including road and parking area runoff. For example, benzo(a)pyrene was the only SVOC in sediments that exceeded the RSL, and it was found in the upstream sample at a higher concentration than some of the samples collected adjacent to the Site.

Similarly, more PAHs were found above RSLs in the surface soils at the Park and Asbestos Pile parcels than in the wastes in those parcels. Additionally, concentrations of SVOCs were higher in the surface soil than in the waste at the Asbestos Pile parcel. It is likely that some of the PAHs in the surface soils on all parcels are due to deposition of airborne products of off-Site combustion, as PAHs were also found in background surface soil samples. This airborne off-Site source would explain the higher PAH concentrations in the surface soils than in the wastes and native soils.

Pesticides/PCBs/Dioxins - Pesticides do not dissolve easily, and they adhere to fine-grained and organic material. Samples collected during pre-removal conditions detected pesticides at low levels in native soils, surface water from all surface water bodies, and turbid overburden groundwater; however, pesticides were not detected in groundwater samples from bedrock monitoring wells. Pesticides present in waste material and cover soil of upland areas will adsorb to fine-grained particulate matter and migrate on the particle via runoff and overland flow to the Reservoir and creeks. However, pesticides were found in similar numbers and concentrations in upstream sediment samples. The ubiquitous presence of pesticides suggests their presence may not be attributable to the waste material disposed on the Site.

Surface soil samples collected during pre-removal conditions near the former electrical transformers indicated that PCB contamination at those locations is limited, because only one RSL exceedance was observed. Although deeper samples were not collected in the area where the PCB concentration exceeded the RSL, the tendency for PCBs to adsorb to fine-grained material and the generally low PCB concentrations detected in surface soils do not suggest the likelihood of extensive vertical migration of PCBs.

Dioxin was detected in soil samples collected during pre-removal conditions from the fire training areas and the slag area on the Asbestos Pile parcel. Concentrations detected in the deepest soil investigated at these locations (6 inches to 24 inches) exceeded RSLs. However, dioxins are not considered to be highly mobile in soil because they can adsorb to organic material and fine-grained material (silts and clays). Therefore, extensive vertical migration of dioxins in these areas would not be expected.

Metals - As noted above, metals were detected in the ACM waste during pre-removal conditions. However, metals also occur as constituents of minerals and can be present in non-impacted soils at concentrations greater than the RSLs. A comparison of the suite of metals and the ranges of concentrations of metals in the different soil strata at the Site revealed the highest chromium and aluminum concentrations on each parcel (other than from the slag area on the Asbestos Pile parcel) was detected in a waste sample from that parcel. In addition, some other metals were found at concentrations exceeding the RSLs in waste samples: nickel and zinc (Park parcel), copper (Asbestos Pile parcel), and antimony and copper (Reservoir parcel). Based on these observations, the disposed waste may be a source for aluminum, antimony, chromium, copper, nickel, and zinc.

To some extent, the presence of metals in the groundwater samples appears to correlate to the turbidity (presence of particulates such as clay). For example, in MW-04, concentrations of aluminum exceeding the RSL are likely due to naturally-occurring aluminum present in clay particles present in the unfiltered, turbid sample. Similar patterns can be seen in the concentration of other metals in MW-

04 (arsenic and vanadium) where arsenic and vanadium were only detected in the most turbid samples. MW-02 also shows some correlation between higher concentrations of metals and turbidity.

Groundwater is included as a theoretical source of exposure to future residents living at the Site using a private well in the CSM and was considered in the Human Health Risk Assessment (HHRA). However, no action is anticipated for groundwater because the groundwater risk drivers occurred at concentrations lower than those found in the upgradient well, included isolated or one-time detections that do not suggest the presence of a contaminant plume, and/or do not appear to emanate from waste material or contaminated soil at the Site. The groundwater data used were based on pre-removal conditions and were identified in the HHRA (provided in **Table 1**).

Based on the data gathered prior to the removal action, the potential human and ecological risks from these non-asbestos contaminants and exposure pathways are discussed further under the Summary of Site Risks section.

SCOPE AND ROLE OF RESPONSE ACTION

This proposed response action is intended to address the waste and soil, at the Asbestos Pile parcel and Park parcel and the Reservoir sediment at the Site. This action will be the final action for the Site.

EPA continues to complete the ongoing removal response action at the Site that includes the following:

- Stream Bank stabilization at Rose Valley Creek, Tannery Run, and Wissahickon Creek
- Installation of cap at Park
- Installation of cap at Asbestos Pile
- Dewatering of Reservoir with treatment of surface water prior to discharge
- Re-grading and lining of Reservoir berm interior slopes
- Installation of a cap on the Reservoir bottom
- Refilling of the Reservoir

The waste, soil, and Reservoir sediment contaminated with asbestos at the Site is considered a principal threat waste. The proposed response action will physically contain the asbestos to prevent migration from the Site and to prevent exposure to human and ecological receptors.

To accomplish this response action, four remediation zones have been delineated for the Site by considering the extent of Site contamination, the individual parcel boundaries, the removal action activities, and the **remedial action objectives (RAOs)** developed for the Site. **Figure 6** highlights the four remediation zones which include: the Stream Banks, the Park, the Asbestos Pile, and the Reservoir (Berm and Bottom Subzones).

SUMMARY OF SITE RISKS

CERCLA requires EPA to protect human health and the environment from current and possible future exposures to hazardous substances at Superfund sites. As part of the Remedial Investigation/Feasibility Study (RI/FS), a HHRA and a Screening Level Ecological Risk Assessment (SLERA) were conducted to characterize the potential risk to human and ecological receptors, respectively, associated with Site media in the absence of any remedial action. This section of the Proposed Plan summarizes the results of the HHRA and SLERA. The HHRA and SLERA are included in their entirety in Appendix A and B of the RI Report, respectively. As mentioned previously, the vast majority of samples collected as part of the RI and post-RI field efforts were collected prior to or were not directly impacted by ongoing removal action work. This means that the risk assessments completed for the RI evaluated risks for pre-removal conditions (i.e., the baseline, un-remediated conditions at the Site).

HHRA

The objective of the HHRA is to characterize and quantify the current and potential future human health risks that would occur based on pre-removal conditions if no remedial action is taken at the Site. The Baseline HHRA evaluates risks to human receptors from contaminants found in contaminated soil, air, and groundwater across the entire Site, as well as surface water and sediment from Wissahickon Creek, Rose Valley Creek, and Tannery Run. The HHRA also evaluated air at residential and public spaces adjacent to the Site. Results from the HHRA determine if there is an unacceptable risk to human health and/or the environment from the Site. The results also help determine where Site contamination poses the highest risk to receptors and determine the exposure pathways that need to be addressed by the remedial action. Key findings from the asbestos and chemical HHRA are summarized in this Proposed Plan.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund human health risk assessment estimates the baseline risk. This assessment is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. To estimate the baseline risk at a Superfund site, EPA undertakes a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies help EPA to determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a **reasonable maximum exposure** (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur.

In Step 3, EPA uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. EPA considers two types of risk: cancer risk and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as an upper bound probability; for example, a 1 in 10,000 chance. In other words, a risk of 5E-08 means that, over a lifetime, the contamination is expected to have a risk of 5 extra cancer deaths per 100 million people. An extra cancer case means that one more person could get cancer than would normally be expected, given the background cancer rate. For non-cancer adverse health effects, EPA calculates a **hazard index**. The key concept here is that a threshold level (measured usually as a hazard index of less than 1) exists below which non-cancer adverse health effects are no longer predicted. EPA's acceptable target range for carcinogenic risk is 1 in ten thousand to 1 in one million (1E-04 to 1E-06) individual excess lifetime risk of developing cancer from the contaminants at a site, and the acceptable non-carcinogenic target hazard level is a HI of less than 1.0.

In Step 4, EPA determines whether site risks are great enough to cause health problems for people at or near the Superfund site. The results of the three previous steps are combined, evaluated and summarized. EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk.

Asbestos

The potential receptors evaluated for risk from asbestos on the three on-Site exposure areas (Park parcel, Asbestos Pile parcel, and Reservoir parcel), and off-Site areas are as follows:

On-Site:

- Current/Future Maintenance Worker at all three exposure areas;
- Future Recreational Visitor at all three exposure areas; and
- Future Commercial Worker at the Park parcel and Asbestos Pile parcel exposure areas.

Off-Site:

- Current/Future Residents; and
- Current/Future Recreational Visitor.

Human health risks from asbestos were based on inhalation exposures to asbestos in air during soil disturbance activities as measured during ABS. Risks were also calculated based on inhalation exposures to asbestos in ambient air. With the exception of the Asbestos Pile parcel and the Park parcel, cancer risks are within the acceptable target risk range of one in ten thousand (1E-04) and one in one million (1E-06) for all exposure areas and receptors.

For the Asbestos Pile parcel and the Park parcel, cancer risks exceed 1E-04 for the maintenance worker (most conservative exposure receptor). These results suggest that, if maintenance workers frequently engage in active soil disturbance activities within these two Site parcels, the resulting asbestos concentrations in air have the potential to result in unacceptable cancer risks.

Conversely, existing ABS air results for soil disturbance activities at off-Site areas adjacent to the Site, including the residential areas and recreational areas, indicate that exposure to asbestos does not result in unacceptable risks. Confirmation ABS sampling, which is included in all the Remedial Alternatives, is currently underway in residential areas.

EPA has not yet developed national guidance for evaluating non-cancer effects from inhalation exposure to chrysotile. Therefore, no quantitative evaluation of non-cancer risks from airborne chrysotile exposure was performed.

Non-Asbestos Contaminants

The HHRA concluded that there are several chemicals detected in Site media that are at levels that may have adverse effects to human receptors.

PAHs in surface water from Wissahickon Creek - The current/future recreational user (swimmer) may be exposed to an unacceptable risk. However, as indicated earlier, the source of SVOCs in the Creeks appears to be due to upstream sources, including road and parking area runoff. In addition, portions of the Wissahickon Creek, Rose Valley Creek, and Tannery Run stream banks were stabilized as part of the removal action work at the Site. The removal action work was performed to prevent future contamination of creek surface water and sediment by minimizing erosion from the Site.

PAHs, pesticides/PCBs, and metals in sediment from Wissahickon Creek – The current/future recreational user (swimmer) and fisher exposed to contaminated sediment also exceeded EPA's acceptable target risk range. A summary of risk drivers can be found on **Table 1**.

However, no further action, beyond the stabilization work performed during the removal action, is proposed for creek sediment. Similar to the SVOCs noted above, pesticides were found in similar numbers and concentrations in upstream and Site sediment samples. The ubiquitous presence of pesticides in the environment suggests their presence may not be attributable to the waste material disposed on the Site. In addition, only one PCB sample result exceeded EPA's screening level. This exceedance was observed near the former electrical transformers and the likelihood of extensive vertical migration is limited. Furthermore, metals, occurring as constituents of minerals, are found throughout the Site and are present in non-impacted soils at concentrations greater than those found at the Site.

***VOCs, SVOCs, and metals in the shallow bedrock aquifer* –** The hypothetical future resident using a drinking water well installed in the shallow bedrock aquifer at the Site would be exposed to unacceptable risks due to the presence of carbon tetrachloride, chloroform, PCE, TCE, bis(2-ethylhexyl)phthalate, arsenic, and chromium in the groundwater.

Non-cancer hazards also exist and are associated with the presence of aluminum, arsenic, manganese, thallium, vanadium, and PCE.

Note that while groundwater is included as a potential exposure medium to future residents in the CSM and was considered in the HHRA, the following conditions have been considered:

1. Detections of the listed VOCs were below the concentration found in the upgradient well (MW-07) and on-Site waste and contaminated soil is not believed to be a large contributor to contamination in the shallow bedrock aquifer.
2. Only one SVOC, bis(2-ethylhexyl) phthalate, was detected in groundwater at concentrations above the RSL, but the RSL exceedances were limited to MW-02, MW-05, and MW-06 in the first round of sampling (2010). Bis(2-ethylhexyl)phthalate was not detected in any of the three subsequent rounds of sampling completed at these wells in 2013.
3. While manganese has been detected frequently in groundwater samples collected at the Site, the occurrence of manganese concentrations above a risk based cleanup level of 430 micrograms per liter (µg/L) in filtered samples has been limited to MW-03 and MW-06. The potentiometric surface at the Site suggests that the manganese exceedances in these two wells are not connected and do not constitute a plume. It should be noted that manganese is a secondary contaminant meaning that the risk based cleanup level for manganese is non-enforceable and based on aesthetic considerations such as taste, color, and odor. Finally, manganese does not appear to be related to historical Site activities.

Therefore, no action is anticipated for groundwater at the Site.

A number of uncertainties arise during the process of estimating human exposure and risk to asbestos and chemicals which limit the confidence in the risk conclusions. These can include uncertainties related to sampling and analysis, toxicity and exposure assessment, and risk characterization. These uncertainties are considered when making risk management decisions for the Site.

<u>SLERA</u>

A SLERA based on pre-removal conditions was conducted to evaluate the potential for ecological risks from asbestos and chemicals to environments present within the study area at the Site in the absence of any remedial action. Prior to performing the assessment, the United States Fish and

Wildlife Service (USFWS) and Commonwealth of Pennsylvania (PA) agencies were contacted to identify threatened and endangered species that may exist at or near the Site. If threatened and endangered species are present, then risks to individuals of those species would be evaluated whereas risk to communities (not individuals) are evaluated for non-threatened and endangered species. The USFWS reported that there were no known occurrences of any federally listed or sensitive environments at the Site or surrounding areas. The Pennsylvania Game Commission reported no known occurrences of birds or mammal species of concern within the vicinity of the Site. The Pennsylvania Fish and Boat Commission (PFBC) reported that the State threatened red-bellied turtle is known to be found within the area of the Site, and may inhabit Site aquatic environments; however, no red-bellied turtles were observed during the habitat evaluation. The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) reported that no plant species of concern are known to be found within the Site.

The SLERA identified nine assessment endpoints that were used to evaluate risk to ecological receptors. Risk from exposure to Site media (soils, creek and Reservoir surface water and sediment, and an on-Site seep) were evaluated via two exposure scenarios, direct contact and/or dietary exposure. Both exposure scenarios utilized the maximum concentration of contaminants detected in each medium. For those assessment endpoints evaluated via direct contact, risks were determined through a comparison of maximum concentrations of chemicals and asbestos detected in each medium to chemical-specific and media-specific ecological screening levels. Assessment endpoints aimed at the protection of upper trophic level receptors via food chain uptake, were evaluated using food chain exposure models which compare a daily dietary dose of a specific contaminant to its respective literature-based dietary toxicity reference value (TRV).

The results of the SLERA indicated that several chemicals and asbestos detected in Site media are at levels that may cause adverse effects to ecological receptors. The majority of risks noted were related to direct exposure to contaminants in Site media; risks from dietary exposure were limited.

- For those terrestrial receptors in direct contact with soil, risk drivers primarily include several metals, PAHs, dioxins/furans, and to a lesser extent, pesticides.
- For those receptors in direct contact with creek and Reservoir sediment, PAHs were the most common ecological risk driver. Pesticides and metals also potentially pose a risk to receptors in both of these water bodies. Aroclor-1254 potentially poses a risk to receptors in creek sediments only.
- Asbestos and metals were the primary risk drivers in surface water for both the creek and the Reservoir; however, metal concentrations in creek surface water were generally lower than the Reservoir.
- Risks from dietary exposure to zinc and asbestos in Site soil were noted for insectivorous birds and mammals, respectively.
- No risks from dietary exposure of chemicals in creek or Reservoir sediment were noted for piscivorous birds or mammals; and potential risks were identified for aquatic receptors for a limited set of metals and asbestos in seep water from the Reservoir parcel.

<u>Site-related Contaminants of Concern</u>

Waste, soil, air, sediment, surface water, and groundwater samples were collected and analyzed as part of the RI. The results of the analyses were screened against benchmark levels for these media as part of the HHRA and SLERA, and contaminants of potential concern (COPCs) were identified in the RI. **Table 1** and **Table 2** (HHRA and SLERA, respectively) present the initial list of COPCs and risk drivers resulting from the completion of the HHRA and SLERA based on pre-removal conditions. During the preparation of the FS, the COPCs identified in Site media were further evaluated using Site history, the range of detections, background concentrations, regulatory criteria, and the results of the baseline risk assessment to develop a list of proposed Site-related **contaminants of concern (COCs)** and Site media to address. An evaluation of those COPCs and media that could be eliminated from further consideration during development of remedial alternatives is presented below under the Basis for Action section of this Proposed Plan. A summary of the additional refinement of the initial list of proposed Site-related COPCs and PRGs presented in **Table 1** and **Table 2** for soil/waste and Reservoir sediment. **Table 3** is a summary of the Site COCs and PRG used for remedial alternative development.

Site-related COCs in Waste/Soil

Human health protection: Asbestos.
Ecological Protection: Asbestos, bis(2-ethylhexyl)phthalate, dioxins and furans, chromium, nickel, and zinc.

Site-related COCs in Reservoir Sediment

Ecological Protection: Asbestos and carbon disulfide.[3]

Media	Human Health COC	Ecological COC
Waste/soil	Asbestos	Asbestos Bis(2-ethylhexyl)phthalate Dioxins and furans Chromium Nickel Zinc
Reservoir sediment	None	Asbestos[4]
Reservoir surface water	None	Carbon disulfide Asbestos

Basis for Action

Note that all risks for the Site were determined based on pre-removal conditions. Generally, where the baseline risk assessment indicates that a cumulative human health site risk to an individual using reasonable maximum exposure assumptions for either current or future land use exceeds the 1E-04 (1 in 10,000) individual excess lifetime cancer risk end of the risk range, action under CERCLA is generally warranted at a site. Where the non-carcinogenic risk to humans exceeds a **hazard quotient** (HQ) of 1, action under CERCLA may also be warranted.

The outcome of the HHRA (**Table 1**) indicates that for the Asbestos Pile parcel and the Park

[3] Insufficient information is available at this time to eliminate carbon disulfide as a COC.
[4] Even though asbestos was not detected at levels that potentially posed a risk in the SLERA, the Reservoir bench study (previously discussed under the CSM section and discussed in detail in the RI Addendum) demonstrated that Reservoir surface water is directly affected by Reservoir sediment. Therefore, EPA used a conservative approach and assumed that asbestos is also a potential ecological risk in Reservoir sediment.

parcel, the presence of asbestos results in cancer risks that are at or above 1E-04 (1 in 10,000) for the maintenance worker. In addition, the SLERA indicated HQs above 1 for waste/soil Site-related COCs, bis(2-ethylhexyl)phthalate (HQ =303), dioxins/furans (HQ=249), chromium (HQ=4.8), nickel (HQ=9.1) and zinc (HQ=53) and carbon disulfide (HQ=11) in Reservoir sediment. (Refer to **Table 3**)

Based on the outcome of the HHRA and SLERA, EPA has determined that the proposed Preferred Alternative identified in this plan, or one of the other active measures, is necessary to protect the public health, welfare, or the environment from actual or threatened releases of contaminants or hazardous substances into the environment. Active measures that address asbestos in contaminated soil/waste, Reservoir sediment, and air across the entire Site are necessary to protect the public health, welfare, and the environment.

Active measures are not proposed for the following Site media.

Reservoir Surface Water

COPCs proposed for Reservoir surface water included asbestos, aluminum, iron, and lead; however, the Reservoir was drained as part of the previously described removal action work at the Site. Because the Reservoir surface water and the contaminants listed above are no longer present, FS remedial alternatives were not developed for Reservoir surface water. However, the development of the remedial alternatives for waste/soil/sediment assumes that the Reservoir will need to be refilled and that the "new" surface water will be sampled to confirm the effectiveness of the alternatives after their construction.

Seep Water

COPCs proposed for seep water included asbestos, aluminum, and iron, all of which exceeded ecological screening levels at the seep water sampling location. However, similar to the Reservoir surface water, because the seep is no longer present (Reservoir berm was reinforced during EPA removal action), seep water and its associated contaminants were not included in the FS development of remedial alternatives.

Creek Surface Water/Sediment

Portions of the Wissahickon Creek, Rose Valley Creek, and Tannery Run stream banks were stabilized as part of the removal action work at the Site in order to prevent future potential contamination of creek surface water and sediment by minimizing erosion of the waste and soil. That work, as well as the response actions considered in this Proposed Plan are all assumed to satisfactorily address creek surface water and sediment. However, the development of the remedial alternatives for waste/soil/sediment assumes sampling of creek surface water and sediment to confirm the effectiveness of the alternatives after their construction.

Groundwater

The HHRA evaluated the hypothetical use of site-wide groundwater as a potential risk to future residents exposed to contaminated groundwater and identified several chemicals as risk drivers. Those risk drivers occurred at concentrations lower than those found in the upgradient well and included isolated or one-time detections that do not suggest the presence of a contaminant plume, and/or do not appear to emanate from waste material or contaminated soil at the Site. More specifically, manganese, which occurred at high concentrations in two wells that are not hydraulically connected and which do not constitute a plume, is not a Site-related COPC in contaminated soil or waste and does not appear to be related to historical Site activities. In addition, manganese is a secondary contaminant meaning that the risk based cleanup level for manganese is non-enforceable and based on aesthetic considerations such as taste, color, and odor. Finally, asbestos, the primary contaminant at the Site present in the source material (waste, soil, and Reservoir sediment), was not found above its MCL in groundwater. This is consistent with what literature suggests, i.e., that asbestos does not easily move through soil into groundwater.

REMEDIAL ACTION OBJECTIVES

Several remedial action objectives (RAOs) have been proposed to mitigate the potential present and/or future risks associated with exposure to contamination at the Site. RAOs for the Site were developed based on the following primary assumptions:

1. RAOs and proposed remedial alternatives are focused on asbestos-contaminated material (waste, soil, Reservoir sediment). Stream surface water and sediment, Reservoir surface water, seep water, and groundwater are not directly addressed either because the medium is no longer a concern (because of removal activities), on-Site COPC concentrations in the medium are similar to upgradient/upstream concentrations, a plume is not present, or the medium can be sufficiently addressed through remedial action of the source material coupled with monitoring and **institutional controls (ICs)**.

2. RAOs and proposed remedial alternatives are focused on addressing Site-related COCs and risk drivers. Based on analytical results, it appears that some contaminants present at the Site may emanate wholly or partly from unidentified off-Site sources. When present, these chemicals will be addressed to the extent practicable incidentally to Site-related contaminants, but the proposed remedial alternatives will focus on controlling/eliminating on-Site sources and achieving RAOs for Site-related COCs.

For each medium, RAOs address both human health and environmental protection. It should be noted that while the removal action is currently undertaking extensive capping work at the Site, the RAOs listed below are based on pre-removal conditions at the Site.

RAOs for Waste/Soil

Protection of Human Health

- Minimize the inhalation of asbestos associated with waste/soil disturbances, such that related cancer risks from airborne asbestos fibers are within or below EPA's acceptable risk range of 1E-04 to1E-06.

Environmental Protection

- Prevent direct contact (i.e., inhalation, incidental ingestion, and dermal absorption) by ecological receptors to contaminated waste and soil containing ecological COC [asbestos, bis(2-ethyhexyl)phthalate, dioxins and furans, chromium, nickel, or zinc] concentrations exceeding the respective PRGs.

The selection of the 1E-04 to 1E-06 (1 in 10,000 to 1 in 1,000,000) risk range is consistent with EPA guidance contained in OSWER Directive 9355.0-30, "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" which indicates that, where the cumulative cancer risk to an individual based on reasonable maximum exposure for both current and future land use is less than 1E-04, remedial action is generally not warranted unless there are adverse environmental impacts. In general, EPA considers excess cancer risks that are below 1E-06 to be so small as to be negligible, and risks above 1E-04 to be sufficiently large that some sort of remediation is desirable. The PRGs established for the Site are risk-based values that fall within EPA's acceptable risk range. PRGs proposed to remediate the contaminated soil to protect human health and the environment are listed in **Table 4**. The PRGs include a Site-specific value for asbestos in air calculated by the EPA Region 3 Toxicologist. For asbestos, successful remediation of source waste material and soil will be assessed by achievement of the Site-specific air PRG.

RAOs for Reservoir Sediment

Protection of Human Health

- None.

Environmental Protection

- Prevent direct exposure of ecological receptors to contaminated sediment containing concentrations of carbon disulfide exceeding the ecological screening level of 4.1 micrograms per kilogram (μg/kg).
- Minimize migration of asbestos from sediment to surface water to prevent surface water concentrations of asbestos exceeding the surface water screening level of 0.0001 MFL.

SUMMARY OF REMEDIAL ALTERNATIVES

This section of the Proposed Plan presents the cleanup alternatives that were considered to address known sources of contamination at the Site. The Superfund law and regulations, specifically CERCLA Section 121(b), identify several criteria that must be considered when developing and evaluating remedial alternatives. The alternative must protect human health and the environment and meet the requirements of environmental regulations, known as Applicable and/or Relevant and Appropriate Requirements (ARARs). Remedial actions that involve treatment that permanently and significantly reduces toxicity, mobility, and volume (T/M/V) of the hazardous substances are preferred over remedial actions not involving such treatment. Emphasis is also placed on treating the wastes at a site, whenever this is possible, and on assessing innovative technologies to clean up site contaminants. The Preferred Alternative does not use treatment of principal threat wastes as a principal element of the remedy primarily because of the volume of asbestos waste/soil and complexity of the site, which make treatment impracticable.

A number of remedial technologies and process options were identified and evaluated during the FS to develop remedial alternatives for cleanup. The potentially applicable remedial technologies and process options were combined into seven remedial alternatives which were screened during the FS. The seven screened remedial alternatives include the following:

Alternative WSS1	No Action
Alternative WSS2	Capping
Alternative WSS3	Excavation and Off-Site Disposal
Alternative WSS4	In Situ Joule Heating
Alternative WSS5	Excavation, On-Site Ex Situ Plasma Arc Furnace, and On-Site Disposal
Alternative WSS6	Excavation, On-Site Ex Situ Thermo-Chemical Conversion Treatment (TCCT), and On-Site Disposal
Alternative WSS7	Excavation, Off-Site Ex Situ TCCT, and Off-Site Disposal

The remedial action alternatives were screened with respect to the criteria for effectiveness, implementability, and cost as set forth in CERCLA, as amended, Section 121, and in the NCP (40 C.F.R. 300.430(e)(7)) and OSWER Directive 9355.3-01, "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA." Descriptions of the three criteria are presented in the FS. Alternatives deemed to have implementability challenges and substantially high costs were not retained for further evaluation. Alternative WSS5 was eliminated because it would require significant time to complete, due to very limited availability of the treatment unit, lack of commercial use, and limited treatment capacity. Alternative WSS7 was eliminated due to substantially high costs as a result of the significant travel distance from the Site to the only available off-Site TCCT treatment facility. Long travel distances resulted in substantially higher costs compared to all the other alternatives. Additional information on screening determination can be found in the FS.

The five remedial alternatives retained for detailed analysis include the following:

Alternative WSS1	No Action
Alternative WSS2	Capping
Alternative WSS3	Excavation and Off-Site Disposal
Alternative WSS4	In Situ Joule Heating
Alternative WSS5[5]	Excavation, On-Site Ex Situ TCCT, and On-Site Disposal

Alternative WSS2 Capping is being recommended by EPA as the Preferred Alternative.

Cost components, common elements and detailed descriptions of the five retained remedial alternatives follow. It is important to note that the remedial alternatives and their components as described below (e.g., grading, materials, depth of cover soils, etc.) are conceptual in nature, with the exception of WSS2. **Table 5** is used to provide estimated quantities of waste, soil, and Reservoir sediment for each of the five remedial alternatives discussed below.

Cost Components

Remedial action projects typically involve construction costs that are expended at the beginning of a project (e.g., **capital costs**) and costs in subsequent years that are required to implement and maintain the remedy after the initial construction period (e.g., annual **O&M costs**, **periodic costs**). Costs presented for each alternative reflect cost estimates developed for the detailed analysis of alternatives presented in the FS. The summarized cost information presented with each remedial alternative description below lists capital, and any applicable O&M and periodic subtotals along with the total estimated cost for the alternative. The detailed cost estimates are developed to compare one remedial alternative to another and support remedy selection. Costs developed for the detailed analysis of alternatives are expected to achieve an accuracy range of -30 percent to +50 percent which means that, for an estimate of $100,000, the actual cost of an alternative is expected to be between $70,000 and $150,000. It should be noted that O&M, periodic and total alternative costs are listed as **present value costs**. Present value analysis is a method to evaluate expenditures, either capital or O&M, which occur over different time periods. This standard methodology allows for cost comparisons of different remedial alternatives on the basis of a single cost figure for each alternative. This single number, referred to as the present value, is the amount needed to be set aside at the initial point in time (base year 2016) to assure that funds will be available in the future as they are needed.

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[5] Alternative WSS5 was formerly WSS6 (in Section 3 of the FS) but was renumbered after alternative screening.

The present value analysis can include the application of a discount rate. A discount rate, which is similar to an interest rate, is used to account for the time value of money. A dollar is worth more today than in the future because, if invested in an alternative use today, the dollar could earn a return (i.e., interest). Discounting reflects the productivity of capital; the higher the discount rate, the lower the present value of the cost estimate. For the BoRit Site, all capital costs are present value with no present value discounting. Present value for future O&M and periodic costs were calculated using a 7% discount rate as recommended in EPA guidance for developing FS cost estimates.

Common Elements

Five-Year Reviews (FYRs) are included as common elements across all the alternatives. FYRs would be conducted to evaluate the implementation and performance of the remedy in order to determine if the remedy is protective of human health and the environment. The specific requirements for FYRs for each alternative are included in the following descriptions of alternatives. The number of FYRs estimated for each alternative is based on anticipated confirmation sampling and ongoing O&M requirements for the alternative.

With the exception of Alternative WSS1 No Action, confirmation sampling is included across all the alternatives. Confirmation sampling would be used to assess the effectiveness of the completed remedial action in achieving RAOs for the Site-related COCs. Confirmation sampling activities may include conducting ABS, surface soil sampling, ambient air monitoring, sediment sampling, and surface water sampling, when applicable.

Alternative WSS1: No Action

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Value Cost: $165,000 (30 year duration: includes 6 FYRs)
Estimated Construction Timeframe: None

Evaluation of the No Action Alternative is required by law to provide a baseline against which impacts of the various cleanup alternatives can be compared. Its inclusion is meant to help assure that the consequences of no action are fully evaluated so that unnecessary remedial action is not taken where no action is appropriate. Under Alternative WSS1, no action would be implemented. To allow for comparison with the other alternatives, the baseline conditions assumed for the No Action Alternative are the conditions that were present at the Site prior to initiation of removal action work on the Site (i.e., RI Site conditions). The only actions that would be implemented for Alternative WSS1 include completion of FYRs, as required by the NCP, and monitoring (specifically non-intrusive visual inspections) required to support conclusions made in the FYRs. Non-intrusive visual inspections (i.e., surface inspections) performed in support of FYRs would be made on all parcels at the Site.

The estimated present value cost for Alternative WSS1 is estimated at $165,000. This estimate is for FYRs that would be required as contamination remains on the Site at levels that do not allow for an unrestricted use, unlimited exposure scenario.

Alternative WSS2: Capping

Estimated ***Capital Cost****: $26.2 million (M)*
Estimated Annual Present Value ***O&M*** *Cost: $742,000 (30 year duration: includes long-term monitoring (LTM), annual cap maintenance)*
Estimated Present Value ***Periodic*** *Costs: $165,000 (30 year duration: includes 6 FYRs)*

*Estimated Present Value Cost: $27.1M**
Estimated Construction Timeframe: 8 years (from the start of removal action work initiated in 2008)

> **The estimated total for WSS2 ($27.1M) includes the following components: $25.2M incurred capital costs for capping work completed by the removal action through October 2016 and $0.3M capital cost to be incurred for removal action work between October 2016 and completion. Therefore, upon issuance of the ROD, approximately $1.6M of confirmation sampling, institutional controls and engineering controls, O&M, and long term monitoring remains to be incurred to complete WSS2 if selected as the remedial action for the Site.*

Alternative WSS2 would encompass and essentially complete the removal action work initiated at the Site. Alternative WSS2 would include capping of waste, contaminated soil, and Reservoir sediment with clean material along with implementation of associated health and safety (H&S) controls, erosion and sediment (E&S) controls, grubbing and clearing, and re-grading to meet design grade to facilitate capping. Because Alternative WSS2 would be a continuation/completion of currently ongoing removal action work, the majority of the construction of Alternative WSS2 has been completed. Current conditions or components that have been completed, are underway, or are to be completed by the removal action are noted below.

Alternative WSS2 includes the following major components:

- Bank stabilization at Rose Valley Creek, Tannery Run, and Wissahickon Creek (complete)
- Installation of cover at Park (underway and to be completed)
- Installation of cover at Asbestos Pile (complete)
- Dewatering of Reservoir with treatment of surface water prior to discharge (complete)
- Re-grading and lining of Reservoir berm interior slopes (complete)
- Installation of a cover on the Reservoir bottom (complete)
- Refilling of the Reservoir (complete)
- Implementation of ICs/ECs (not complete)
- Confirmation Sampling (not complete)
- LTM for Site-related COCs (not complete)
- O&M (inspection and maintenance of covers, liners, and stabilized areas) (not complete)
- FYRs (not complete)

Stream Bank Stabilization

Stream Bank stabilization was completed as follows:

- Phase 1 - (December 2008 - June 2009): Addressed approximately 1,350 linear feet of Wissahickon Creek from the north end of the Park to the confluence of Rose Valley Creek and Wissahickon Creek. After 475 tons of ACM waste were removed and properly disposed in an off-Site landfill, the east bank of Wissahickon Creek was cleared and stabilized from the water's edge to the 100-year flood plain elevation using 10 to 15 inches clean fill, geotextile fabric, geo-cells, and rip-rap followed by hydroseeding.

- Phase 2 - (July 2009 - May 2010): Addressed banks of Rose Valley Creek as well as the adjacent Reservoir berm exterior and floodplain. A 104-foot stone wall was constructed on the left side of the headwall and a 6-foot reinforced concrete retaining wall was constructed on the right side of the headwall. The Park-side slope was cleared of large ACM material and covered with 10 to 12 inches of clean fill followed by a two to three inch layer of top soil and then hydroseeded. The slope was further covered with an erosion control mat. The Reservoir-side slope was cleared of ACM material, covered with 10 to 12 inches of clean fill and a layer of topsoil, and hydroseeded for erosion control. Rose Valley Creek from Chestnut Avenue to the confluence of Wissahickon Creek was cleared of ACM and re-graded at a constant slope. CCMs were installed and infilled with concrete at the four stream bend locations. Approximately 1,073 tons of ACM material were collected and properly disposed in an off-Site landfill during Phase 2.
- Phase 3 - (March 2010 - June 2010): Addressed a 600-foot section along the Reservoir berm parallel to Wissahickon Creek. Material excavated during Phase 2 activities was placed on the berm slope and covered with 12 to 15 inches of clean fill and 6 inches of topsoil. No ACM material was collected or disposed during this phase.
- Phase 4 - (2010 - 2011): Addressed a 720-foot section of Tannery Run. Approximately 290 linear feet of stream bed downstream of Maple Street were re-graded at a constant slope and stabilized with CCM along the stream bed and banks. The remaining section of Tannery Run, approximately 380 linear feet, was enclosed in an 8-foot diameter pipe that terminates at the confluence of Wissahickon Creek. During the preparation stages of the slope, bulk (big pieces) of ACM debris and stumps were removed and collected into roll-off containers and sent to an off-Site landfill for proper disposal.
- Phase 5 - (June 2011 - September 2011): Addressed 297 linear feet of Wissahickon Creek between the old dam and the Tannery Run confluence. The first 65 linear feet of slope along the banks was re-graded with stone, and then topsoil was added, hydroseeded, and covered with an erosion control mat. The remaining slope area was covered with geotextile fabric and overlaid with geocells, which were in-filled with stone and/or soil, and 4 inches of top soil were placed on top, hydroseeded, and covered with straw mats for erosion control. Numerous pieces of ACM (e.g., pipes, shingles, and tiles) were found along the Phase 5 area. During the preparation stages of the slope, bulk (big pieces) of the ACM debris and stumps were removed and collected into roll-off containers and sent to an off-Site landfill for proper disposal.

Park Parcel Cover

The planned cover at the Park parcel, to be completed by the ongoing removal action, will be similar to the work completed at the Asbestos Pile (see below). The following elements have been completed or are in progress:

- Clearing Activities - Demolition of storage structure north of the Oak Street entrance, clearing and grubbing the far northern portion of the Park area along Wissahickon Creek, and removal of asphalt from the tennis courts.
- Excavation Activities - Excavation undertaken to prepare for curb installation. Excavated areas were lined with geotextile fabric and pinned in place. ACM waste was relocated within the Park parcel.
- Cover Installation - Backfill was installed in the slope and curb areas. Geotextile fabric and clean fill were placed in areas at the north end of the Site. Cover elements follow the same

design as the Asbestos Pile, i.e., with geotextile fabric, a minimum of 2 feet of clean material, and approximately 6 inches of topsoil to support a vegetative cover.

- In December 2013, removal action stabilization work at the Park parcel was temporarily postponed as efforts focused on addressing the Reservoir parcel. Work on the Park parcel was resumed in October 2015.

Asbestos Pile Cover

The design for the Asbestos Pile involved cutting the slopes back to a stable 3 horizontal: 1 vertical gradient, placing a geotextile fabric, covering the area with a minimum of 2 feet of clean material, and approximately 6 inches of top soil to support a vegetative cover. Major components of Asbestos Pile work completed during the removal action included the following:

- Clearing Activities - The area was cleared of trees and ACM material, and access roads were constructed.
- Excavation activities - ACM waste was re-located to different areas on the Asbestos Pile to create the desired subgrade prior to the placement of geotextile, clean fill, and topsoil. All areas with exposed ACM were covered at the end of each day with clean material, straw mats, or geotextile fabric (if the desired subgrade had been achieved).
- Cover Installation - Waste cells were graded, covered with geotextile fabric, and then covered with lifts of compacted clean fill to a depth of 2 feet to match the grade of the rest of the Asbestos Pile. The cover installation was completed with an application of the topsoil layer across the Asbestos Pile which was then hydroseeded and covered with straw mats for erosion control.

Reservoir Parcel

Work at the Reservoir parcel conducted during the removal action addressed the Reservoir interior berms, bottom, and surface water and included the following major components:

- Clearing and Initial Earthwork Activities - Activities included tree removal, placement of clean fill to widen the West Maple Street side of the Reservoir to stabilize and widen the area for brush clearing operations. A platform was constructed (using clean fill) for placement of a pump and treat system needed to dewater the Reservoir.
- Dewatering - In order to allow sufficient access to the Reservoir bottom and interior of the berms, it was necessary to completely dewater the Reservoir. Approximately 31 MG of water were pumped out of the Reservoir, treated, and discharged to Wissahickon Creek, with dewatering operations completed at the beginning of August 2014. Thereafter, until the Reservoir was refilled, water was pumped intermittently to remove collected storm-water runoff. Throughout EPA's removal action, more than 37 MG of water was treated.
- Cover Installation - The Reservoir berms were covered with a geotextile fabric, a minimum of 2 feet of clean material, and a layer of topsoil to support a vegetative cover (on the berms). Certain areas of the Reservoir berm include up to 10 feet of clean material. Cover installation on the Reservoir bottom was completed in October 2015 and included a geotextile fabric and a minimum of 2 feet of clean material.
- Refilling of Reservoir - After construction activities were completed at the Reservoir in October 2015, the Reservoir was filled by pumping water from Wissahickon Creek back into the reservoir.

Alternative WSS2 includes the implementation of ICs to restrict future use of the Site parcels and protect the engineered remedy. Specifically, the ICs will prohibit activities at the Site that would adversely impact the remedy and compromise the protection of human health and the environment.

Specific ICs to be implemented as part of Alternative WSS2 are listed below and shown in **Figure 11**.

Site-Wide:

- Activities or modifications that could disturb or otherwise adversely impact the 2-foot soil cover on the Capped Areas are prohibited. Any proposed future use of the Site will be reviewed by EPA, in consultation with PADEP, to ensure that such activity will not adversely impact the remedy or compromise the protection of human health and the environment.
- Construction activities are prohibited unless prior written approval from EPA, in consultation with PADEP, is obtained authorizing the specific activity. Prohibited construction activities may include, but are not limited to, piling installation, dredging, drilling, digging, excavation, or use of heavy equipment in the Capped Areas.
- Any modifications to the drainage pattern on-Site is prohibited unless EPA, in consultation with PADEP, determines that such activity will not adversely impact the remedy.
- Public access should be restricted after major storm events until the property has been inspected for any signs of damage or erosion especially in the 100-year flood plain.
- The Preferred Alternative is protective for maintenance workers, recreational visitors, and commercial workers. Any other use of the parcels would require further investigations and plans, approved by EPA, in consultation with PADEP, to identify parcels that can be used for additional activities that are consistent with local zoning regulations.

Parcel Specific:

- Asbestos Pile Parcel:
  - Construction of structures or habitat enhancement features that could undermine the slope stability of the Asbestos Pile parcel are prohibited unless prior written approval from EPA, in consultation with PADEP, is obtained authorizing the specific activity.
  - Trees are prohibited on the Asbestos Pile parcel slopes.
- Reservoir Parcel:
  - Maintain suitable vegetation on the capped areas (berms and Reservoir floor) to ensure protection from erosion.
  - Trees are prohibited along the berm of the Reservoir adjacent to the Wissahickon Creek.
- Stream Banks:
  - Maintain vegetation at stabilized stream banks.
  - Trees are prohibited along the steep slope along the Wissahickon Creek where geocells were utilized to stabilize the slope and on the steep slopes adjacent to Rose Valley Creek and Tannery Run where CCMs is present to stabilize the slope.

The remaining components of Alternative WSS2 include implementation of Environmental Covenants to control future use of the property and protect the engineered remedy, community information and education programs, confirmation sampling at the completion of the construction phase, and implementation of O&M activities including LTM and FYRs. Unless completed as part of EPA's removal action, the remaining components would be completed under the Preferred Alternative.

The components of confirmation sampling would include:

- ABS in previous locations of high level asbestos detections in the Park and Asbestos Pile parcels, and off-Site residential areas;
- Ambient air sampling; and
- Surface water sampling.

During the O&M phase of Alternative WSS2, visual inspections would be conducted, at a minimum, on a quarterly basis and maintenance of vegetative cap cover, liners, and stabilized areas would be carried out on an annual basis and as needed in response to significant weather events (e.g., hurricanes). LTM would also be included as part of O&M activities and may include ABS, ambient air, soil, sediment, and surface water sampling to confirm PRGs are not exceeded and to demonstrate that the cover continues to perform as designed. The specific LTM program would be designed based on confirmation sampling and will be modified based on results indicating the remedy is protective of human health and the environment. LTM sampling would be conducted annually for the first four years leading to the first FYR. Following each FYR, plans for LTM would be re-assessed. The Site would be reviewed at least every five years while on-Site contamination remains at concentrations that do not result in an unrestricted use/unrestricted exposure scenario.

Alternative WSS3: Excavation and Off-Site Disposal
Estimated Capital Cost: $268.7M
Estimated Annual O&M Cost: None
Estimated Periodic Costs: $58,000 (includes periodic costs for 1 FYR)
Estimated Present Value Cost: $269M
Estimated Construction Timeframe: 13 years (from initial removal and stockpiling activities through confirmation sampling)

Alternative WSS3 includes the following major components:

- Removal and Stockpiling of soil covers and other contaminated materials installed as part of EPA's removal action for reuse
- Dewatering of the Reservoir
- Excavation of contaminated material for off-Site disposal from
    - Stream Banks
    - Asbestos Pile
    - Park
    - Reservoir
- Backfilling of excavated areas with imported fill and stockpiled material and Site restoration
- Refilling of the Reservoir

- Monitoring
- Confirmation sampling
- FYR (1)

Alternative WSS3 would include excavation of waste, contaminated soil, and Reservoir sediment from the Site with off-Site disposal. Excavation would be performed primarily via mechanical methods, which include dredging of Reservoir sediment; however, hydraulic and/or pneumatic removal may also be used. Stabilization of excavated sediment may be required to improve handling characteristics of sediment for transportation off of the Site. Off-Site treatment of non-asbestos contaminants prior to disposal may be necessary to meet handling requirements for hazardous waste or meet specified levels for hazardous constituents before disposing of the waste on the land. However, it is anticipated that waste would be characterized and disposed as non-hazardous waste, and treatment would not be necessary. Additional testing would be required to verify the classification of waste prior to disposal. ACM waste and contaminated soil and Reservoir sediment must be disposed in a facility permitted to handle asbestos waste. Physical separation of large ACM debris from soil or sediment may be required in some areas. Transport of asbestos would need to follow storage and containment requirements which may include double bagging ACM or containing ACM in leak proof containers while wet. Alternative WSS3 would require H&S controls, E&S controls, grubbing and clearing, and the staged removal and stockpiling of the clean fill/cap material for reuse.

Prior to excavating waste, clean fill from EPA's Removal stabilization work at all four remediation zones would be removed and stockpiled on the Site for reuse.

Waste excavation would be completed in stages including one foot of native soil below the greatest depth of identified historical fill or waste. At the Stream Banks, temporary dewatering during excavation and/or pumping to divert stream water in work areas may be required. Once excavation is complete, the excavated area would be backfilled to design grade and stabilized following the design implemented for stream bank stabilization work.

At the Park parcel, the Asbestos Pile parcel, and the Reservoir Berm, excavation of historical fill and waste would be completed to one foot of native soil below the greatest depth of identified historical fill or waste, or to bedrock, to ensure contaminants have been removed. The excavated areas would be backfilled with clean fill to design grade, followed by six inches of topsoil and hydroseeding.

At the Asbestos Pile parcel and the Reservoir berm, this remedy would require temporary dewatering during excavation below the water table with on-Site water treatment (e.g., filtration and carbon) and discharge of treated water to the Wissahickon Creek.

In the Reservoir Bottom, sediment would be excavated in stages down to bedrock, using hydraulic or pneumatic methods to remove the soft sediment, which is assumed to average a depth of four feet. The excavated area would be backfilled with substrate to design grade. The Reservoir would be re-filled with water from Wissahickon Creek, re-vegetated, and re-populated with native species.

For the four remediation zones, significant amounts of imported fill would be required in addition to the stockpiled cover and clean fill material on the Site. Monitoring would be implemented throughout the construction duration on a semiannual basis and would include ambient air sampling and surface water sampling.

A significantly large volume of material would need to be transported from the Site for off-Site disposal and a large volume of clean backfill material would need to be delivered to the Site. Assuming a truck capacity of 18 tons, approximately 48,900 truckloads[6] over a period of 13 years is estimated to haul the total volume of excavated material away from the Site for off-site disposal and approximately 41,100 truckloads of clean fill material and topsoil would need to be transported to the Site for backfilling.

At the completion of the excavation and disposal phase of this alternative, one round of confirmation sampling would be conducted in previous locations of high asbestos levels to demonstrate that waste, soil, and Reservoir sediment have been removed from the Site and Site-related COCs have been addressed. Components of confirmation sampling would be the same as those listed under Alternative WSS2.

Because all contaminated soil, waste, and Reservoir sediment would be removed from the Site, only one FYR is assumed to evaluate performance of the remedy in order to demonstrate continued protectiveness.

Alternative WSS4: In Situ Joule Heating

Estimated Capital Cost: $256.6M
Estimated Annual O&M Cost (includes periodic costs for 1 FYR): $58,000
Estimated Present Value Cost: $257M
Estimated Construction Timeframe: 15 to 20 years (from Site preparation and treatment through confirmation sampling)

Alternative WSS4 includes the following major components:

- Covers and linings previously installed as part of EPA's removal action would remain in place
- Dewatering of the Reservoir
- **In situ** joule heating of contaminated material at the
    - Stream Banks
    - Asbestos Pile
    - Park
    - Reservoir
- Placement of imported fill where necessary to meet future land use(s), grading and hydroseeding
- Refilling of Reservoir
- Confirmation sampling
- FYR (1)

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[6] The conversion factors for loose dirt and rammed earth range from 1.01 to 1.35 tons per cubic yard. With the assumption that material on-Site would be similar to sand and to account for moisture in some locations, a conservative conversion factor of 1.5 tons per cubic yard was used to estimate the number of truckloads.

Alternative WSS4 would include in situ thermal treatment of waste, contaminated soil, and Reservoir sediment with electrodes that cause in-place contaminated materials to melt. The melted matrix is then allowed to cool in place into a solid inert, **vitrified** mass. Electrical power consumption is a major cost driver for Alternative WSS4. Costs for energy use and construction of a sub-station have been estimated and incorporated into the treatment unit costs for Alternative WSS4. Site conditions, specifically moisture content and the presence of groundwater, will significantly influence power efficiency and costs.

Some on-Site consolidation of materials within parcels may be required to meet **geotechnical** and/or grading requirements. Physical separation of large ACM debris from soil or sediment may be required in some areas. This remedy would require a treatability study and a pre-design investigation to support detailed design specifications, including performance in heterogeneous materials and the need for off-gas collection and treatment. Additional remedy components required would include H&S controls, E&S controls, and grubbing and clearing. It is assumed that the soil cap placed by the removal action would be left in place for the remedy. Portions of the Site may need to be covered with **geosynthetic** material in addition to soil, to support the future land use for each parcel.

At the Stream Banks, Park, and Reservoir Berm, boreholes would be advanced to one foot below the greatest depth of waste or historical fill and electrodes would be installed. At the Asbestos Pile and in the Reservoir, boreholes would be advanced to bedrock and electrodes would be installed. For the Reservoir berm and in the Reservoir, this remedy would require temporary draining of surface water with on-Site water treatment (e.g., filtration and activated carbon) and discharge of treated water to Wissahickon Creek.

Based on the size of the Site, it is assumed that at least three in situ joule heating machines would operate simultaneously and equipment would be utilized 24 hours per day. Subsequent melts would occur until the entire Site was treated. The boreholes would subsequently be abandoned, followed by re-grading and hydroseeding at the Stream Banks, Park, Asbestos Pile, and Reservoir Berm. The Reservoir would be re-filled with water, re-vegetated, and re-populated with native species. Off-gases (e.g., VOCs, SVOCs, and metals) produced during the melt would be collected in steel containment hoods (two per machine) and directed to an off-gas treatment system consisting of particulate filtration, quenching, wet scrubbing, two stages of high efficiency particulate filtration, and carbon adsorption or thermal oxidation. Depending on the results of the treatability/pilot study, additional treatment steps may be required.

A volume reduction of 30 percent is assumed for all contaminated waste, soil, and Reservoir sediment that would be treated. If the remaining treated material does not allow all parcels to meet grade requirements, additional fill would need to be obtained. The duration of the active implementation phase of Alternative WSS4 is projected to be approximately 15 to 20 years.

At the completion of the treatment phase of the alternative, one round of confirmation sampling would be conducted in previous locations of high asbestos levels to demonstrate that waste, soil, and Reservoir sediment were treated as designed and Site-related COCs have been addressed. Components of confirmation sampling would be the same as those listed under Alternative WSS2 and would include confirmation that the treatment has rendered the waste inert.

Because all contaminated soil, waste, and Reservoir sediment would be treated in situ on the Site and the contaminated material would be rendered inert, only one FYR is assumed to evaluate performance of the remedy in order to demonstrate continued protectiveness.

Alternative WSS5: Excavation, On-Site Ex Situ TCCT, and On-Site Disposal
Estimated Capital Cost: $266.4M
Estimated Annual O&M Cost (includes periodic costs for 1 FYR): $58,000
Estimated Present Value Cost: $267M
Estimated Construction Timeframe: 12 years (from removal and stockpiling of material through confirmation sampling)

Alternative WSS5 includes the following major components:

- Removal and stockpiling of soil covers previously installed as part of EPA's removal action for reuse
- Dewatering of the Reservoir
- Excavation of contaminated material from
  - Stream Banks
  - Asbestos Pile
  - Park
  - Reservoir
- Treatment of excavated material in an on-Site ex situ TCCT unit
- Backfilling of excavated areas with treated and stockpiled material and Site restoration
- Refilling of the Reservoir
- Monitoring
- Confirmation sampling
- FYR (1)

Alternative WSS5 would include excavation of contaminated waste, soil, and Reservoir sediment and on-Site, ex situ TCCT. Excavation would be performed primarily via mechanical methods which would include dredging of Reservoir sediment. However, hydraulic and/or pneumatic removal may also be required. Some on-Site consolidation of materials within parcels may be required to meet geotechnical and/or grading requirements. Contaminated waste, soil, and Reservoir sediment would pass through a shredding system to reduce particle size. Subsequent to shredding, the technology vendor's (ARI Global Technologies'(ARI)) fluxing solution would be added to the shredded waste and mixed. Mixed waste would then be transferred to a feed hopper that would push waste into a rotary hearth to be processed. Processing temperatures in the furnace are maintained around 1200 degrees Celsius (°C). While in the hearth, the fluxing solution would facilitate fast reactions in which the fibrous morphology of asbestos fibers would be destroyed. Processed product would then be transferred to a water bath for cooling. The treated product would resemble a volcanic type mineral such as olivine or wollastonite, depending on the chemistry of the feed waste. Solidified material would be collected and disposed on the Site. Off-gas treatment and wastewater processing would be required to support TCCT operation and to protect human health and the environment. Portions of the Site may be covered with geosynthetic material and soil to support the future land use for each parcel.

Mobile TCCT treatment units are currently very limited. Alternative WSS5 would require mobilization and assembly of a full-scale TCCT treatment system and the installation of significant necessary utility infrastructure. It should be noted, however, that ARI Global Technologies was recently acquired by the British firm Windsor Integrated Services Group which may impact availability of the vendor's TCCT mobile treatment units.

Alternative WSS5 would require a treatability study to support detailed design specifications including the ability to treat contaminated materials containing various non-asbestos organic and inorganic contaminants. Additional remedy components required would include H&S controls, E&S controls, grubbing and clearing, and the staged removal and stockpiling of the clean fill/cap for reuse. Prior to excavating waste, clean fill from EPA Removal stabilization work at the Stream Banks, Asbestos Pile parcel, Park parcel, and the Reservoir berm would be removed and stockpiled on the Site for reuse.

Waste excavation would be completed in stages including one foot of native soil below the greatest depth of identified historical fill or waste. At the Stream Banks, temporary dewatering during excavation and/or pumping to divert stream water in work areas may be required. Excavated materials would be treated on the Site in stages in the TCCT equipment, and the treated product would be placed back into the excavation, followed by clean fill to design grade, six inches of topsoil, and hydroseeding.

At the Park parcel, the Asbestos Pile parcel, and the Reservoir Berm, excavation of historical fill and waste to one foot of native soil below the greatest depth of identified historical fill or waste, or to bedrock would be completed to ensure contaminants have been removed. Excavated materials would be treated on the Site in stages in the TCCT equipment, and the treated product would be placed back into the excavation and followed by clean fill to design grade, six inches of topsoil, and hydroseeding.

At the Asbestos Pile parcel, and the Reservoir berm, this remedy would require temporary dewatering during excavation of the waste located below the water table with on-Site water treatment (e.g., filtration and carbon) and discharge of treated water to the Wissahickon Creek.

In the Reservoir, sediment would be excavated in stages down to bedrock, using hydraulic or pneumatic methods to remove the soft sediment, which is assumed to average a depth of four feet. This remedy would require temporary draining of surface water with on-Site water treatment (e.g., filtration and carbon) and discharge of treated water to the Wissahickon Creek. Excavated materials would be dewatered and treated on the Site in stages in the TCCT equipment. The treated product would be placed back into the excavation, followed by clean natural substrate to design grade. The Reservoir would be re-filled with water, re-vegetated, and re-populated with native species.

A volume reduction of 70 percent is assumed (range of 50 percent to 90 percent [ARI 2011]) for all contaminated waste, soil, and Reservoir sediment that would be treated. If the remaining treated material does not allow all parcels to meet grade requirements, significant amounts of additional off-Site fill would need to be obtained. The duration of the active implementation phase of Alternative WSS5 is estimated to be approximately 12 years.

At the completion of the treatment phase of the alternative, one round of confirmation sampling would be conducted in previous locations of high asbestos levels to demonstrate that waste, soil, and Reservoir sediment have been treated as designed and Site-related COCs have been addressed.

Components of confirmation sampling would be the same as those listed under WSS2 and would be used to confirm that the treatment rendered the waste inert.

Because all contaminated soil, waste, and Reservoir sediment would be treated on the Site and would leave the contaminated material inert, only one FYR is assumed to evaluate performance of the remedy in order to demonstrate continued protectiveness.

The estimated present value cost for Alternative WSS5 is estimated at approximately $267M. Fuel and equipment costs are the major drivers of capital costs. Estimated costs associated with hooking up to a gas supply source have been included in the Site preparation and mobilization cost estimate for Alternative WSS5 based on the technology vendor's estimate.

EVALUATION OF ALTERNATIVES

In this section, the remedial alternatives, summarized above are compared to each other using seven of the nine evaluation criteria set forth in 40 C.F.R. § 300.430(e)(9)(iii) and summarized below.

Evaluation Criteria for Superfund Remedial Alternatives
***Threshold Criteria:** Must be satisfied in order for a remedy to be eligible for selection.*
1 - Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, ECs, or ICs.
2 - Compliance with ARARs addresses whether a remedy will meet all applicable or relevant and appropriate requirements (ARARs) of Federal and State environmental statutes, regulations, and other requirements that are pertinent to a Site and/or justifies a waiver.
***Primary Balancing Criteria:** Weigh major trade-offs among the remedial alternatives.*
3 - Long-term effectiveness and permanence addresses expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.
4 - Reduction of toxicity, mobility, or volume through treatment addresses the anticipated performance of the treatment technologies a remedy may employ.
5 - Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.
6 - Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
7 - Cost includes estimated capital and **O&M** costs, compared as present worth costs.
***Modifying Criteria:** Are considered by EPA after public comment is received on the Proposed Plan.*
8 - State/Support Agency Acceptance indicates whether the support agency concurs with or has comments on the Preferred Alternative.
9 - Community Acceptance summarizes the public's general response to the alternatives described in the Proposed Plan and **Remedial Investigation/Feasibility Study** Report. The specific responses to public comments are addressed in the Responsiveness Summary section of the Record of Decision.

These criteria address statutory requirements and considerations for cleanup actions in accordance with the NCP and additional technical and policy considerations that have proven to be important for selecting among cleanup alternatives. The nine evaluation criteria fall into three groups: Threshold, Primary Balancing, and Modifying. Each alternative (except no-action) must meet the threshold criteria. The primary balancing criteria are used to weigh major trade-offs among alternatives, and the modifying criteria, State and Community Acceptance, can only be fully considered after State and public comment is received on the Proposed Plan. **Table 6** presents the comparative analysis of alternatives against the Threshold and Primary Balancing criteria. A detailed analysis of the alternatives can be found in the FS.

Overall Protection of Human Health and the Environment *(Threshold Criteria*) – All the alternatives, except for Alternative WSS1 (No Action), would provide overall protection of human health and the environment. A no action alternative (Alternative WSS1) must be evaluated in accordance with CERCLA and the NCP to serve as a basis for comparison with the other alternatives. Alternative WSS1 is not protective of human health and the environment. Alternative WSS1 would allow continued release of asbestos fibers to un-impacted media (primarily air and surface water). If disturbed, contaminated waste and soil could release asbestos fibers to air and represent a potential inhalation exposure to human receptors. Disturbances from rain events and flooding would allow asbestos fibers to migrate via surface water runoff and potentially impact both human and ecological receptors. Contaminated soil transported by surface water would be able to travel and be deposited off-Site. Reservoir sediment can continue to contaminate surface water when disturbed, exposing fish and other aquatic animals. The No Action alternative fails to meet the threshold criterion of protectiveness and will not be considered further.

Alternative WSS2 (Capping) would be protective of human health and the environment as the proposed actions would prevent further migration of asbestos to un-impacted media (primarily air and surface water) by physically containing contaminated waste, soil, and Reservoir sediment on the Site. Specifically, capping completed at the Park parcel and the Asbestos Pile parcel would eliminate continued release and migration of asbestos fibers to non-impacted media (primarily soil and air) and would eliminate inhalation exposures from asbestos to human receptors. Stream bank stabilization work for Rose Valley Creek, Wissahickon Creek, and Tannery Run would prevent erosion of any underlying contaminated waste and soil and would eliminate contaminant migration and deposition away from the Site. Dewatering of the Reservoir and treatment of surface water would eliminate the risk posed by asbestos to human and ecological aquatic receptors. Installation of a cover on the Reservoir bottom and berms would prevent the migration of asbestos from Reservoir sediment to Reservoir surface water once the Reservoir is refilled. Long-term protectiveness to human health and the environment would be dependent on ICs/ECs, O&M (inspection and maintenance of covers, liners and stabilized areas), and LTM.

Similar to Alternative WSS2, Alternative WSS3 (Excavation and Off-Site Disposal) would prevent further migration of asbestos to un-impacted media (primarily air and surface water) by physically containing contaminated waste, soil, and Reservoir sediment off-Site. Excavation and off-Site disposal of contaminated waste, soil, and Reservoir sediment would eliminate exposure pathways and significantly reduce the level of risk at the Site.

Alternatives WSS4 (In Situ Joule Heating) and WSS5 (Excavation, On-Site Ex Situ TCCT, and On-Site Disposal) both utilize on-Site treatment to chemically alter asbestos fibers present in contaminated waste, soil, and Reservoir sediment thereby eliminating the release of asbestos to un-impacted media (primarily soil and air) and eliminating inhalation exposures from asbestos to human receptors.

Compliance with ARARs (*Threshold Criteria)* – **Table 7** lists the ARARs identified for the retained alternatives. Alternatives WSS2, WSS3, WSS4, and WSS5 would address chemical-specific and action-specific ARARs. Alternatives WSS4 and WSS5 may have difficulty meeting location-specific ARARs related to floodplain management because changes to infiltration capacities could have significant impacts on floodplain hydraulics and could influence the extent of the 100-year floodplain. If pilot studies indicate that flood zone-related ARARs could not be met for Alternative

WSS4 or Alternative WSS5, ARAR waivers or appropriate variances, if available, would need to be employed.

Long-Term Effectiveness and Permanence (*Primary Balancing Criteria)* – Alternative WSS2 would provide a moderate to high degree of long-term protectiveness and permanence by containing contaminated waste, soil, and Reservoir sediment in place through capping. While migration of asbestos fibers would be significantly inhibited by implementation of a protective cap, long-term effectiveness and permanence would be dependent on continued inspection, monitoring, and maintenance of the cap. Alternative WSS3 would provide a high degree of long-term protectiveness and permanence, because contaminated waste, soil, and Reservoir sediment would be removed from the Site.

Alternative WSS4 would provide a moderate to high degree of long-term protectiveness and permanence due to treatment variability. In addition, because of the in situ subsurface nature of the treatment, it would be difficult to confirm that all the waste has been completely converted to a solid inert, vitrified mass. Alternative WSS5 would provide a high degree of long-term protectiveness and permanence, because confirmation of treatment would be more certain as all waste would be excavated prior to treatment. Both remedies would chemically convert contaminated waste, soil, and Reservoir sediment to asbestos-free material that would be extremely stable. Site-specific treatability studies would be required to confirm that the treated waste would no longer pose a risk to human health and the environment.

Reduction of Toxicity, Mobility, or Volume through Treatment *(Primary Balancing Criteria)* – Alternatives WSS2 and WSS3 would not involve treatment of contaminated waste, soil, and Reservoir sediment; thus, the statutory preference for treatment as a principal element of the remedial action would not be met for these two alternatives.

Alternatives WSS4 and WSS5 would both use treatment to eliminate the inherent hazards posed by contaminated waste, soil, and Reservoir sediment on the Site, and would reduce contaminated volumes by approximately 30 percent to 70 percent, respectively. Alternative WSS4 is ranked moderate to high, and Alternative WSS5 is ranked high in reduction of toxicity, mobility, or volume through treatment. The toxicity of the contaminated waste, soil, and Reservoir sediment would be significantly reduced through chemical conversion to an inert asbestos-free material. Both alternatives would destroy asbestos fibers and eliminate the risks of asbestos fiber release and mobility. Alternatives WSS4 and WSS5 both satisfy the statutory preference for treatment as a principal element of the remedial action.

Short-Term Effectiveness *(Primary Balancing Criteria)* – Alternative WSS2 would provide a moderate to high degree of short-term effectiveness. Alternative WSS2 would require some degree of excavation (already substantially completed by the removal action) to implement the remedy. Alternative WSS2 would require the shortest duration to complete; the total duration for the active implementation of Alternative WSS2, as implemented by the removal action, is approximately 8 years, with completion estimated for 2016.

Alternatives WSS3 and WSS5 would each provide low to moderate degree of short-term effectiveness. Both alternatives would require complete excavation of contaminated waste, soil, and Reservoir sediment for either off-Site disposal or on-Site treatment. Excavation for the implementation of these remedies would pose the risk of allowing contaminated waste, soil, and Reservoir sediment to release asbestos fibers to un-impacted media (primarily air and surface water) and would pose inhalation exposures from asbestos to human receptors. In addition, trucks hauling contaminated waste, soil, and Reservoir sediment away from the Site and trucks hauling off-Site backfill material to the Site would greatly impact the local community through increased truck traffic and pose a safety risk to workers on the Site. Alternative WSS5 would require construction of utility infrastructure capable of supplying a reliable source of natural gas to the treatment unit. The active implementation durations for WSS3 and WSS5 are estimated to be 13 and 12 years, respectively.

Alternative WSS4 would provide a moderate degree of short-term effectiveness. Alternative WSS4 would require high energy use and construction of a substation. In addition, Alternative WSS4 would present potential short-term exposures to workers and equipment operators when installing electrodes. Temperature and electric hazards would also be a concern for workers. Elevated temperatures of the subsurface during Alternative WSS4 treatment could impact water quality of Wissahickon Creek, Rose Valley Creek, Tannery Run, and impact groundwater temperatures. The active implementation of Alternative WSS4 is estimated to be the longest duration at 15 to 20 years.

Implementability *(Primary Balancing Criteria)* – Alternative WSS2 would provide a moderate to high degree of implementability. Implementation of IC/ECs, confirmation sampling, LTM, and FYRs would be routine. O&M including comprehensive inspection, monitoring, and maintenance of covers and stabilized stream banks would be required to maintain the integrity of the caps. Inspection, maintenance, and replacement of the soil cover systems, ECs, and stream bank stabilization work could be easily implemented using available materials, equipment, and labor resources. Regulatory approval for capping of contaminated waste, soil, and Reservoir sediment and monitoring should be obtainable. In addition, a significant portion of Alternative WSS2 has been completed by the removal action.

Alternative WSS3 would provide a low to moderate degree of implementability. A large volume of contaminated waste, soil, and Reservoir sediment, estimated at 590,300 cy, would require excavation and transportation to an off-Site disposal facility. Approximately 48,900 truckloads over a period of 13 years are estimated to be needed to haul the total volume of excavated material away from the Site, and approximately 41,100 truckloads are estimated to transport clean fill material and topsoil to the Site for backfilling. Logistics for working with a large quantity of heavy equipment, both on-Site and off of the Site may be difficult to manage and could result in significant schedule delays. Backfill material would be required from off-Site sources, which could potentially lead to delays in the schedule. Regulatory approval for excavation and off-Site transport of contaminated waste, soil, and Reservoir sediment should be obtainable. On-Site utilities (if any) impacted by excavation would require coordination with the affected utility company.

Alternatives WSS4 and WSS5 would provide the lowest degree of implementability. Although both technologies have been demonstrated to treat asbestos waste on the pilot study-scale and/or small scale (i.e., 10 tons per day for TCCT), no successful implementation has been demonstrated for a site of similar size to the BoRit Site. Alternative WSS4 would require a significant amount of coordination with local utility providers. Alternatives WSS4 and WSS5 would need to meet substantive requirements of permitting related to assembly and construction of the treatment unit (Alternative WSS4) or the on-Site TCCT treatment facility (Alternative WSS5). In addition, Alternatives WSS4 and WSS5 would need to meet the substantive requirements of permitting for the release of treated off-gas emissions. Because both remedies would result in a volume reduction of waste material on the Site, clean fill would be required for backfill to meet design grade requirements.

The containment remedy already installed by the removal action would need to be removed to implement Alternatives WSS3 and WSS5.

Costs *(Primary Balancing Criteria)* – When comparing costs among retained alternatives, Alternative WSS2 has the lowest present value cost ($27.1M) while Alternative WSS3 has the highest present value cost ($269M).

State Agency Acceptance *(Modifying Criteria)* – The State agency has tentatively approved the Preferred Alternative. Final State agency acceptance of the Preferred Alternative will be evaluated after the public comment period ends. Substantive comments will be described in the Responsiveness Summary section of the Record of Decision.

Community Acceptance *(Modifying Criteria)* – Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and public comments are considered. Substantive comments will be described in the Responsiveness Summary section of the Record of Decision.

GREEN AND SUSTAINABLE REMEDIATION ASSESSMENT

Although not a selection criteria in the NCP, in September 2010 EPA released Superfund Green Remediation Strategy, which sets out EPA's current plans to reduce the demand placed on the environment during implementation of the Preferred Alternative and to conserve natural resources. Green remediation is the "*practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprint of cleanup actions*". Green and sustainable remediation (GSR) is the "s*ite-specific employment of products, processes, technologies, and procedures that mitigate contaminant risk to receptors while making decisions that are cognizant of balancing community goals, economic impacts, and environmental effects*". A GSR assessment entitled Green and Sustainable Remediation Assessment of Proposed Plan Alternatives, was conducted for the BoRit Site to evaluate the environmental, economic, and social impacts (i.e., "triple bottom line") associated with the four retained waste, soil, and Reservoir sediment remedial alternatives. The complete GSR report is included in the FS.

The GSR assessment for the Site was comprised of considering the following impacts and corresponding evaluation methodologies for each of the retained alternatives:

- Environmental impacts: Environmental metrics evaluated as part of the footprint analysis include total energy and water resources utilized, generation of waste, materials used, as well as emissions of greenhouse gases, nitrogen oxides, sulfur oxides, particulate matter, and hazardous air pollutants. Environmental impacts were quantified using USEPA's Spreadsheets for Environmental Footprint Analysis (SEFA) tool;
- Socio-Economic impacts: Results of the environmental footprint analysis were extended to quantify the long-term global impacts (e.g., climate change, long-term health impacts, water availability, sea-level rise, agricultural impacts etc.) attributed from the environmental metrics based on socio-economic and climate models; and
- Community impacts: Includes the qualitative evaluation of potential detrimental and beneficial impacts to the surrounding community such as increased truck traffic or short term risks to workers and the community.

Results from this GSR assessment suggest that Alternative WSS2 will contribute the least overall impact under the triple bottom line (i.e., economic, social, and environment). Alternatives WSS4 and WSS5 would contribute the most towards the environmental footprint, while Alternative WSS4 would significantly contribute towards long-term global impacts from emissions and energy use. Alternative WSS3 would have the most detrimental impacts towards the community due to increased truck hauling and anticipated congestion. Alternatives WSS4 and WSS5 would likely result in additional infrastructure on the property to supply an electricity source and thus could devalue the aesthetics of the parcel.

PREFERRED ALTERNATIVE

This section presents EPA's Preferred Alternative. The Commonwealth of Pennsylvania supports EPA's Preferred Alternative at this time; however, EPA will seek formal State concurrence after EPA and the State consider comments received on this Proposed Plan. The Preferred Alternative can change in response to comments or if new information becomes available before the cleanup action is selected in the ROD.

EPA's Preferred Alternative for the BoRit Superfund Site is Alternative WSS2 (Capping) to address contaminated waste, soil, and Reservoir sediment. The present worth cost for the total Preferred Alternative is $27.1M.

Alternative WSS2 eliminates continued release and migration of asbestos fibers to un-impacted media (primarily soil and air) and would eliminate inhalation exposures from asbestos to human receptors. In addition Alternative WSS2 achieves all RAOs.

The outcome of the comparative analysis indicates that except for Alternative WSS1 (No Action) all the retained alternatives could achieve the threshold evaluation criteria. However, Alternative WSS2 is preferred over the other alternatives because it is readily implementable with available resources and requires the shortest duration to implement. In addition, Alternative WSS2 provides a higher degree of short-term effectiveness than Alternatives WSS3 and WSS5 which both require the disturbance of large volumes of waste. Further, as previously mentioned, the development and comparative analysis of remedial alternatives for the Site were based on pre-removal conditions ("baseline"). Removal action work at the Site is anticipated to be complete in 2016 meaning that the Preferred Alternative would be implemented under Site conditions significantly different than those assumed for the FS. The estimated total present value cost of Alternative WSS2 includes the $25.2M incurred costs for capping work completed by the removal action through October 2016; $0.3M to be incurred for work between October 2016 and December 2016; and all remaining remedial components of the Preferred Alternative are estimated at $1.6M.

Alternative WSS2 will eliminate exposure to the source materials by eliminating the exposure pathway associated with disturbance of the source materials by in-place containment (capping to contain waste, contaminated soil, and Reservoir sediment). ICs will provide assurance that the integrity of the remedy will be protected. While the NCP establishes the expectation that EPA will use treatment to address any principal threat waste, the use of treatment technologies for waste, contaminated soil, and Reservoir sediment is cost prohibitive for the Site.

Alternative WSS2 includes the implementation of ICs to control future use of the Site parcels and protect the engineered remedy. Specifically, the ICs will prohibit activities at the Site that would adversely impact the remedy and compromise the protection of human health and the environment.

Specific ICs to be implemented as part of Alternative WSS2 are listed below and shown in **Figure 11**.

Site-Wide:

- Activities or modifications that could disturb or otherwise adversely impact the 2-foot soil cover on the Capped Areas are prohibited. Any proposed future use of the Site will be reviewed by EPA, in consultation with PADEP, to ensure that such activity will not adversely impact the remedy or compromise the protection of human health and the environment.
- Construction activities are prohibited unless prior written approval from EPA, in consultation with PADEP, is obtained authorizing the specific activity. Prohibited construction activities may include, but are not limited to, piling installation, dredging, drilling, digging, excavation, or use of heavy equipment in the Capped Areas.
- Any modifications to the drainage pattern on-Site is prohibited unless EPA, in consultation with PADEP, determines that such activity will not adversely impact the remedy.
- Public access should be restricted after major storm events until the property has been inspected for any signs of damage or erosion especially in the 100-year flood plain.
- The Preferred Alternative is protective for maintenance workers, recreational visitors, and commercial workers. Any other use of the parcels would require further investigations and plans, approved by EPA, in consultation with PADEP, to identify parcels that can be used for additional activities that are consistent with local zoning regulations.

Parcel Specific:

- Asbestos Pile Parcel:
    - Construction of structures or habitat enhancement features that could undermine the slope stability of the Asbestos Pile parcel are prohibited unless prior written approval from EPA, in consultation with PADEP, is obtained authorizing the specific activity.
    - Trees are prohibited on the Asbestos Pile parcel slopes.
- Reservoir Parcel:
    - Maintain suitable vegetation on the capped areas (berms and Reservoir floor) to ensure protection from erosion.
    - Trees are prohibited along the berm of the Reservoir adjacent to the Wissahickon Creek.
- Stream Banks:
    - Maintain vegetation at stabilized stream banks.
    - Trees are prohibited along the steep slope along the Wissahickon Creek where geocells were utilized to stabilize the slope and on the steep slopes adjacent to Rose Valley and Tannery Run where CCM is present to stabilize the slope.

Based on the information available in the Administrative Record, EPA believes that the Preferred Alternative, Alternative WSS2, meets the threshold criteria and provides the best balance among the other alternatives with respect to the balancing criteria. ICs/ECs, O&M (inspection and maintenance of covers, liners, and stabilized areas), and LTM will be implemented to track effectiveness and ensure protectiveness of the remedy. EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA § 121, 42 U.S.C. § 9621: (1) be protective of human health and the environment; (2) comply with alternative specific ARARs; (3) be cost-effective; (4) and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The Preferred Alternative does not satisfy the statutory preference for treatment as a principal element. However, the treatment alternatives developed for the Site have significant implementability concerns, including uncertainties regarding full scale performance of the technologies to address a site as large as the BoRit Site, the availability of an adequate energy source, and/or the limited availability of vendors. In addition, by an order of magnitude, the treatment alternatives, as well as the excavation and off-Site disposal alternative, would be substantially more expensive to complete. EPA's Preferred Alternative, capping, is cost-effective and will physically contain Site contaminants and prevent contaminant release and migration off-Site.

COMMUNITY INVOLVEMENT

To assure that the community's concerns are understood, a 60 day public comment period on this Proposed Plan will open **December 4, 2016** and close on **February 1, 2017**. During the public comment period, the public is encouraged to submit comments to EPA on this Proposed Plan. A public meeting to discuss the Proposed Plan will be held on **January 10, 2017 at 6:00 p.m**. at the **Ambler Borough Hall**. During the comment period, you are invited to participate in any of the following ways: 1) by letter to Jill Lowe at the address listed to the right, 2) by email to: Lowe.jill@epa.gov, and/or 3) in person at the public meeting. If you have any questions about the public meeting, contact Jill Lowe or Gina Soscia at the address or telephone numbers listed.

For further information on the BoRit Asbestos Site or to submit comments on the Proposed Plan, please contact:

Jill Lowe, 3HS21
Remedial Project Manager
215-814-3123

Gina Soscia, 3HS52
Community Involvement
Coordinator
215-814-5538

Comments can be emailed to:
R3_Boritcomments@epa.gov

U.S. EPA
1650 Arch Street
Philadelphia, PA 19103-2029

Community engagement plays a key role in the process of developing an effective cleanup plan for a Superfund site. EPA relies on public input to assure that the remedy selected for each Superfund site meets the needs and concerns of the local community. EPA will continue to provide information regarding the cleanup activities at the BoRit Asbestos Superfund Site to the public through the Administrative Record for the Site, Site updates, newsletters, direct mailings, announcements published in the Ambler Gazette and other local papers or blogs, public meetings, and through its BoRit Asbestos Superfund Site website which may be accessed at: http://www.epa.gov/reg3hwmd/npl/PAD981034887.htm.

The BoRit Community Advisory Group (CAG) is made up of members of the community and is designed to serve as the focal point for the exchange of information among the local community and EPA, the State regulatory agency, and other pertinent Federal agencies involved in the cleanup of the Site. The CAG can provide the community with additional insight into the work that has been done. If you are interested in learning more about the BoRit CAG, contact Gina Soscia at 215-814-5538 or soscia.gina@epa.gov. Additional information about the CAG is available at http://www.boritcag.org/. The CAG can be accessed by email at Info@BoRitCAG.org.

EPA may modify the Preferred Alternative or develop another alternative based on new information or public comments. The remedy selected will be documented in a Record of Decision.

Background documents regarding the BoRit Asbestos Superfund Site, as well as copies of the Remedial Investigation, Remedial Investigation Addendum, Feasibility Study, and this Proposed Plan, are available to the public at the information repository located at the EPA Region III offices in Philadelphia, Pennsylvania and the Wissahickon Valley Library, Ambler Branch, 209 Race Street, Ambler, PA 19002. All comments submitted to EPA must be postmarked by **February 1**, **2017**.

LIST OF ABBREVIATIONS AND ACRONYMS USED IN THIS PROPOSED PLAN

°C	degrees Celsius
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µm	micrometers
cy	cubic yards
f/cc	fibers per cubic centimeter
ng/kg	nanograms per kilogram
s/cc	structures per cubic centimeter
ABS	activity-based sampling
ACM	asbestos-containing material
AR	administrative record
ARARs	applicable or relevant and appropriate requirements
ARI	ARI Global Technologies
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
CAA	Clean Air Act
CAG	community advisory group
CCM	concrete cable mat
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFC-11	trichlorofluoromethane
C.F.R.	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
COCs	contaminants of concern
COPCs	contaminants of potential concern
Cr^{+6}	hexavalent chromium
CSC	Center for Sustainable Communities
CSM	conceptual site model
EC	engineering control
ECO-SSLs	USEPA Ecological Soil Screening Levels
EPA	United States Environmental Protection Agency Region III
E&S	erosion and sediment
FEMA	Federal Emergency Management Agency
FS	feasibility study
FYR	Five-Year Review
GSR	green and sustainable remediation
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
H&S	health and safety
IC	institutional control
K&M	Keasby & Mattison
LTM	long-term monitoring
M	million
MCL	maximum contaminant level
MEK	2-butanone
MFL	million fibers per liter
MG	million gallon

MIBK	4-methyl-2-pentanone
Mt.	Mount
MTBE	methyl tert-butyl ether
MW	monitoring well
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum 1988
NCP	National Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOAEL	no observed adverse effect level
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PA	Pennsylvania
PA DCNR	Pennsylvania Department of Conservation and Natural Resources
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCME	phase contrast microscopy equivalent
PFBC	Pennsylvania Fish and Boat Commission
PRG	preliminary remediation goal
RACM	regulated asbestos-containing material
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RSL	regional screening levels
SARA	Superfund Amendments and Reauthorization Act
SEFA	USEPA's Spreadsheets for Environmental Footprint Analysis
Site	BoRit Asbestos Superfund Site
SLERA	screening level ecological risk assessment
SVOC	semi-volatile organic compound
T/M/V	toxicity, mobility, or volume
TCCT	Thermochemical Conversion Technology
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCE	trichloroethene
TEQ	toxicity equivalent quotient
TRV	toxicity reference value
TSD	treatment, storage, and disposal
TSDF	treatment, storage, and disposal facility
TWF	time weighting factor
USACE	United States Army Corps of Engineers
U.S.C.	United States Code

USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound
WHO	World Health Organization
WWP	Wissahickon Waterfowl Preserve

GLOSSARY OF TERMS USED IN THIS PROPOSED PLAN

Activity-based sampling (ABS): Activity-based sampling (ABS) simulates routine activities in order to mimic and evaluate or predict personal exposures from disturbance of materials potentially contaminated with asbestos.

Administrative Record (AR): Material documenting EPA's selection of cleanup remedies at Superfund sites, usually placed in the **Information Repository** near the site.

Ambient air: Existing or present on all sides; surrounding.

Applicable or Relevant and Appropriate Requirements (ARARs): Refers to Federal and State requirements a selected remedy must attain, which vary from site to site.

Aquifer: A geologic formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

Asbestos: The generic name for the fibrous form of a broad family of naturally occurring silicate minerals. Based on crystal structure, asbestos minerals are usually divided into two classes: serpentine and amphibole. The only asbestos member of the serpentine class is chrysotile, the type of asbestos found most commonly at the BoRit Site.

Asbestos-containing material (ACM): ACM is any material with more than 1 percent asbestos, according to U.S. Occupational Health and Safety Administration (OSHA) standards.

Chrysotile: The most widely used form of asbestos, accounting for approximately 90% of the asbestos used in commercial products, such as insulation, friction products, floor tiles, cement building materials and textiles; and the type of asbestos most commonly found at the BoRit Site.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund): A federal law passed in 1980 and amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA); the Act created a trust fund, known as Superfund, to investigate and cleanup abandoned or uncontrolled hazardous waste sites.

Contaminants of Concern (COCs): Those site-related chemicals detected in soil, sediment, water or air that could pose an unacceptable risk to human health or the environment. During the preparation of the feasibility study (FS), the Contaminants of Potential Concern (COPCs) identified in Site media were further evaluated using Site history, the range of detections, background concentrations, regulatory criteria, and the results of the baseline risk assessment to develop a list of proposed Site-related COCs and Site media to address.

Contaminants of Potential Concern (COPCs): Those chemicals detected in soil, sediment, water or air that could pose an unacceptable risk to human health or the environment based on the human health and ecological risk assessments.

Costs (capital, annual O&M, periodic, and present value costs): Criterion for evaluation of alternatives. Includes estimated costs: capital, annual operation and maintenance (O&M), periodic, and present worth. Costs are expected to be accurate within a range of +50 to -30 percent.

- **Capital costs:** Are those expenditures that are required to construct a remedial action. They are exclusive of costs required to operate or maintain the action throughout its lifetime. Capital costs consist primarily of expenditures initially incurred to build or install the remedial action (e.g., construction of a water treatment system and related site work). Capital costs include all labor, equipment, and material costs (including contractor markups, such as overhead and profit) associated with mobilization/demobilization activities; monitoring site work; installation of extraction, containment, or treatment systems; and disposal. Capital costs also include expenditures for professional/technical services that are necessary to support construction of the remedial action.
- **Annual O&M costs:** Are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial action. These costs are estimated mostly on an annual basis. Annual O&M costs include all labor, equipment, and material costs (including contractor markups, such as overhead and profit) associated with activities, such as monitoring; operating and maintaining extraction, containment, or treatment systems; and disposal. Annual O&M costs also include expenditures for professional/technical services necessary to support O&M activities.
- **Periodic costs:** Are those costs that occur only once every few years (e.g., 5-year reviews, equipment replacement) or expenditures that occur only once during the entire O&M period or remedial timeframe (e.g., site closeout, remedy failure/replacement). These costs may be either capital or O&M costs but, because of their periodic nature, it is more practical to consider them separately from other capital or O&M costs in the estimating process.
- **Present Value Costs:** Provides the basis for cost comparison between alternatives. The present value cost represents the amount of money that, if invested in the initial year of the remedial action at a given rate, would provide the funds required to make future payments to cover all costs associated with the remedial action over its planned life. For the BoRit Site, all capital costs are present value with no present value discounting. Present value for future O&M and periodic costs were calculated using a 7% discount rate as recommended in EPA guidance for developing FS cost estimates over the period of evaluation for each alternative (i.e., alternative duration). Inflation and depreciation were not considered in preparing the present value costs.

Current conditions: Current conditions refer to Site conditions post removal action work.

Downgradient: The direction that groundwater flows; similar to "downstream" for surface water.

Dry synoptic event: Water levels are measured in monitoring wells during a period that coincides with dry weather. The post-RI dry event was conducted eight days after a period of no rainfall.

Engineering Controls (ECs): Containment and/or treatment systems that are designed and constructed to prevent or limit the movement of or exposure to hazardous substances. An example of an engineering control is a fence.

EPA's National Recommended Water Quality Criteria (NRWQC): NRWQC for human health specify how much of a chemical may be present in a water body before there is a threat to human health. These human health criteria are developed by EPA under Section 304(a) of the Clean Water Act and are recommendations for states and tribes that are developing water quality standards.

Excavation: The act of cutting, scooping, or digging out a part of a solid mass.

Exposure: The amount of pollutant present in a given environment that represents a potential health threat to living organisms.

Feasibility Study (FS): A feasibility study identifies, develops and evaluates a number of alternative methods for achieving the remedial action objectives for the Site. The FS provides information sufficient to select a feasible and cost-effective remedy for the site that best eliminates, reduces or controls risks to human health and the environment.

Five-Year Reviews (FYRs): Remedial actions that result in hazardous substances, pollutants, or contaminants remaining at a site above levels that allow for unlimited use and unrestricted exposure are required, by statute, to be reviewed every five years to ensure protection of human health and the environment.

Geosynthetic: Synthetic product used to stabilize terrain.

Geotechnical: Related to engineering characteristics of earth materials.

Geotextile: Defined as any permeable textile material used to increase soil stability, provide erosion control or aid in drainage.

Gradient: The ratio of the vertical distance between two points on a slope to the horizontal distance between them; a rate of inclination or declination of a slope.

Groundwater: The supply of fresh water found beneath the Earth's surface (usually in aquifers) which is often the source of water for wells and springs.

Hazard Index: The summation of the **hazard quotients** for all chemicals to which an individual is exposed. A hazard index value of 1.0 or less than 1.0 indicates that no adverse human health effects (non-cancer) are expected to occur.

Hazard Quotient: The ratio of estimated site-specific exposure to a single chemical from a site over a specified period to the estimated daily exposure level, at which no adverse health effects are likely to occur. A typical acceptable range for a hazard quotient is less than 1.0.

Hydraulic: Of or related to water or other liquid in motion; operated, moved or affected by means of water.

In Situ: In the natural or original position; in place.

Information Repository: A library or other location where documents and data related to a Superfund project are placed to allow the public access to the material.

Institutional Controls (ICs): Non-engineering measures, that minimize the potential for human exposure to contamination and/or to protect the integrity of a remedy by limiting land or resource use, implemented by legal measures such as environmental covenants and zoning.

Maximum Contaminant Level (MCL): The maximum permissible level of contaminant in water that may be delivered to any user of a public water system.

Medium/Media: Environmental category (e.g., surface water, groundwater, soil, air) in which contaminants may be present and may migrate.

Migration: The movement of a contaminant (or anything else) from one location or media to another.

National Emission Standards for Hazardous Air Pollutants (NESHAP): Regulations to protect the public from exposure to airborne contaminants that are known to be hazardous to human health. EPA's air toxics regulation for asbestos is intended to minimize the release of asbestos fibers during activities involving the handling of asbestos.

National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP): Federal regulations for Superfund site cleanups and responses to oil and other spills into surface waters or elsewhere.

National Priorities List (NPL): EPA's list of priority hazardous waste sites that are eligible to receive federal money for response under Superfund.

Operation and Maintenance (O&M): Activities conducted at NPL sites after cleanup remedies have been constructed to ensure that they are properly functioning.

Parcel: A piece of land.

Pathway: The physical course a contaminant takes from its source to the point where an organism is exposed to the contaminant.

Phase Contrast Microscopy Equivalent (PCME): PCME structures are defined as structures with a length greater than 5 micrometers (µm), a width greater than or equal to 0.25 µm, and an aspect ratio (length:width) greater than or equal to 3:1. All ABS and ambient air concentrations of asbestos discussed within this Proposed Plan are reported in terms of PCME structures.

Potentiometric (Surface): A hypothetical surface representing the level to which groundwater would rise if not trapped in a confined aquifer (an aquifer in which the water is under pressure because of an impermeable layer above it that keeps it from seeking its level). The potentiometric surface is equivalent to the water table in an unconfined aquifer.

Preferred Alternative: The remedial alternative proposed by the EPA in a Proposed Plan using the nine criteria in the NCP.

Preliminary Remediation Goal (PRG): Preliminary remediation goals (PRGs) are the initial or proposed cleanup goals developed to provide risk reduction targets.

Pre-removal conditions: Pre-removal conditions refers to "baseline" conditions prior to removal action work, i.e., un-remediated conditions.

Proposed Plan: The Proposed Plan briefly summarizes the alternatives studied in the detailed analysis phase of the RI/FS, highlighting the key factors that led to identifying the Preferred Alternative.

Reasonable maximum exposure (RME): Reasonable maximum exposure is defined as the highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures.

Receptors: Human or other living organism potentially exposed to site contamination.

Record of Decision (ROD): The Record of Decision (ROD) is a public document that explains which cleanup alternatives will be used to clean up a Superfund site. The ROD for sites listed on the NPL is created from information generated during the RI/FS.

Regional Screening Levels (RSLs): Regional Screening Levels (RSLs) are conservative values developed using EPA Superfund risk assessment guidance and are generic, i.e., they are calculated without site-specific information. RSL exceedances do not necessarily indicate the presence of unacceptable risk; they are used to help identify areas, contaminants, and conditions that require further attention.

Remedial Action Objectives (RAOs): Remedial Action Objectives (RAOs) are media-specific cleanup goals for a selected remedial action.

Remedial Investigation (RI): An in-depth study including sampling and analyses to determine the nature and extent of contamination at a Superfund site, and establish criteria to support the analyses of alternatives in the succeeding FS.

Remedial Investigation/Feasibility Study (RI/FS): A two-part investigation conducted to fully assess the nature and extent of the release, or threat of release, of hazardous substances, pollutants, or contaminants, and to identify alternatives for cleanup. The Remedial Investigation gathers the necessary data to support the corresponding Feasibility Study.

Semi-Volatile Organic Compounds (SVOCs): Semi-volatile organic compounds (SVOCs) are organic compounds which have boiling points higher than water and which may vaporize when exposed to temperatures above room temperature.

Stratigraphy: The order and relationship between different layers of rock and unconsolidated material (called strata).

Superfund: A term for the hazardous waste cleanup law (CERCLA), also the EPA program that implements that law.

Synoptic: Relating to or displaying conditions as they exist simultaneously over a broad area.

Terrestrial: Living or growing on land, rather than in the sea or the air.

Topography: The relief features or surface configuration of an area including mountains, hills, creeks, etc.

Toxicity equivalent quotient (TEQ): TEQs are used to report the toxicity-weighted mases of mixtures of dioxins. TEQs are used for risk characterization and allow comparison of the toxicity of different combinations of dioxins and dioxin-like compounds. Dioxin and dioxin-like compounds are trace-level unintentional byproducts of some forms of combustion and several industrial chemical processes.

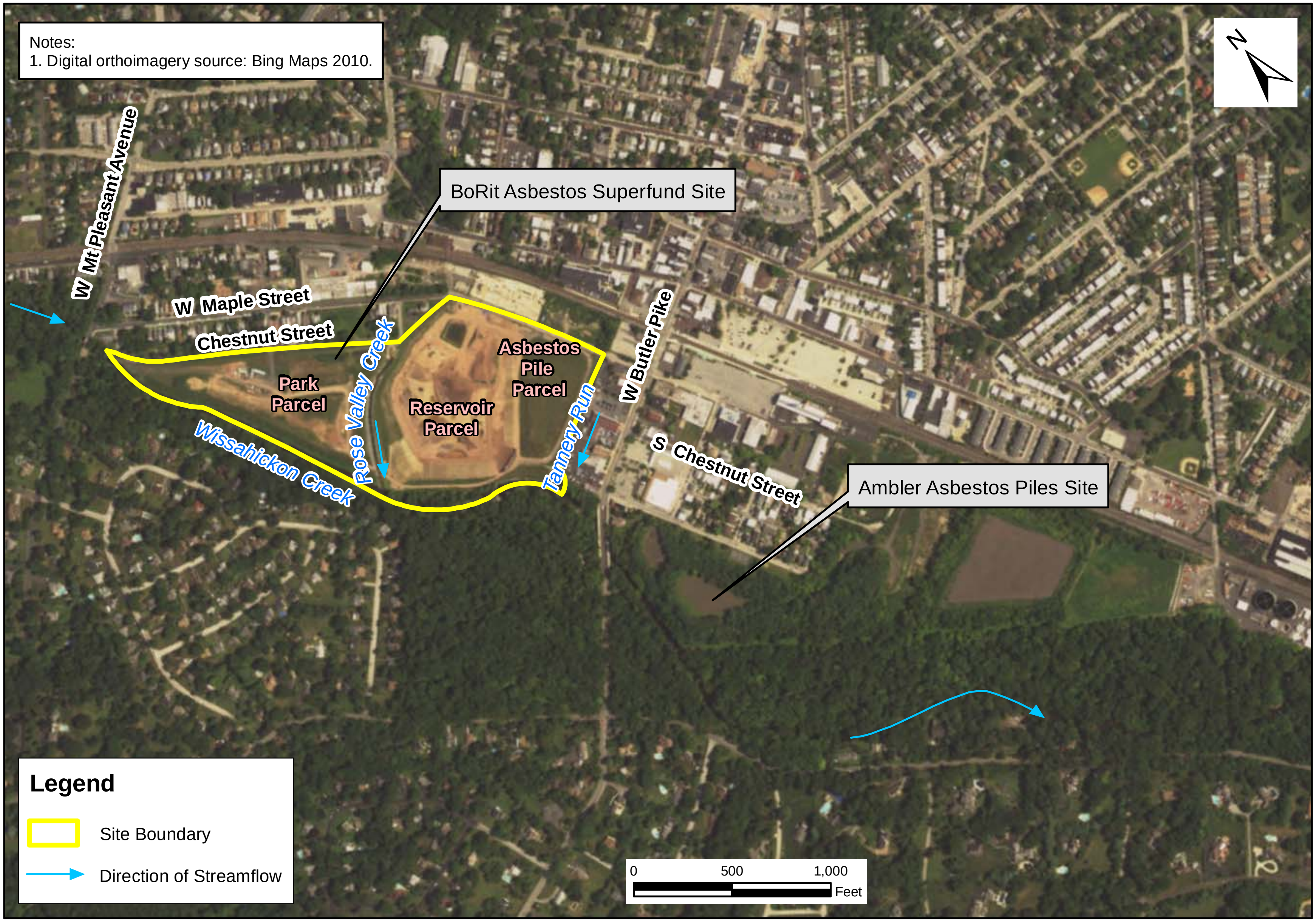
Upgradient: The direction from which groundwater flow originates; similar to "upstream" for surface water.

Vitrified: Converted into glass or a glass substance by heat.

Volatile Organic Compounds (VOCs): Volatile organic compounds, or VOCs, are organic chemical compounds whose composition makes it possible for them to evaporate under normal atmospheric conditions of temperature and pressure.

Water Table: The boundary in the ground between where the ground is saturated with water (zone of saturation) and where the ground is filled with water and air (zone of aeration).

Wet synoptic event: Water levels are measured in monitoring wells during a period that coincides with wet weather. The recorded rainfall two days leading up to the post-RI wet synoptic event totaled 0.70 inches.



CDM Smith

BoRit Asbestos Superfund Site, OU-1
Ambler, Pennsylvania

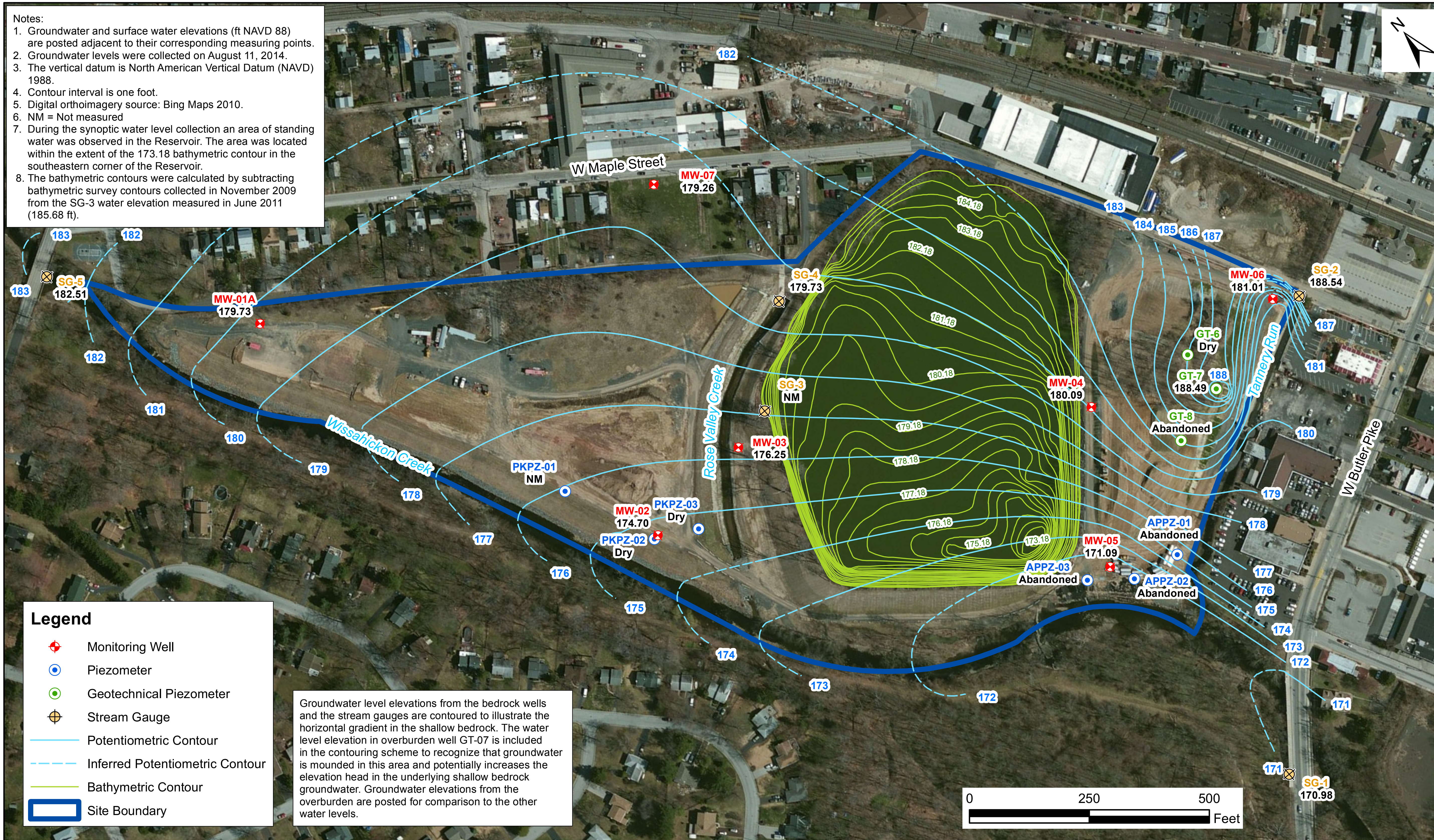
Figure 1
Site Map

CDM Smith

BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Figure 2
Potentiometric Surface Map
Wet Event, July 2014

AR304848

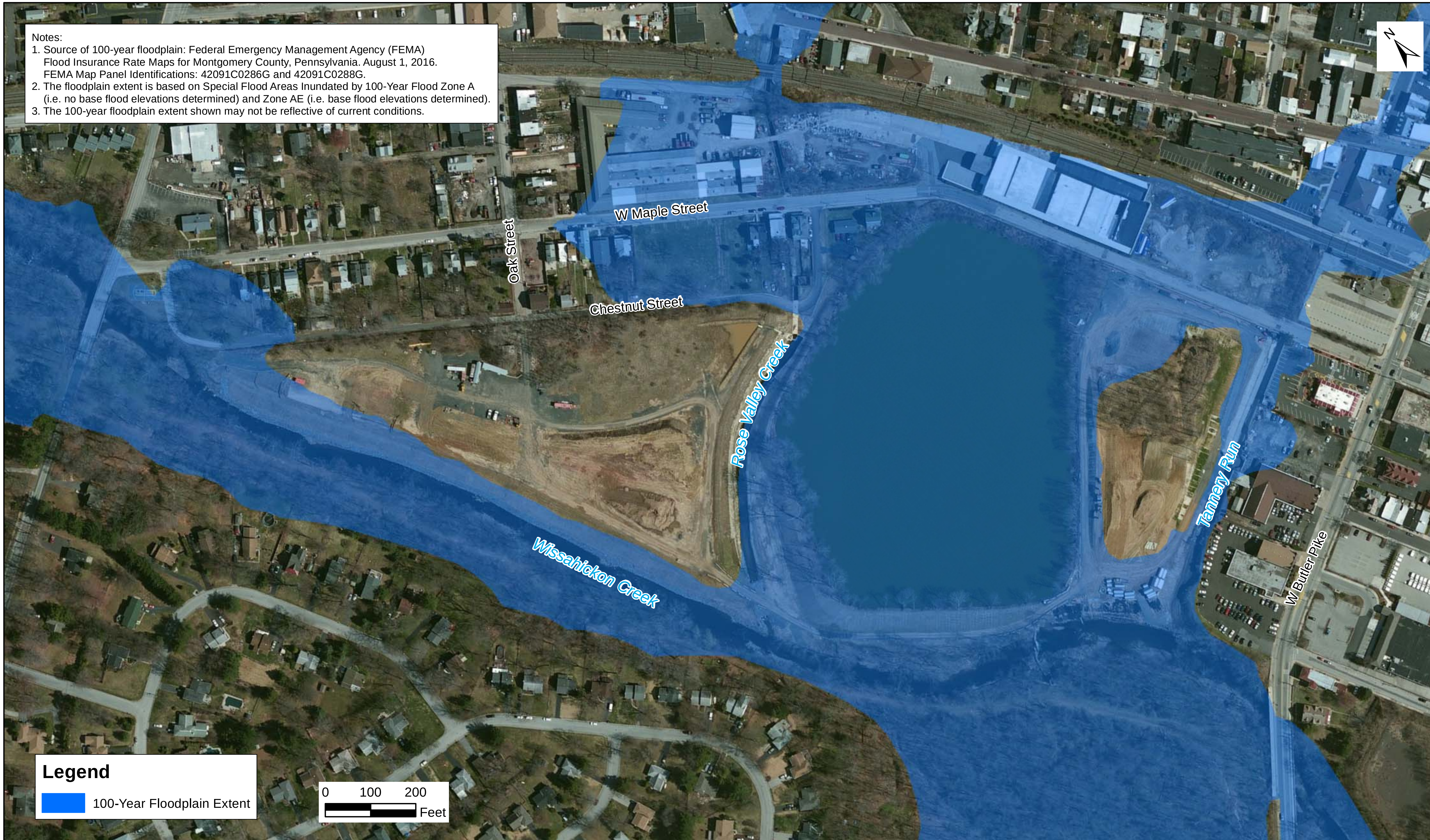


CDM Smith

BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Figure 3
Potentiometric Surface Map
Dry Event, August 2014

AR304849



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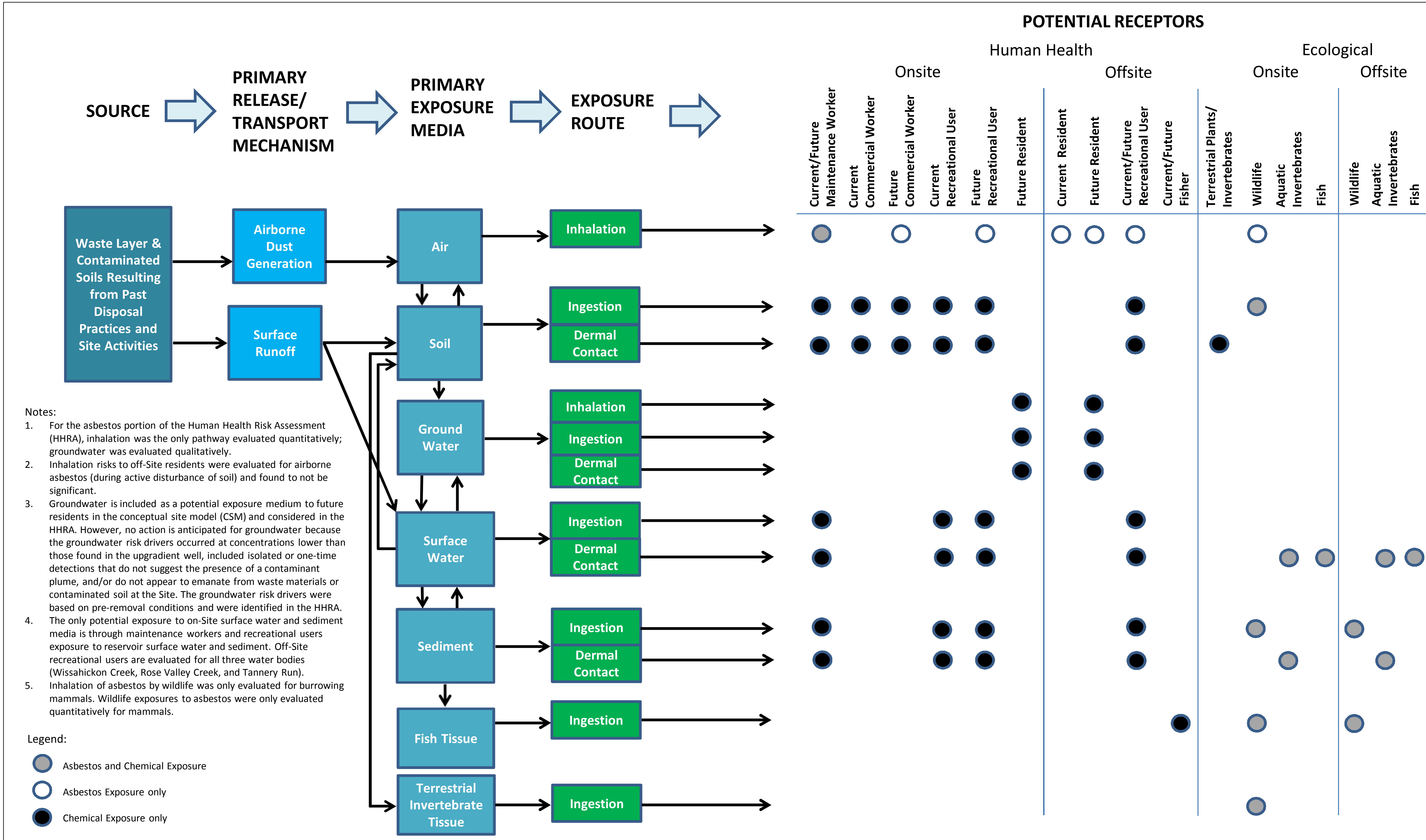
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Figure 4
100-Year Floodplain Extent



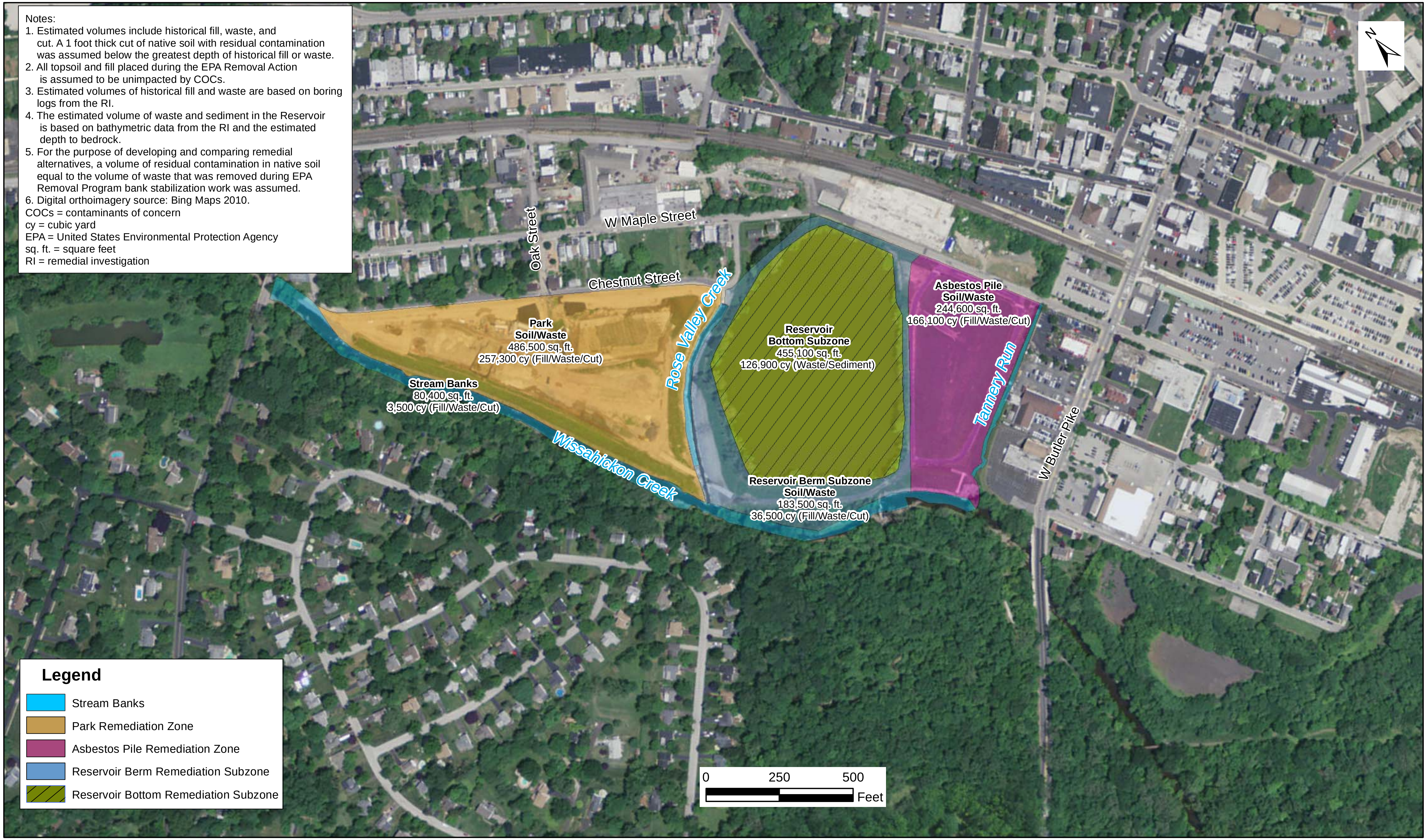
Notes:

1. For the asbestos portion of the Human Health Risk Assessment (HHRA), inhalation was the only pathway evaluated quantitatively; groundwater was evaluated qualitatively.
2. Inhalation risks to off-Site residents were evaluated for airborne asbestos (during active disturbance of soil) and found to not be significant.
3. Groundwater is included as a potential exposure medium to future residents in the conceptual site model (CSM) and considered in the HHRA. However, no action is anticipated for groundwater because the groundwater risk drivers occurred at concentrations lower than those found in the upgradient well, included isolated or one-time detections that do not suggest the presence of a contaminant plume, and/or do not appear to emanate from waste materials or contaminated soil at the Site. The groundwater risk drivers were based on pre-removal conditions and were identified in the HHRA.
4. The only potential exposure to on-Site surface water and sediment media is through maintenance workers and recreational users exposure to reservoir surface water and sediment. Off-Site recreational users are evaluated for all three water bodies (Wissahickon Creek, Rose Valley Creek, and Tannery Run).
5. Inhalation of asbestos by wildlife was only evaluated for burrowing mammals. Wildlife exposures to asbestos were only evaluated quantitatively for mammals.

CDM Smith

BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Figure 5
Conceptual Site Model for Development of Remedial Alternatives



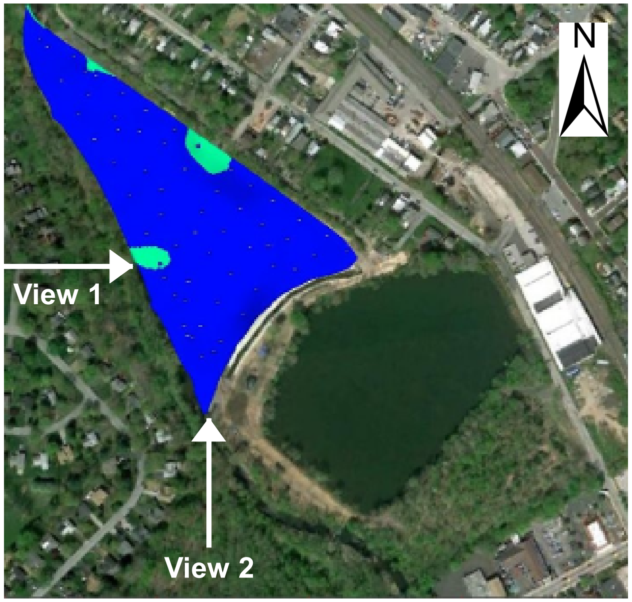
CDM Smith

BoRit Asbestos Superfund Site
Ambler, Pennsylvania

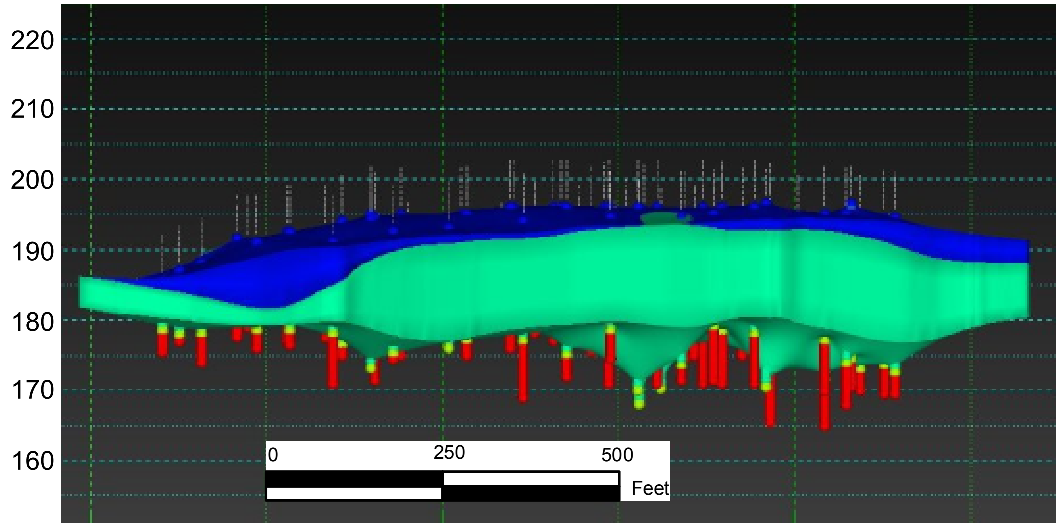
Figure 6
Remediation Zones

AR304852

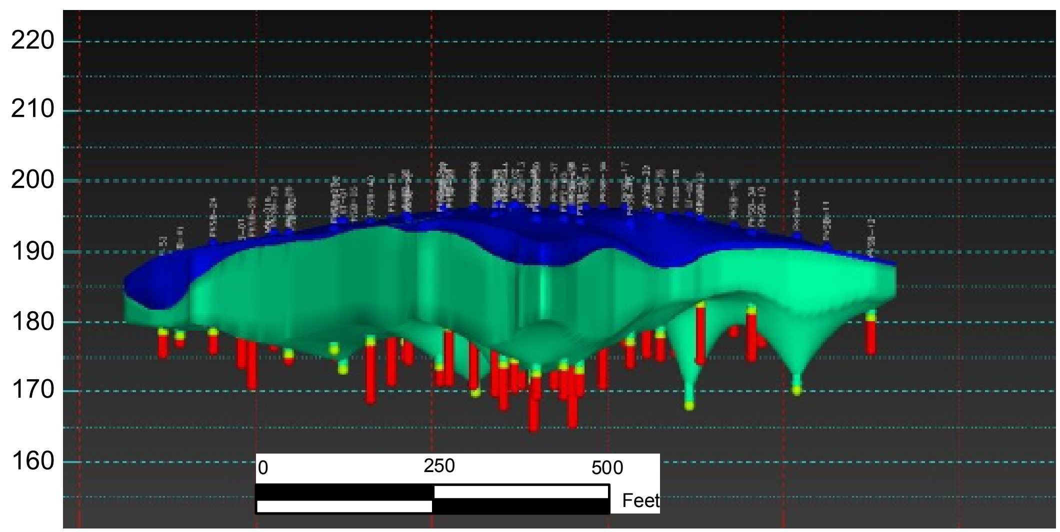
Plan View

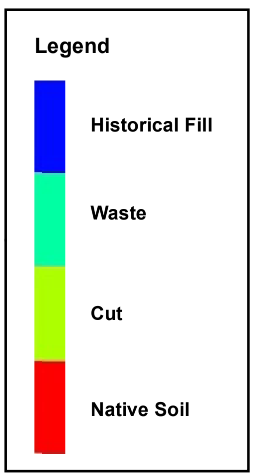


View 1



View 2





Notes:

1. Cut = a one foot depth of native soil below the greatest depth of historical fill or waste encountered.
2. The elevations posted adjacent to View 1 and View 2 are NAVD88 feet.
3. NAVD88 = North American Vertical Datum of 1988.

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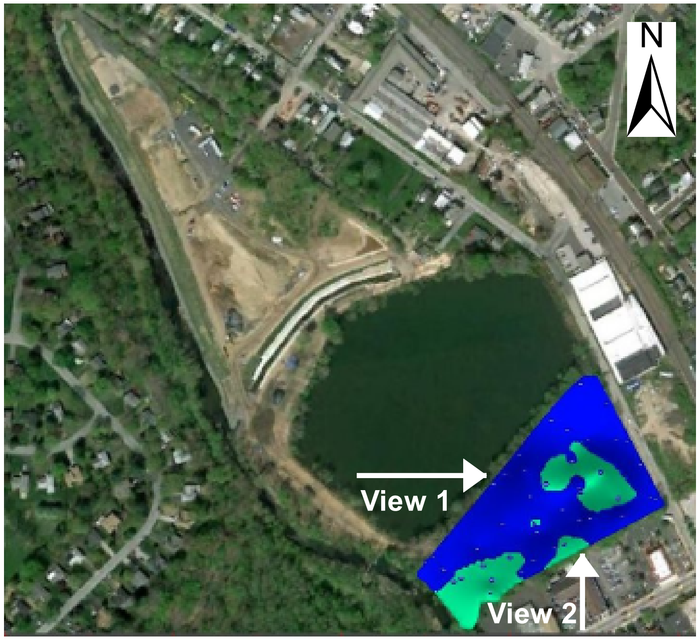
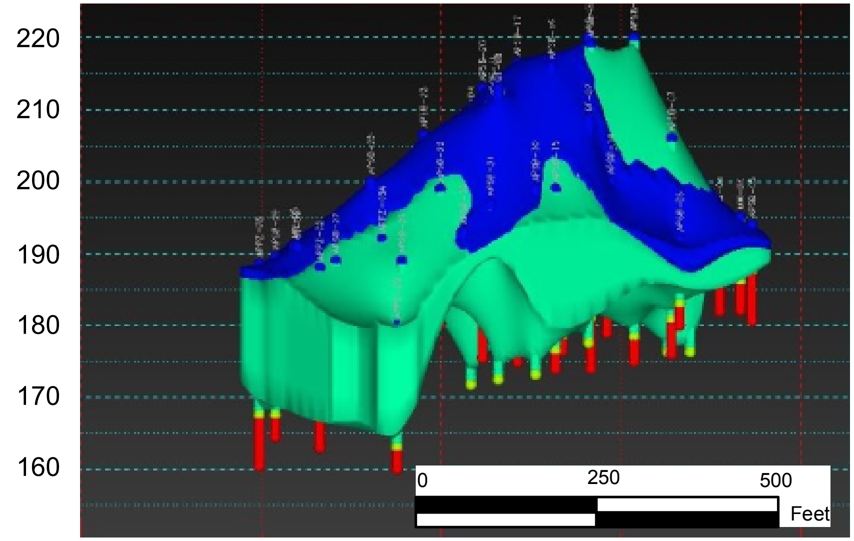
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Figure 7
Fill/Waste Distribution
at Park Parcel

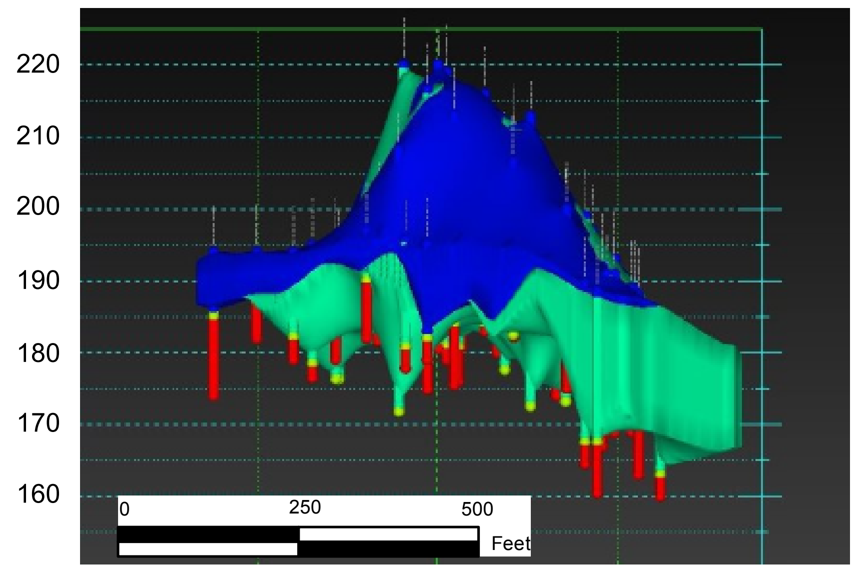
Plan View



View 1



View 2



Legend

- **Historical Fill**
- **Waste**
- **Cut**
- **Native Soil**

Notes:
1. Cut = a one foot depth of native soil below the greatest depth of historical fill or waste encountered.
2. The elevations posted adjacent to View 1 and View 2 are NAVD88 feet.
3. NAVD88 = North American Vertical Datum of 1988.

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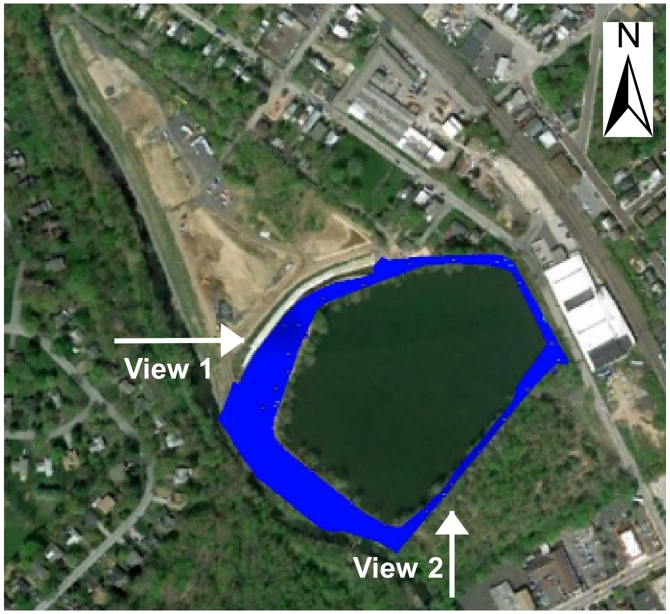
Ambler, Pennsylvania

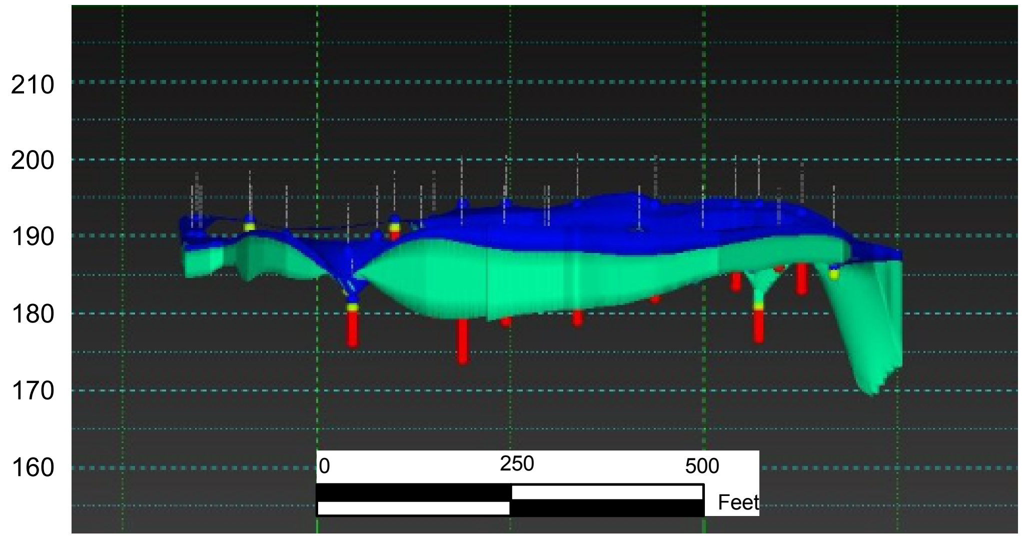
Figure 8
Fill/Waste Distribution
at Asbestos Pile Parcel

AR304854

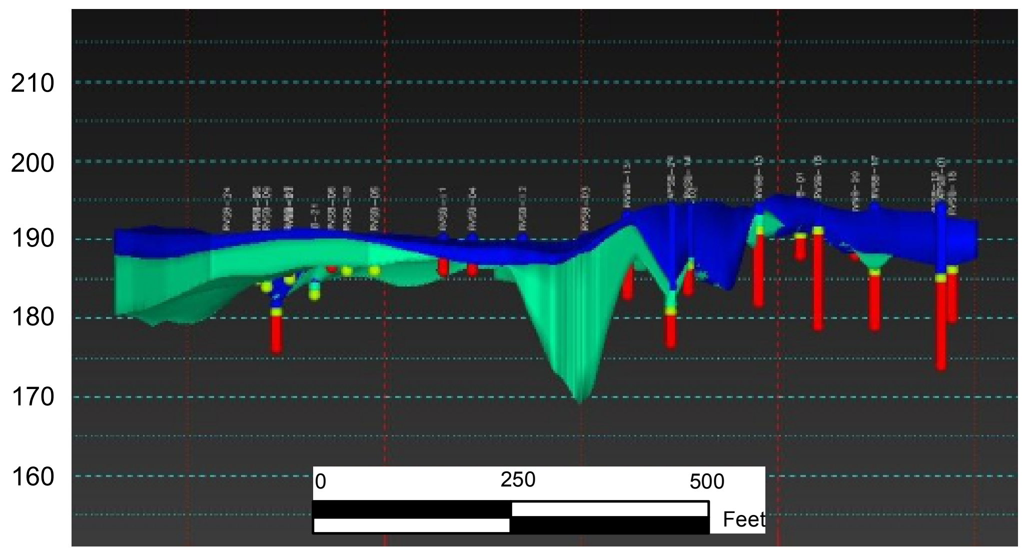
Plan View

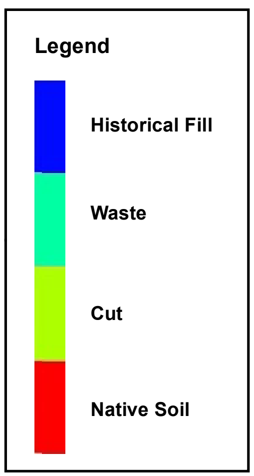


View 1



View 2





Notes:
1. Cut = a one foot depth of native soil below the greatest depth of historical fill or waste encountered.
2. The elevations posted adjacent to View 1 and View 2 are NAVD88 feet.
3. NAVD88 = North American Vertical Datum of 1988.

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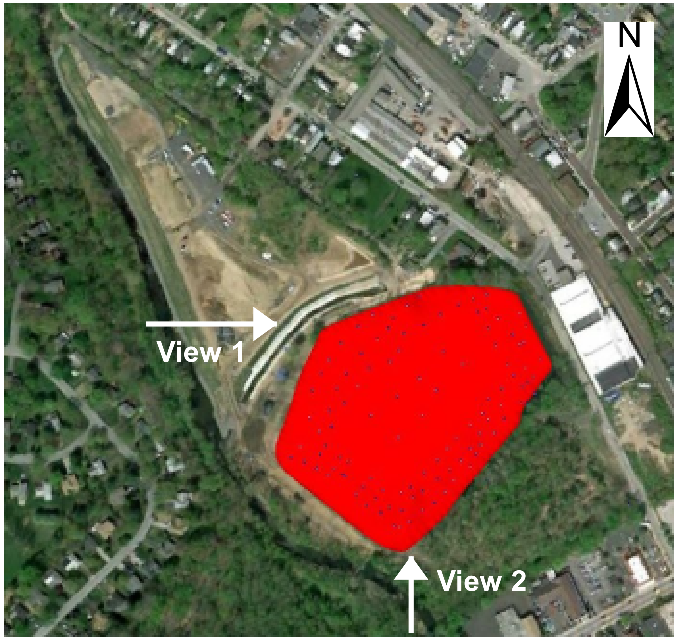
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

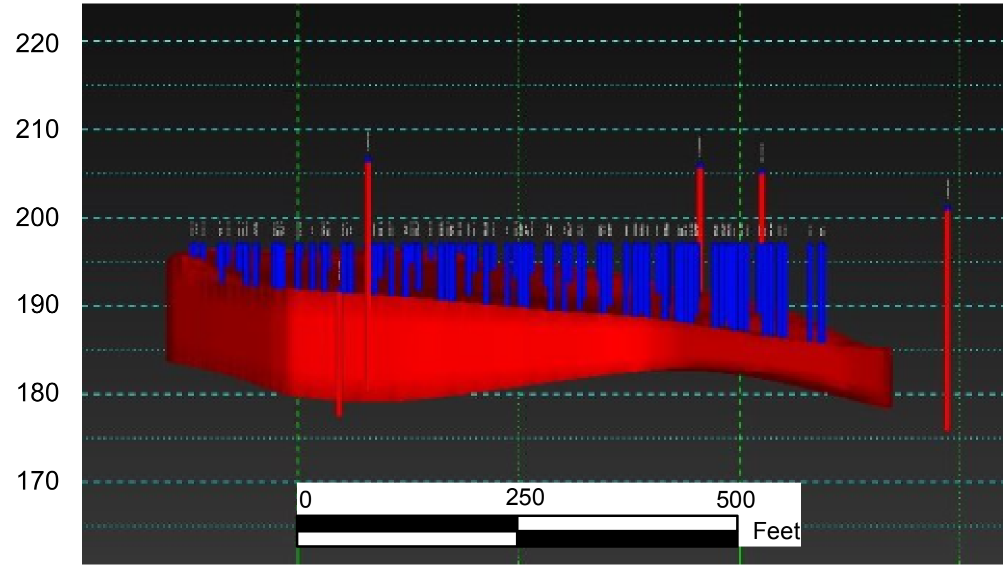
Figure 9
Fill/Waste Distribution
at Reservoir Berm

AR304855

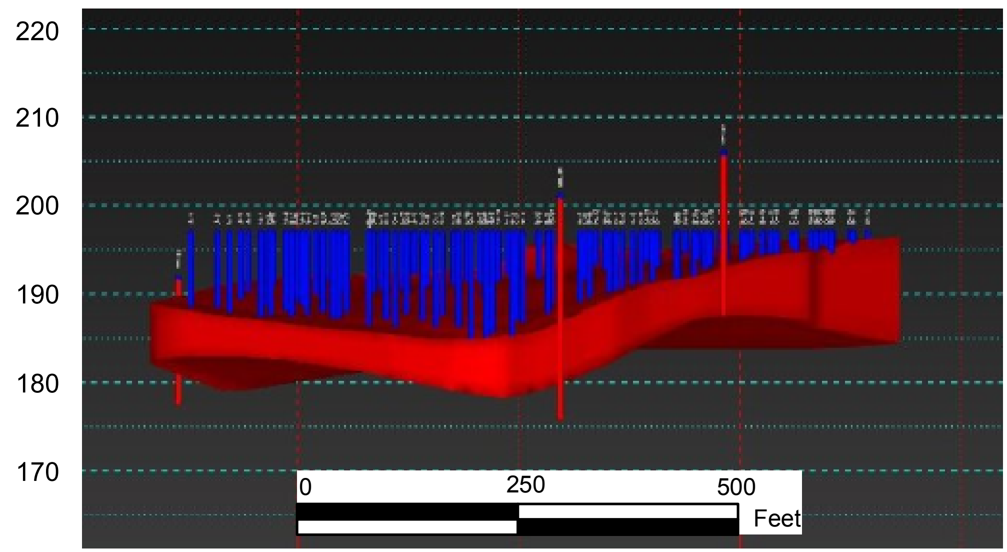
Plan View

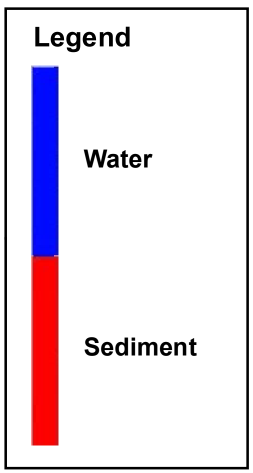


View 1



View 2





Notes:
1. Sediment (red) is shown from the sediment/surface water interface to the bedrock surface.
2. The elevations posted adjacent to View 1 and View 2 are NAVD88 feet.
3. NAVD88 = North American Vertical Datum of 1988.

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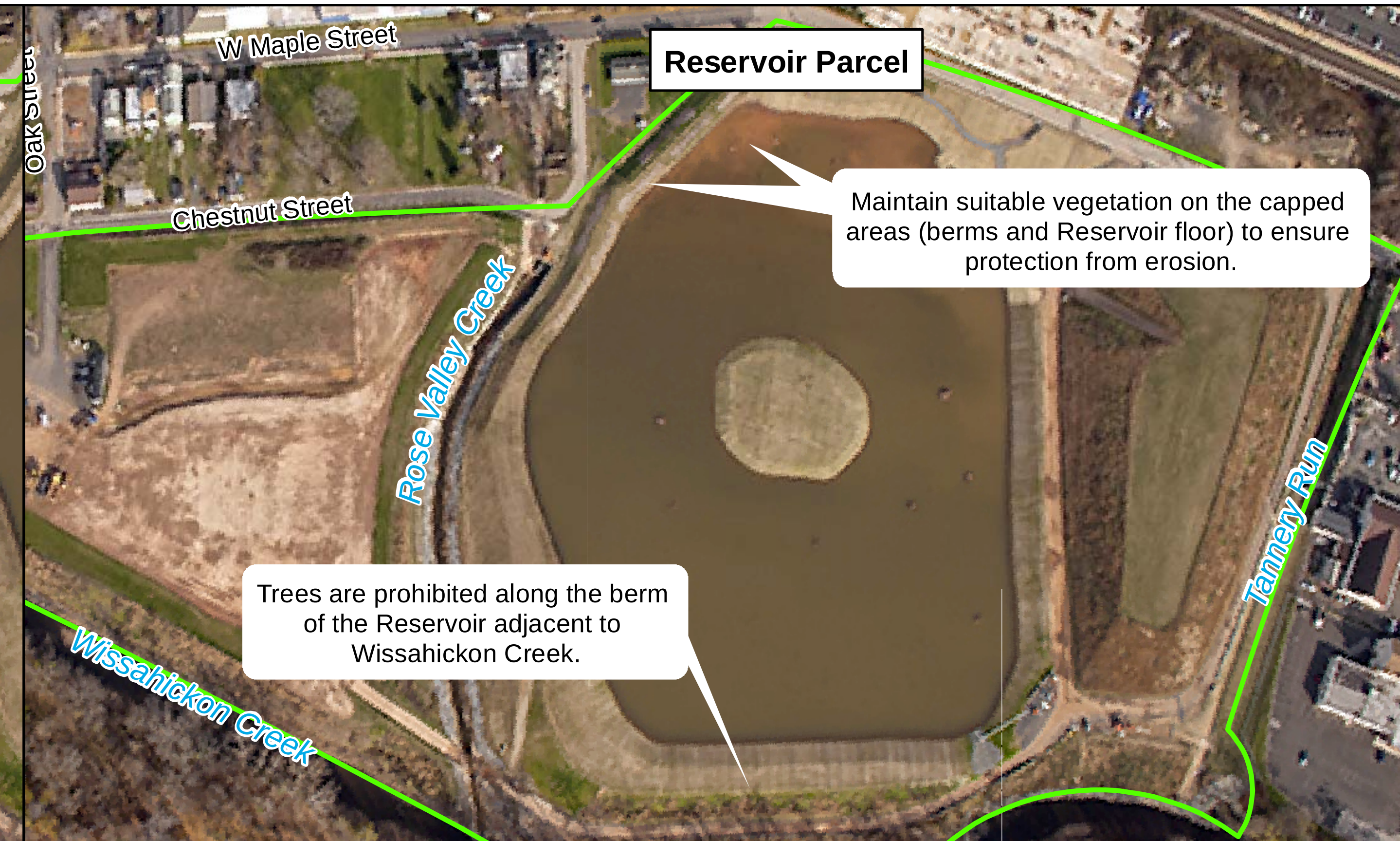
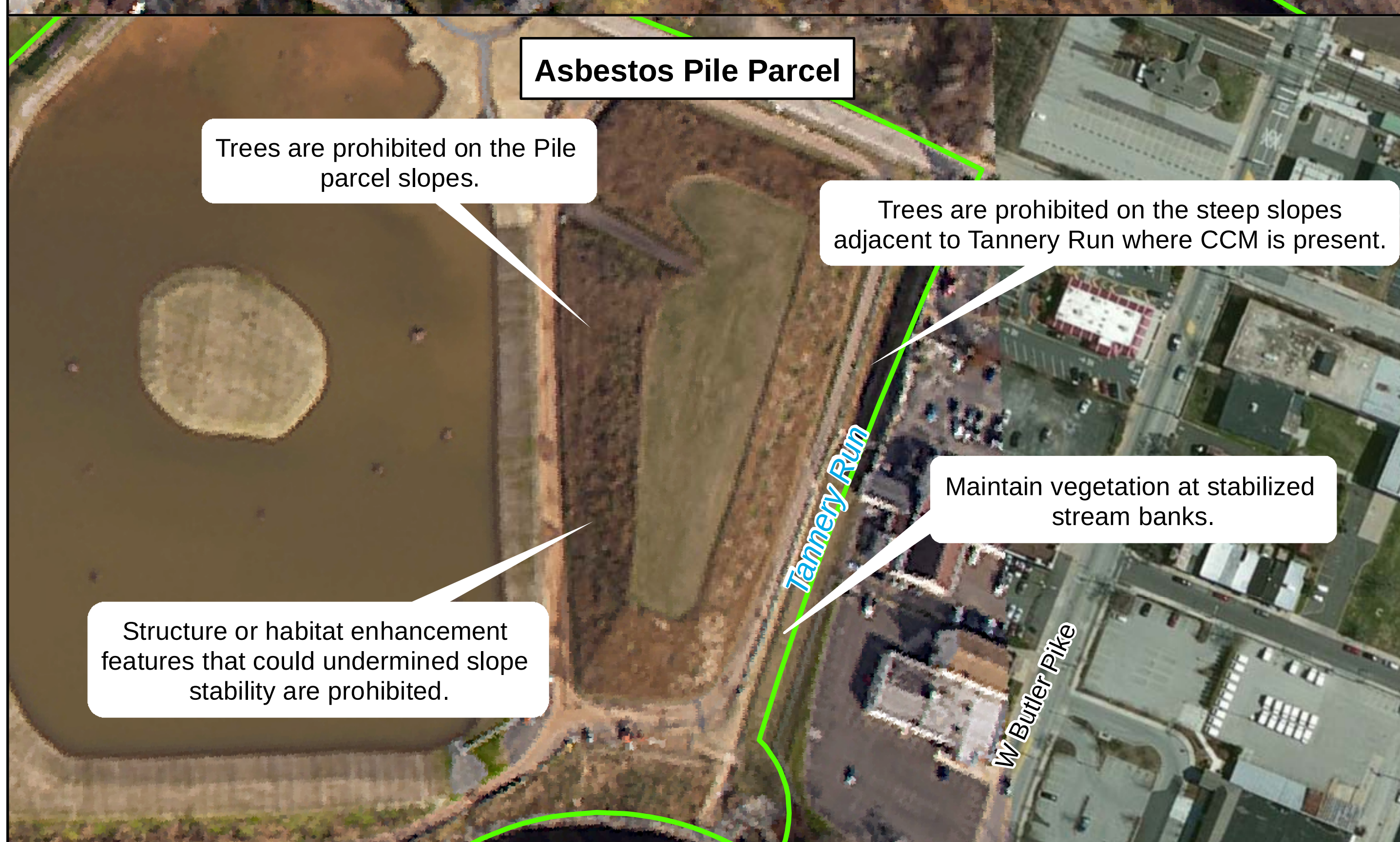
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Figure 10
Distribution of
Reservoir Sediment





Please refer to the section "Alternative WSS2: Capping" of the Proposed Plan for a detailed description of ICs, including Site-wide ICs which are not included in Figure 11.

Notes:
CCM - concrete cable mats
ICs - institutional controls
Source: Sal Boccuti's Aerial Photography, November 24, 2015.

Legend

Site Boundary

N

0 250 500 Feet

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BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Figure 11
Proposed Parcel-Specific Institutional Controls

Table 1
COPCs from the Human Health Risk Assessment
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Receptor	Exposure Area	Cancer Risk Exceeds 1E-04 or Non-Cancer Risk Exceeds 1?	COPC/Risk Driver (RME)	COPC/Risk Driver (CTE)	Contaminant of Concern	Develop PRGs and Remedial Alternatives to directly address the impacted media?	Include in a Site Remedy Long-Term Monitoring Program?	Proposed PRG	Rationale
Current/Future Scenario Timeframe									
Maintenance Worker	Park Parcel	Yes	Asbestos	NA	Yes	Yes	Yes	Yes	Asbestos is historically related to past Site practices and drives risk (inhalation) at the Site. In addition, ACM waste and contaminated soil and Reservoir sediment could potentially impact other media (groundwater and surface water) in addition to air if not addressed. Note that while ABS did not result in an unacceptable risk at the Reservoir Parcel, exposed ACM debris is located on the Reservoir berm.
	Reservoir Parcel	No	NA	NA	NA	Yes	Yes		
	Asbestos Pile Parcel	Yes	Asbestos	NA	Yes	Yes	Yes		
Recreational User	Other side of Wissahickon Creek along the Walking Trail	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
	Tannery Run	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
	Rose Valley Creek	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
	Wissahickon Creek	Yes	Surface Water: Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene Sediment: Benzo(a)pyrene	Surface Water: Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene Sediment: Benzo(a)pyrene	No	No	No	NA	The source of SVOCs in creeks could be upstream sources, including road and parking area runoff. Benzo(a)pyrene is the only SVOC in sediments that exceeded its RSL (150 µg/kg). It was found in the upstream sample at a concentration of 540 µg/kg while detections at downstream locations ranged from 84 J to 1,000 µg/kg in heavy deposition areas and 150 J to 990 µg/kg in normal deposition areas. In addition, portions of the Wissahickon Creek, Rose Valley Creek, and Tannery Run stream banks were stabilized as part of the EPA Removal Program work at the Site in order to prevent and minimize future contamination of creek surface water and sediment. That work, as well as the response actions described in this Proposed Plan, are all assumed to satisfactorily address creek surface water and sediment.
Fisher	Wissahickon Creek	Yes	Fish Tissue: Dieldrin, Benzo(a)pyrene, DDT, Aldrin, Aroclor 1254, Arsenic, Chromium	Fish Tissue: Dieldrin, Aroclor 1254, Arsenic, Chromium	No	No	No	NA	Pesticides were found in similar numbers and concentrations in upstream and Site sediment samples. The ubiquitous presence of pesticides suggests their presence may not be attributable to the waste material disposed on the Site. Only one PCB RSL exceedance was observed near the former electrical transformers and the likelihood of extensive vertical migration is limited. As indicated above, benzo(a)pyrene was found at an elevated concentration in an upstream location. Metals are found throughout the Site, occurring as constituents of minerals, and can be present in non-impacted soils at concentrations greater than the RSLs. As indicated above, portions of the Wissahickon Creek, Rose Valley Creek, and Tannery Run stream banks were stabilized as part of the EPA Removal Program work at the Site in order to prevent and minimize future contamination of creek surface water and sediment.
Resident	Off-site Residences	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
Future Scenario Timeframe									
Recreational User	Park Parcel	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
	Reservoir Parcel	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
	Asbestos Pile	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
Commercial Worker	Park Parcel	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
	Asbestos Pile	No	NA	NA	NA	No	No	NA	Risk within acceptable range.
Resident	Site-wide Groundwater	Yes	Carbon Tetrachloride, Chloroform, Tetrachloroethene, Trichloroethene, bis(2-ethylhexyl)phthalate, Aluminum, Arsenic, Chromium, Manganese, Thallium, Vanadium	Tetrachloroethene, Aluminum, Arsenic, Manganese, Thallium, Vanadium	No	No	No	No	**VOCs:** Detections of the listed VOCs were below the concentration found in the upgradient, off-Site monitoring well (MW-07). Samples from MW-07 had detections of carbon tetrachloride, cis-1,2-DCE, MTBE, PCE, and TCE, but these VOCs were found only at low concentrations in on-site soil/waste. Due to the elevated concentrations found in groundwater, on-site soil/waste are not believed to be a large contributor to contamination in the shallow bedrock aquifer. **SVOCs:** Although PAHs were found above soil RSLs in many samples, they were not detected in the upper bedrock aquifer, and only one SVOC, bis(2- ethylhexyl)phthalate, was detected in groundwater at concentrations above the RSL. RSL exceedances of bis(2-ethylhexyl)phthalate were limited to MW-02, MW-05, and MW-06 in the first round of sampling (2010). However, bis(2-ethylhexyl)phthalate was not detected in any of the three subsequent rounds of sampling completed at these wells in 2013. **Inorganics:** While manganese has been detected frequently in groundwater samples collected at the Site, the occurrence of manganese concentrations above a risk-based cleanup level of 430 µg/L in filtered samples has been limited to MW-03 and MW-06. The potentiometric surface at the Site does not suggest that the manganese exceedances in these two wells are connected and constitute a plume. It should be noted that manganese is a secondary contaminant meaning that the risk based cleanup level for manganese is non-enforceable and based on aesthetic considerations such as taste, color, and odor. Finally, manganese does not appear to be related to historical Site activities.

Notes:

Confirmation sampling would be conducted upon construction completion of selected remedial alternative to assess the effectiveness of the completed remedial action in achieving remedial action objectives for the Site-related contaminants of concern.

µg/kg - microgram per kilogram
µg/L - microgram per liter
ABS - activity-based sampling
ACM - asbestos-containing material
AWQCs - Ambient Water Quality Criteria
cis-1,2-DCE - cis-1,2-dichloroethene
CTE - central tendency exposure

COPC - contaminant of potential concern
DDT - dichlorodiphenyltrichloroethane
EPA - United States Environmental Protection Agency
f/cc - fibers per cubic centimeter
FS - feasibility study
J - estimated value
MCL - maximum contaminant level

MTBE - methyl tert-butyl ether
NA - Not applicable
PAHs - polynuclear aromatic hydrocarbons
PCB - polychlorinated biphenyl
PCE - tetrachloroethene
PCME - phase contrast microscopy
PRG - preliminary remediation goal

RME - reasonable maximum exposure
RSL - regional screening level
SVOC - semi-volatile organic compound
TCE - trichloroethene
VOC - volatile organic compound

Table 2
COPCs from the Screening Level Ecological Risk Assessment
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

COPC	Units	Range of Detections	Hazard Quotient[1]	Screening Level[2,3,4]	Background Range	Contaminant of Concern	Proposed PRG	Rationale
Soil/Waste								
1,2-benzphenanthracene	µg/kg	42 J - 2900	2.6	1100	160 J - 1300 J	N	NA	Detect range near background range; common constituent in urban soils
Benzo(a)anthracene	µg/kg	37 J - 3100	2.8	1100	140 J - 1100 J	N	NA	Detect range near background range; common constituent in urban soils
Benzo(a)pyrene	µg/kg	48 J - 3000	2.7	1100	130 J - 1100 J	N	NA	Detect range near background range; common constituent in urban soils
Benzo(b)fluoranthene	µg/kg	25 J - 3800	3.5	1100	180 J - 1500 J	N	NA	Detect range near background range; common constituent in urban soils
Benzo(g,h,i)perylene	µg/kg	55 J - 1900	1.7	1100	310 J - 670 J	N	NA	Detect range near background range; common constituent in urban soils
Benzo(k)fluoranthene	µg/kg	26 J - 2600	2.4	1100	280 J - 520 J	N	NA	Detect range near background range; common constituent in urban soils
Benzyl butyl phthalate	µg/kg	22 J - 420 J	1.8	239	ND	N	NA	Maximum detect near screening level
Bis(2-ethylhexyl)phthalate	**µg/kg**	**23 J - 280000**	**303**	**925**	**ND**	**Y**	**Yes**	**One location (former fire training area) of maximum detect three magnitudes higher than screening level**
Fluoranthene	µg/kg	35 J - 7200	6.5	1100	96 J - 2500 J	N	NA	Detect range near background range; common constituent in urban soils
Indeno(1,2,3-c,d)pyrene	µg/kg	31 J - 2000	1.8	1100	350 J - 710 J	N	NA	Detect range near background range; common constituent in urban soils
4,4-DDT	µg/kg	0.11 J - 60	2.9	21	NA	N	NA	Maximum detect near screening level
Endrin Ketone	µg/kg	0.034 J - 12 J	1.2	10.1	NA	N	NA	Maximum detect near screening level
Dioxin and Furans	**ng/kg**	**2.8 - 49.5**	**249**	**0.199**	**NA**	**Y**	**Yes**	**Elevated HQ**
Aluminum	mg/kg	3220 - 20900	418	50	8530 - 12400	N	NA	Detect range near background range
Antimony	mg/kg	1.5 J - 2.4 J	8.9	0.27	0.34 J - 0.81 J	N	NA	Detect range near background range
Cadmium	mg/kg	0.21 J - 2.3	6.4	0.36	0.03 J- - 0.4 J	N	NA	Detect range near background range
Chromium	**mg/kg**	**8.3 - 124**	**4.8**	**26**	**13 - 21.1**	**Y**	**Yes**	**Maximum detect one magnitude greater than background**
Cobalt	mg/kg	5.1 J - 22.9	1.8	13	5.3 J - 11.5 J	N	NA	Detect range near background range
Copper	mg/kg	9.6 J - 80.5	2.9	28	3.9 - 26.7	N	NA	Detect range near background range
Lead	mg/kg	14.9 - 178	16.2	11	15.6 J - 80.5 J	N	NA	Qualitative analysis completed for RI did not indicate disposed waste as potential source for lead
Manganese	mg/kg	108 - 1370 J	6.2	220	268 J - 1030 J	N	NA	Detect range near background range
Mercury	mg/kg	0.037 J - 5	50	0.1	0.025 J - 0.23 J	N	NA	Qualitative analysis completed for RI did not indicate disposed waste as potential source for mercury
Nickel	**mg/kg**	**8.6 - 345**	**9.1**	**38**	**8.8 J - 19.4 J**	**Y**	**Yes**	**Maximum detect one magnitude greater than background**
Thallium	mg/kg	2.4 B - 3.1	3.1	1	ND	N	NA	Detect range near background range
Vanadium	mg/kg	13.2 - 38.6	4.9	7.8	18.6 J - 29.5 J	N	NA	Detect range near background range
Zinc	**mg/kg**	**25.1 - 2440**	**53**	**46**	**20.6 - 104**	**Y**	**Yes**	**Maximum detect one magnitude greater than background**
Total asbestos	**%**	**0.1 - 20**	**NC**	**NSL**	**NA**	**Y**	**Yes**	**Known site contaminant that is not naturally occurring in the Site area**
Reservoir Sediment								
Carbon disulfide	**µg/kg**	**4.1 J - 46 J**	**11**	**4.1**	**ND**	**Y**	**Yes**	**Elevated HQ**
1,2-benzphenanthracene	µg/kg	32 J - 410 J	2.5	166	82 J - 850	N	NA	Detect range near background range; common constituent in urban sediment
Anthracene	µg/kg	120 J - 120 J	2.1	57.2	ND - 210	N	NA	Detect range near background range; common constituent in urban sediment
Benzo(a)anthracene	µg/kg	35 J - 410 J	3.8	108	79 J - 730	N	NA	Detect range near background range; common constituent in urban sediment
Benzo(a)pyrene	µg/kg	31 J - 370 J	2.5	150	84 J - 540	N	NA	Detect range near background range; common constituent in urban sediment
Benzo(b)fluoranthene	µg/kg	44 J - 470 J	2.5	190	96 J - 470	N	NA	Detect range near background range; common constituent in urban sediment
Bis(2-ethylhexyl)phthalate	µg/kg	51 J - 230 J	0.7	180	ND	N	NA	HQ less than 1
Dibenzo(a,h)anthracene	µg/kg	65 J - 65 J	1.3	33	ND	N	NA	Common constituent in urban sediment
Fluoranthene	µg/kg	50 J - 910	2.2	423	110 J - 810	N	NA	Detect range near background range; common constituent in urban sediment
Indeno(1,2,3-c,d)pyrene	µg/kg	92 J - 190 J	11	17	53 J - 150 J	N	NA	Detect range near background range; common constituent in urban sediment
Phenanthrene	µg/kg	480 - 480	2.4	204	61 J - 570	N	NA	Detect range near background range; common constituent in urban sediment
Pyrene	µg/kg	43 J - 720	3.7	195	130 J - 1900	N	NA	Detect range near background range; common constituent in urban sediment
Cadmium	mg/kg	0.3 J - 2 J	2.0	0.99	ND - 0.2 J	N	NA	Detect range near background range
Chromium	mg/kg	2.8 - 65.5	1.5	43.4	17.6 - 20.3	N	NA	Detect range near background range
Copper	mg/kg	2.7 J - 90.9	2.9	31.6	15 J - 15.3 J	N	NA	Detect range near background range
Lead	mg/kg	2.8 - 96	2.7	35.8	11.4 K - 27.5 K	N	NA	Detect range near background range
Manganese	mg/kg	38.3 - 542	1.2	460	341 - 447	N	NA	Detect range near background range
Mercury	mg/kg	0.12 J - 0.36 J	2.0	0.18	0.036 J - 0.043 J	N	NA	Detect range near background range
Nickel	mg/kg	1.8 J - 82.9	3.7	22.7	14.1 - 16	N	NA	Detect range near background range
Zinc	mg/kg	11.3 - 354	2.9	121	73.9 - 95.1	N	NA	Detect range near background range

Table 2
COPCs from the Screening Level Ecological Risk Assessment
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

COPC	Units	Range of Detections	Hazard Quotient[1]	Screening Level[2,3,4]	Background Range	Contaminant of Concern	Proposed PRG	Rationale
Reservoir Surface Water								
Aluminum	**µg/L**	**107 B - 3520**	**40**	**87**	**ND**	**Y**	**Yes**	**Elevated HQ**
Arsenic	µg/L	3.7 J - 5.1 J	1.0	5	ND	N	NA	Low HQ
Barium	µg/L	69.1 J - 297	74	4	107 J	N	NA	Detections near background concentration
Copper	µg/L	23.2 J - 23.2 J	3	9	ND	N	NA	Low HQ
Iron	**µg/L**	**78.2 B - 3930**	**13**	**300**	**161 B**	**Y**	**Yes**	**Detection maximum one magnitude above background and elevated HQ**
Lead	**µg/L**	**3.6 J - 54.4**	**22**	**2.5**	**3 J**	**Y**	**Yes**	**Detection maximum one magnitude above background and elevated HQ**
Manganese	µg/L	40.2 - 311	3	120	34.4	N	NA	Low HQ
Vanadium	µg/L	22.3 J - 22.3 J	1.1	20	ND	N	NA	Low HQ
Zinc	µg/L	176 - 176	1.5	120	ND	N	NA	Low HQ
Total asbestos[5]	**MFL**	**1.8 - 640**	**6,400,000**	**0.0001**	**0**	**Y**	**Yes**	**Very high HQ**
Seep Water								
Aluminum	**µg/L**	**554 - 554**	**40**	**87**	**ND**	**Y**	**Yes**	**Elevated HQ**
Barium	µg/L	65.5 J - 65.5 J	1.0	5	107 J	N	NA	Low HQ
Iron	**µg/L**	**708 - 708**	**74**	**4**	**161 B**	**Y**	**Yes**	**High HQ**
Thallium	µg/L	6.3 B - 6.3 B	3	9	ND	N	NA	Low HQ
Total asbestos[5]	**MFL**	**5.1 - 5.1**	**51,000**	**0.0001**	**0**	**Y**	**Yes**	**Very high HQ**

Notes:
Bolded contaminants indicate the COPC is a proposed COC for the respective media and receptor type.
1. Hazard Quotient based on maximum concentration and reported in the Screening Level Ecological Risk Assessment of the *Final Remedial Investigation Report, BoRit Asbestos Superfund Site, Operable Unit 1, Ambler, Pennsylvania* (CDM Smith 2013).
2. Soil Screening Levels
- Primary Screening Value. USEPA Ecological Soil Screening Levels (Eco-SSLs). 2005 https://www.epa.gov/risk/ecological-soil-screening-level-eco-ssl-guidance-and-documents -
- Secondary Screening Values. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. U.S. DOE 1997b
Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. U.S. DOE 1997a
- Tertiary Screening Values. USEPA Region 5 RCRA Ecological Screening Levels. 2003. http://epa.gov/region05/waste/cars/pdfs/ecological-screening-levels-200308.pdf
3. Reservoir Sediment Screening Levels
- USEPA Region III Freshwater Sediment Screening Benchmarks. 2006. https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_sediment_benchmarks_8-06.pdf
4. Reservoir Surface Water and Seep Screening Levels
- USEPA Region III Freshwater Screening Benchmarks. 2006. https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_benchmarks_07-06.pdf
5. Screening value for asbestos is the lowest no observed adverse effect concentration reported for effects to growth, reproduction and survival of aquatic invertebrates or fish (see Appendix C of the *Final Remedial Investigation Report* [CDM Smith 2013]).
Screening level is based on all fibers (i.e., it is not based on fibers longer than 10 µm, which is the reported concentration unit for site collected samples).

% - percent
µg/kg - micrograms per kilogram
µg/L - micrograms per liter
µm - micrometers
B - not detected substantially above the level reported in laboratory or field blank
COPC - contaminant of potential concern
COC - contaminant of concern
HHRA - Human Health Risk Assessment
HQ - Hazard Quotient
J - Analyte present. Reported value may not be accurate or precise
K - Analyte present. Reported value may be biased high. Actual value is expected to be lower
N - No
MCL - Maximum Contaminant Level
MFL - million fibers per liter
mg/kg - milligrams per kilogram
NA - not applicable
NC - not calculated
ND - not detected
NSL - no Screening Value
PRG - Preliminary Remediation Goal
RCRA - Resource Conservation and Recovery Act
SLERA - Screening Level Ecological Risk Assessment
Y - Yes

Table 3
Identification of Contaminants of Concern and Preliminary Remediation Goals for Remedial Alternative Development
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Site-Related Human Health COCs - Soil/Waste

COC	Range of Detections (PCME s/cc)	Cancer Risk Level *1E-06*	Cancer Risk Level *1E-05*	Cancer Risk Level *1E-04*	Hazard Index *HI = 1*	Background Range (f/cc)	Proposed PRG (f/cc)	Rationale for Proposed PRG
Asbestos (based on air sampling)								
Park parcel (ABS)	**0 - 0.46**	**NE**	**NE**	**0.04**	**NE**	**NA**	**0.04**	**Risk level set at 1E-04**
Asbestos Pile parcel (ABS)	**0 - 0.13**	**NE**	**NE**	**0.04**	**NE**		**0.04**	**Risk level set at 1E-04**
Reservoir parcel (ABS)	**0**	**NE**	**NE**	**0.04**	**NE**		**0.04**	**Risk level set at 1E-04; ABS did not result in an unacceptable risk, however exposed ACM debris is located on the Reservoir berm.**
Ambient Air	0 - 0.0012	NE	NE	0.001	NE	0	0.001	One detect (CM01-AA-HD12) above 0.001 PCME s/cc

Site-Related Ecological COCs - Soil/Waste

COC	Units	Range of Detections	Hazard Quotient[1]	Hazard Quotient using 95% UCL	Screening Level[2,3,4]	Background Range	Rationale for PRG development	Proposed PRG	Rationale for Proposed PRG
Bis(2-ethylhexyl)phthalate	**μg/kg**	**23 J - 280000**	**303**	**82**	**925**	**ND**	**Maximum detections tied to former fire training area**	**925**	**ESL**
Dioxin and Furans	**ng/kg**	**2.8 - 49.5**	**249**	**105**	**0.199**	**NA**	**Maximum detections tied to former fire training area**	**0.199**	**ESL**
Chromium	**mg/kg**	**8.3 - 124**	**4.8**	**NC**	**26**	**13 - 21.1**	**Qualitative analysis completed for RI indicated that disposed waste may be source for chromium**	**26**	**ESL**
Nickel	**mg/kg**	**8.6 - 345**	**9.1**	**2.7**	**38**	**8.8 J - 19.4 J**	**Qualitative analysis completed for RI indicated that disposed waste may be source for nickel**	**38**	**ESL**
Zinc	**mg/kg**	**25.1 - 2440**	**53**	**11**	**46**	**20.6 - 104**	**Qualitative analysis completed for RI indicated that disposed waste may be source for zinc**	**104**	**Maximum Background Concentration**
Total asbestos	**%**	**0.1 - 20**	**NC**	**NC**	**NSL**	**NA**	**Site history**	**25 WHO f/cc in air**	**ESLs for asbestos are not available, however the SLERA indicated a potential for risk from exposure to asbestos in air. The SLERA also indicated risk from exposure to asbestos to the short-tailed shrew using a food-chain model. (SLERA did not evaluate asbestos risk to avian communities as avian toxicity data are not available for asbestos.) A surrogate PRG is proposed for soil. The proposed PRG is the NOAEL TRV for inhalation.**

Site-Related Ecological COCs - Reservoir Sediment

COC	Units	Range of Detections	Hazard Quotient[1]	Hazard Quotient using 95% UCL	Screening Level[5]	Background Range	Rationale for PRG development	Proposed PRG	Rationale for Proposed PRG
Carbon disulfide	**μg/kg**	**4.1 J - 46 J**	**11**	**6**	**4.1**	**ND**	**Insufficient information to eliminate**	**4.1**	**ESL**
Total asbestos	**%**	**0.1 - 0.5**	**0.1**	**NC**	**5 (Endrin)**	**NA**	**Site history**	**0.0001 MFL in Reservoir surface water**	**Although there were no detections above the screening level, a surrogate PRG is proposed for Reservoir sediment based on the risk to ecological receptors that may occur from exposure to asbestos in surface water that may be released from Reservoir sediment. The surface water ESL is proposed as the PRG.**

Notes:
Bolded contaminants indicate the COPC is a proposed COC for the respective media and receptor type.
1. Hazard Quotient based on maximum concentration and reported in the SLERA of the *Final Remedial Investigation Report, BoRit Asbestos Superfund Site, Operable Unit 1, Ambler, Pennsylvania* (CDM Smith 2013).
2. Primary Screening Value. USEPA Ecological Soil Screening Levels (Eco-SSLs). 2005 https://www.epa.gov/risk/ecological-soil-screening-level-eco-ssl-guidance-and-documents
3. Secondary Screening Values. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. U.S. DOE 1997b.
Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. U.S. DOE 1997a.
4. Tertiary Screening Values. USEPA Region 5 RCRA Ecological Screening Levels. 2003. http://epa.gov/region05/waste/cars/pdfs/ecological-screening-levels-200308.pdf.
5. USEPA Region III Freshwater Sediment Screening Benchmarks. 2006. https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_sediment_benchmarks_8-06.pdf

% - percent
μg/kg - microgram per kilogram
μm - micrometer
ABS - activity-based sampling
ACM - asbestos-containing material
COC - contaminant of concern
COPC - contaminant of potential concern
ESL - ecological screening level
f/cc - fibers per cubic centimeter
HI - Hazard Index
HQ - Hazard Quotient
J - Analyte present. Reported value may not be accurate or precise.
MCL - Maximum Contaminant Level
MFL - million fibers per liter
mg/kg - milligram per kilogram
NA - not applicable
NC - not calculated
ND - not detected
NE - not evaluated
ng/kg - nanogram per kilogram
NOAEL - no observed adverse effect level
NSL - no screening value
PCME - phase contrast microscopy equivalent
PRG - Preliminary Remediation Goal
RCRA - Resource Conservation and Recovery Act
RI - Remedial Investigation
s/cc - structures per cubic centimeter
SLERA - Screening Level Ecological Risk Assessment
TRV - toxicity reference value
UCL - upper confidence level
USEPA - United States Environmental Protection Agency
WHO - World Health Organization

Table 4
Target Media, Contaminants of Concern, and Preliminary Remediation Goals
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Contaminant	PRGs				Basis
Soil/Waste					
	Soil	Air (ABS)	Air (Ambient)		
Asbestos		0.04 f/cc (ABS)(PCME)	0.001 f/cc (PCME)		Human Health Protection
Asbestos			25 f/cc (WHO)		Ecological Protection; NOAEL TRV
Bis(2-ethylhexyl)phthalate	925 µg/kg				Ecological Protection; ESL
Dioxins and Furans	0.199 ng/kg				Ecological Protection; ESL
Chromium	26 mg/kg				Ecological Protection; ESL
Nickel	38 mg/kg				Ecological Protection; ESL
Zinc	104 mg/kg				Ecological Protection; Maximum background concentration
Reservoir Sediment					
Contaminant	**PRGs**				**Basis**
	Reservoir Sediment	Air (ABS)	Air (Ambient)	Reservoir Surface Water	
Asbestos				0.0001 MFL	Ecological Protection; ESL
Carbon Disulfide	4.1 µg/kg				Ecological Protection; ESL

Notes:

1. Asbestos is the dominant environmental concern and primary risk driver at the BoRit Site. PRAOs are focused on preventing release of asbestos from source material and preventing exposure to asbestos in both source material and primary exposure media. The remaining contaminants in the table are likely attributed to source material or past activities at the Site and the remedial action proposed to address asbestos in source material will address these additional contaminants as well. Although the HHRA and SLERA proposed additional COPCs, including COPCs for groundwater, surface water, and seep water beyond those listed above, those remaining COPCs were not included because they are not considered to be related to past Site activities (i.e., they come from off the Site or occur naturally at elevated levels in the soil) or they no longer occur at concentrations of concern.
2. Groundwater, surface water, and seep water are not proposed as target media. The RI data suggest that the presence of ACM and other contaminants in soil has not resulted in a Site-related groundwater contaminant plume or location with levels above the MCL of 7 MFL. Additionally, although PAHs were found above soil RSLs in many samples, they were not detected in the upper bedrock aquifer, and only one SVOC, bis(2-ethylhexyl)phthalate, was detected in groundwater at concentrations above the RSL. The detections of bis(2-ethylhexyl)phthalate above the RSL were limited to samples collected from MW-02, MW-05, and MW-06 in the first round of sampling conducted in 2010. Bis(2-ethylhexyl)phthalate was not detected in any of the three subsequent rounds of sampling completed at these wells in 2013. While Mn has been detected frequently in groundwater samples collected at the Site, the occurrence of concentrations above a risk-based cleanup level in filtered samples has limited to MW-03 and MW-06. The potentiometric surface at the Site does not suggest that the Mn exceedances in these two wells are connected and constitute a plume. It should be noted that Mn is a secondary contaminant meaning that the risk-based cleanup level for Mn is non-enforceable and based on aesthetic considerations such as taste, color, and odor. Finally, Mn does not appear to be related to historical Site activities.
3. Even though asbestos was not detected at levels that potentially posed a risk in the SLERA, the Reservoir bench study (discussed in CSM section of the Proposed Plan and in detail in the RI Addendum) demonstrated that Reservoir surface water is directly affected by the Reservoir sediment. Therefore, EPA used a conservative approach and assumed that asbestos is also a potential ecological risk in Reservoir sediment.

µg/kg - micrograms per kilogram
ABS - activity-based sampling
ACM - asbestos-containing material
COPC - contaminant of potential concern
CSM - conceptual site model
ESL - ecological screening level
f/cc - fibers per cubic centimeter
HHRA - Human Health Risk Assessment
MCL - maximum contaminant level
MFL - million fibers per liter
mg/kg - milligrams per kilogram
Mn - manganese
ng/kg - nanograms per kilogram
NOAEL - no observed adverse effect level
PCME - phase contrast microscopy equivalent
PRAO - preliminary remedial action objective
RI - Remedial Investigation
SLERA - Screening Ecological Risk Assessment
TRV - toxicity reference value
WHO - World Health Organization

Table 5
Estimated Quantity of Contaminated Soil, Waste, Reservoir Sediment, and Reservoir Surface Water
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

	Remediation Zones					
	Park (Soil & Waste)	**Asbestos Pile (Soil & Waste)**	**Reservoir Berm (Soil & Waste)**	**Reservoir Bottom (Waste & Sediment)[2]**	**Stream Banks**	**Total (Soil, Waste, Sediment)**
Dimensions and Volume of Clean Topsoil/Fill						
Perimeter (ft):	3,700	2,300	3,300	2,500	9,300	11,800
Surface Area (ft^2):	486,500	244,600	183,500	455,100	80,400	1,450,100
Surface Area (yd^2):	54,056	27,178	20,389	50,567	8,933	161,122
Surface Area (ac):	11	6	4	10	2	33
Clean Topsoil/Fill[1] (cy):	45,000	22,600	17,000	NA	15,800	100,400
Volume of Waste						
Historical Fill[3] (cy):	25,100	27,300	11,600	NA	NA	64,000
Waste/Sediment[4,5] (cy):	214,200	129,700	18,100	126,900	(3,500) [8]	488,900
Residual Contamination (cy):	18,000 [6]	9,100 [6]	6,800 [6]	NA	3,500 [9]	37,400
Total[7] (cy):	257,300	166,100	36,500	126,900	3,500	590,300

Notes:

1. Topsoil/clean fill is defined as fill and topsoil placed by the EPA Removal Program during the Removal Action and assumed to be unimpacted by COCs. An average depth of two feet of clean fill and six inches of topsoil was assumed for estimation purposes. It is assumed that this layer will need to be removed and stockpiled for implementation of several alternatives. There is potential that topsoil and fill placed by the EPA Removal Program contacted waste material on site. As a result, details for handling and treating topsoil and fill for certain alternatives will be accounted for during remedial design.
2. The sediment/waste volume for the Reservoir was calculated using bathymetric data collected during the RI, the highest Reservoir stream gauge elevation during the 5 rounds of groundwater synoptics, the bedrock elevations logged in the monitoring wells, and estimated bedrock elevations along the Wissahickon Creek. The total volume includes all sediment down to the estimated top of bedrock in the Reservoir.
3. Volumes of historical fill and waste were estimated using soil boring data collected during the RI.
4. Waste includes ACM and LPW.
5. 12 borings across the three parcels did not penetrate the bottom of the waste layer. The estimated depth to the top of bedrock at these locations was used to estimate the waste volumes.
6. A 1 foot thick cut of native soil with residual contamination was assumed below the greatest encountered depth of historical fill or waste.
7. Unless noted, the total volume for the Site and each remediation zone includes estimated quantities from historical fill, waste/sediment, and residual contamination (1 foot thick cut of native soil with residual contamination).
8. Previously removed during EPA Removal Program bank stabilization work. This volume is not included in the total volume estimated for remediation.
9. For the purpose of developing and comparing remedial alternatives, a volume of native soil containing residual contamination equal to volume of waste removed during EPA Removal Program bank stabilization work was assumed.

ac - acre
ACM - asbestos containing material
cy - cubic yard
COCs - contaminants of concern
ft - feet
ft^2 - square foot
LPW - light process waste
NA - not applicable
RI - Remedial Investigation
yd^2 - square yard

Table 6
Summary of Detailed Analysis for Retained Alternatives
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

Remedial Alternative	Description	*Threshold Criteria*		*Balancing Criteria*					
		Overall Protection of Human Health and the Environment	**Compliance with ARARs**	**Long-Term Effectiveness and Permanence**	**Reduction of Toxicity, Mobility, or Volume through Treatment**	**Short-Term Effectiveness**	**Implementability**	**Present Value Cost (Dollars)**	
WSS1	No Action	**N**	**N**	⓿	⓿	⓿	❺	$	165,000
WSS2	Capping	**Y**	**Y**	❹	⓿	❹	❹	$$$	27,100,000**
WSS3	Excavation and Off-Site Disposal	**Y**	**Y**	❺	⓿	❷	❷	$$$$$$	269,000,000
WSS4	In Situ Joule Heating	**Y**	**Y***	❹	❹	❸	❶	$$$$$$	257,000,000
WSS5	Excavation, On-Site Ex Situ TCCT, and On-Site Disposal	**Y**	**Y***	❺	❺	❷	❶	$$$$$$	267,000,000

Notes:

1. Threshold Criteria must be satisfied by the remedial alternative being considered as the preferred alternative (unless an ARAR waiver is granted). Alternatives are rated either "Yes" or "No" as to whether the threshold criterion is met.
2. The numerical designations for qualitative ratings used in this table are not used to quantitatively assess remedial alternatives (for instance, individual rankings for an alternative are not additive).
3. Detailed analysis cost estimates for each alternative are provided in the Feasibility Study Report and are expected to achieve an accuracy range of -30 percent to +50 percent.

ARAR - applicable or relevant and appropriate requirements

TCCT - Thermo-chemical conversion technology

* With the qualifier that if pilot studies indicate that flood zone-related ARARs cannot be met, an ARAR waiver or an appropriate variance, if available, would need to be employed.

** The estimated total for the capping alternative ($27.1M) includes the following components: $25.2M incurred capital costs for capping work completed by the removal action through October 2016; $0.3M to be incurred for removal action work to be completed between October 2016 and completion; and approximately $1.6M to finalize the remedial action. the selected remedial action for the Site. Incurred and to be incurred costs are summarized in the table below.

For WSS2 Capping	
Estimated Total Costs That Will be Incurred by Removal Action when Capping Remedy is Completed ($)	$25,500,000
Estimated Costs To Be Incurred by EPA Remedial Program (including Confirmation Sampling, Remedial Action Report, IC & EC, O&M and LTM)	$1,600,000

Threshold Criteria:

Y	Yes
N	No

Balancing Criteria (Excluding Cost):

⓿	None
❶	Low
❷	Low to Moderate
❸	Moderate
❹	Moderate to High
❺	High

Balancing Criteria (Present Value Cost in Dollars):

⓿	None ($0)
$	Low ($0 to $1M)
$$	Low to Moderate ($1M to $10M)
$$$	Moderate ($10M to $50M)
$$$$	Moderate to High ($50M to $100M)
$$$$$	High ($100M to $250M)
$$$$$$	Very High (Greater than $250M)

Table 7
Alternative Specific ARARs for Retained Alternatives
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

ARAR	Legal Citation	Chemical-Specific	Location-Specific	Action-Specific	ARAR Determination	WSS2 *Capping*	WSS3 *Excavation and Off-site Disposal*	WSS4 *In Situ Joule Heating*	WSS5 *Excavation, On-site Ex Situ TCCT, and On-site Disposal*
FEDERAL									
Clean Water Act Effluent Guidelines and Standards	40 CFR § 401.15	✓		✓	Applicable	Remedy would address substantive requirements for asbestos pursuant to section 307 (a)(1) of the Clean Water Act. It is assumed addressing the source material (waste, soil, and Reservoir sediment) would treat other COCs present.	See WSS2	See WSS2	See WSS2
Clean Water Act Stormwater Program	40 CFR § 122.26 (c) and (d)			✓	Applicable	Remedy would meet substantive permit requirements.	See WSS2	See WSS2	See WSS2
Clean Water Act, 404(b)(1) Guidelines	40 CFR § 230.10 (b) (1-2)		✓	✓	Applicable	Site activities would be designed to meet substantive requirements of 40 CFR 230.10 to control discharge of dredged material and fill material into adjacent creeks and streams.	See WSS2	See WSS2	See WSS2
Clean Water Act; NPDES	40 CFR §§ 129.4 and 129.100-105	✓		✓	Applicable	Treatment of surface water pumped from Reservoir would be designed to meet standards for the listed toxic pollutants if present.	See WSS2	See WSS2	See WSS2
Endangered and threatened wildlife and plants	50 CFR §§ 17.11 and .12; 50 CFR 17.95 and .96		✓		Applicable	Site activities and remedy would be designed and implemented in a manner that protects and conserves threatened or endangered species identified on the Site. Threatened species identified on the Site include Red-bellied turtles.	See WSS2	See WSS2	See WSS2
List of Migratory Birds	50 CFR § 10.13		✓		Applicable	Migratory bird species would be expected because the Reservoir is a water fowl preserve. Activities (i.e. FYRs) would be designed to avoid adverse impact to migratory bird species. The remedy would be implemented to avoid adverse impact to migratory bird species and/or their nests.	See WSS2	See WSS2	See WSS2

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BoRit Asbestos Superfund Site
Ambler, Pennsylvania

ARAR	Legal Citation	Chemical-Specific	Location-Specific	Action-Specific	ARAR Determination	WSS2 *Capping*	WSS3 *Excavation and Off-site Disposal*	WSS4 *In Situ Joule Heating*	WSS5 *Excavation, On-site Ex Situ TCCT, and On-site Disposal*
National Ambient Air Quality Standards (NAAQS)	40 CFR § 50.6	✓		✓	Applicable	Fugitive dust control measures would be implemented for any earth disturbance activities to meet substantive primary and secondary ambient air quality standards.	Fugitive dust control measures would be implemented for any excavation and earth disturbance activities to meet substantive primary and secondary ambient air quality standards.	See WSS3. Off-gas treatment would be used to treat the release of particulate matter produced during thermal treatment. Off-gas emissions would meet substantive primary and secondary ambient air quality standards.	See WSS4
Clean Air Act (CAA) NESHAPs - Standard for asbestos waste disposal sites	40 CFR § 61.150	✓		✓	Relevant and Appropriate	Remedy would meet all substantive requirements for soil disturbance activities and handling of material that do not meet the definition of regulated asbestos-containing material (RACM).	See WSS2. Remedy would also meet substantive standards for waste disposal and transportation of ACM.	See WSS2	See WSS2
CAA NESHAPs - Standard for inactive asbestos waste disposal sites	40 CFR § 61.151 (a) and (b)			✓	Relevant and Appropriate	Capping of waste, soil, and Reservoir Sediment, ICs, ECs, and LTM would meet substantive requirements for ACM left in place.	NA	NA	NA
CAA NESHAPs - Air-Cleaning	40 CFR § 61.152			✓	Relevant and Appropriate	Remedy would meet substantive requirements. Appropriate dust control measures would be implemented to control asbestos emissions.	See WSS2	Remedy would meet substantive requirements. Appropriate dust control measures and off-gas treatment would be implemented to control asbestos emissions.	See WSS4
CAA NESHAPs - Standard for conversion of asbestos-containing waste material into non-asbestos (asbestos-free) material	40 CFR 61.155			✓	Relevant and Appropriate	NA	NA	Design of thermal treatment process, off-gas treatment, and system implementation and operation would meet substantive requirements.	See WSS4

Table 7
Alternative Specific ARARs for Retained Alternatives
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

ARAR	Legal Citation	Chemical-Specific	Location-Specific	Action-Specific	ARAR Determination	WSS2 *Capping*	WSS3 *Excavation and Off-site Disposal*	WSS4 *In Situ Joule Heating*	WSS5 *Excavation, On-site Ex Situ TCCT, and On-site Disposal*
Pennsylvania Hazardous Waste Management Regulations PA Code, Title 25, Article VII Pennsylvania has an EPA authorized hazardous waste program; therefore, the EPA authorized hazardous waste regulations are identified here as the applicable Federal hazardous waste standard.	25 PA Code 264a.1 (incorporating by reference 40 CFR Part 264, but limited to the substantive portions of Section 264.18(b)(1))		✓	✓	Relevant and Appropriate	While the Site is not expected to contain RCRA hazardous waste, as defined in 25 PA Code 261a.1, capping and stream stabilization work would be designed, constructed, and maintained to prevent washout and/or accidental release of asbestos.	While the Site is not expected to contain RCRA hazardous waste, as defined in 25 PA Code 261a.1, contaminated waste, soil, and Reservoir sediment would be excavated and disposed off-site to prevent washout and/or accidental release.	While the Site is not expected to contain RCRA hazardous waste, as defined in 25 PA Code 261a.1, contaminated waste, soil, and Reservoir sediment would be treated in situ. Vitrified product would be resistant to washout and/or accidental release.	While the Site is not expected to contain RCRA hazardous waste, as defined in 25 PA Code 261a.1, contaminated waste, soil, and Reservoir sediment would be treated. Vitrified product disposed on the Site would be resistant to washout and/or accidental release.
	25 PA Code 264a.1 (incorporating by reference 40 CFR Part 264, but limited to the substantive parts of Sections 264.19, .95, .96(a), .96(c), .97, .98, .99, .111, .114, .117, and .310)			✓	Relevant and Appropriate	Appropriate monitoring programs would be conducted (i.e. confirmation sampling and LTM) to monitor waste, soil, and Reservoir sediment capped in place.	NA	NA	NA
	25 PA Code 264a.1 (incorporating by reference 40 CFR Part 264, but limited to the substantive parts of Section 264.301, .310)			✓	Relevant and Appropriate	Capping design and remedy implementation would be conducted to meet substantive design and operating requirements (40 CFR 264.301) and closure/post-closure requirements (40 CFR 264.310) for landfills.	NA	NA	NA
	25 PA Code 264a.1 (incorporating by reference 40 CFR Part 264, but limited to the substantive parts of Sections 264.343, .344, .345, .347, .351)			✓	Relevant and Appropriate	NA	NA	NA	If hazardous waste is present within material to be treated via thermo-chemical conversion technology; process would need to meet substantive requirements for waste analysis, performance standards, and monitoring and inspections for hazardous waste incinerators.

Table 7
Alternative Specific ARARs for Retained Alternatives
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

ARAR	Legal Citation	Chemical-Specific	Location-Specific	Action-Specific	ARAR Determination	WSS2 *Capping*	WSS3 *Excavation and Off-site Disposal*	WSS4 *In Situ Joule Heating*	WSS5 *Excavation, On-site Ex Situ TCCT, and On-site Disposal*
Pennsylvania Hazardous Waste Management Regulations PA Code, Title 25, Article VII (cont'd)				✓	Relevant and Appropriate	If hazardous waste is present within the source material on the Site, use of corrective action management units and/or staging piles required to implement the remedy will follow substantive requirements specified in 40 CFR 261.552 and .554.	See WSS2	See WSS2	See WSS2
	25 PA Code 262a.10 (incorporating by reference 40 CFR Part 262, but limited to the substantive parts of Sections 262.11 and .34)			✓	Relevant and Appropriate	NA	If hazardous waste is identified in the excavated material, the substantive requirements for hazardous waste determination and pre-transport requirements for hazardous waste generators would be followed during excavation, transportation, and disposal of waste, soil, and Reservoir sediment in a permitted landfill. Asbestos is not considered hazardous under RCRA.	NA	The substantive hazardous waste determination requirements would be followed during excavation, TCCT treatment, and disposal of treated, inert material on the Site if hazardous waste is identified. Asbestos is not considered hazardous under RCRA.
	25 PA Code 268a.1 (incorporating by reference 40 CFR Part 268, but limited to the substantive parts of Sections 268.40, .48, .49, and .50)			✓	Relevant and Appropriate	NA	Remedy would meet the substantive LDR requirements and treatment standards for disposal of RCRA hazardous waste if identified on the Site. Asbestos is not identified as hazardous waste under RCRA.	NA	See WSS3
RCRA Subtitle D Nonhazardous Waste Management Standards	40 CFR §§ 257.3-1(a), 3-2(a)(b), 3-3(a-c), 3-4(a), 3-6(a), 3-7(a-b), 3-8(a)(b)(d)			✓	Applicable	NA	Remedy would meet substantive requirements for handling of non-hazardous waste during excavation and disposal.	NA	Remedy would meet substantive requirements for handling of non-hazardous waste during excavation and treatment.

Table 7
Alternative Specific ARARs for Retained Alternatives
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

ARAR	Legal Citation	Chemical-Specific	Location-Specific	Action-Specific	ARAR Determination	WSS2 *Capping*	WSS3 *Excavation and Off-site Disposal*	WSS4 *In Situ Joule Heating*	WSS5 *Excavation, On-site Ex Situ TCCT, and On-site Disposal*
STATE									
Act 2 Site-specific Standards	25 PA Code Chapter 250, Subchapter D (§§ 250.402, .403, .406, .407, .410)	✓			Relevant and Appropriate	Remedy would meet site-specific standards to protect human health and the environment, if more stringent than federal standards.	See WSS2	See WSS2	See WSS2
Act 2 Statewide Health Standards for Soil	25 PA Code Chapter § 250.305	✓			Relevant and Appropriate	Remedy would meet health standards if more stringent than federal standards. Waste, soil, and Reservoir sediment would be capped.	Remedy would meet health standards for soil, if more stringent than federal standards, through excavation and disposal of waste, soil, and Reservoir sediment off of the Site.	Remedy would meet health standards for soil, if more stringent than federal standards, through thermal treatment of waste, soil, and Reservoir sediment.	Remedy would meet health standards for soil, if more stringent than federal standards, through thermal treatment of waste, soil, and Reservoir sediment.
Act 2 Statewide Health Standards for Surface Water	25 PA Code Chapter § 250.309	✓			Relevant and Appropriate	Surface water standards would be met, if more stringent than federal standards, through capping of the source material (waste, soil, and Reservoir sediment) and ICs.	Surface water standards would be met, if more stringent than federal standards, through excavation and off-site disposal of the source material (waste, soil, and Reservoir sediment) and ICs.	Surface water standards would be met, if more stringent than federal standards, through thermal treatment of the source material (waste, soil, and Reservoir sediment) and ICs.	See WSS4
Air Quality Regulations	25 PA Code Chapters §§ 121.7, 123, 124, 135, 137, 139			✓	Applicable	Substantive requirements would be met through dust control measures.	See WSS2	Substantive requirements would be met through dust control measures and off-gas treatment.	See WSS4.
Construction, Modification, Reactivation, and Operation of Sources	25 PA Code §§ 127.201(c)(f)(g), .203, .204, .218(a)(4), .218(m-o)			✓	Applicable	Remedy would meet substantive requirements. Remedy would implement dust control measures.	See WSS2	Remedy would meet substantive requirements. Remedy would implement dust control measures and off-gas treatment.	See WSS4.
Erosion and Sediment Control Regulations	25 PA Code §§ 102.4, .11(a), .14, .22			✓	Applicable	E&S measures for construction and post-construction stormwater would be implemented to meet substantive requirements.	See WSS2	See WSS2	See WSS2

Table 7
Alternative Specific ARARs for Retained Alternatives
BoRit Asbestos Superfund Site
Ambler, Pennsylvania

ARAR	Legal Citation	Chemical-Specific	Location-Specific	Action-Specific	ARAR Determination	WSS2 *Capping*	WSS3 *Excavation and Off-site Disposal*	WSS4 *In Situ Joule Heating*	WSS5 *Excavation, On-site Ex Situ TCCT, and On-site Disposal*
Hazardous Substance List	34 PA Code Part 323, Appendix A	✓			Applicable	Asbestos is listed as an environmental hazard. ACM would be capped and subject to regulatory study.	ACM would be excavated and disposed off of the Site.	ACM would be treated. Asbestos would no longer be present on the Site.	See WSS3
Pennsylvania Water Quality Standards	25 PA Code §§ 93.4a(b-d), .4c(b)(1)(i), .6, .7(a), .8a(d)(e), .8a(b), .8c(a), .9f	✓		✓	Applicable	Remedy and activities on the Site would be designed to prevent contaminant migration that could impact water quality of Wissahickon Creek.	See WSS2.	See WSS2. In situ Joule Heating could impact water quality criteria specifically temperature criterion.	See WSS2

Notes:
µm - micrometer
ACM - asbestos-containing material
ARAR - Applicable or Relevant and Appropriate Requirement
CAA - Clean Air Act
CFR - Code of Federal Regulations
COC - contaminant of concern
EC - engineering control
E&S - erosion and sediment
FYR - five-year review
IC - institutional control
LDR - Land Disposal Restrictions
LTM - long-term monitoring
MFL - million fibers per liter
MSC - Medium-Specific Concentrations
NA - not applicable
NAAQS - National Ambient Air Quality Standards
NESHAP - National Emission Standards for Hazardous Air Pollutants
NPDES - National Pollutant Discharge Elimination System
RACM - regulated asbestos-containing material
RCRA - Resource Conservation and Recovery Act
TCCT - Thermo-chemical Conversion Treatment
TSD - Treatment, Storage, and Disposal
TSDF - Treatment, Storage, and Disposal Facilities