PROPOSED PLAN

FORMER FRANKFORD ARSENAL – AREA II
PHILADELPHIA, PENNSYLVANIA
UNITED STATES ARMY CORPS OF ENGINEERS

*This **Proposed Plan** was prepared to satisfy Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**. This Proposed Plan explains the history of the Former Frankford Arsenal (FFA) Area II ("the site") and the type and extent of contaminants associated with former Department of Defense activities at the site. The primary purpose of the Proposed Plan is to summarize the cleanup alternatives evaluated for the site and to identify the preferred alternative selected by the United States Army Corps of Engineers (USACE), the lead agency for site activities, in consultation with the Pennsylvania Department of Environmental Protection (PADEP), the support agency. Consistent with CERCLA, USACE and PADEP encourage the public to participate in development of the cleanup plan. Public comment is invited on all of the alternatives identified in this Proposed Plan. Note that terms shown in **bold** lettering are defined in the Glossary.*

1.0 INTRODUCTION AND PURPOSE

FFA Area II, which is located in Philadelphia, Pennsylvania (**Figure 1**), is managed under the **Defense Environmental Restoration Program for Formerly Used Defense Sites**, administered by USACE. Work at the site is being completed consistent with CERCLA and the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP**). The Proposed Plan is being issued by USACE as part of its public participation responsibilities under Section 300.430(f)(2) of the NCP. The USACE, in consultation with PADEP**,** is proposing a cleanup plan to address the potential risk to human health and the environment associated with the **contaminants of concern (COCs)**, which include lead, benzo(a)pyrene (a **polycyclic aromatic hydrocarbon [PAH]**), and Aroclor 1260 (a **polychlorinated biphenyl [PCB]**). These COCs are present in soil at six **areas of concern (AOCs)**. This Proposed Plan summarizes three cleanup alternatives evaluated for this site and identifies the preferred cleanup alternative selected for each AOC.

This Proposed Plan includes the following sections:

- Site Background (Section 2)
- Scope and Role of the Response Action (Section 3)
- Summary of Site Risks (Section 4)
- Remedial Action Objectives (Section 5)
- Summary of Cleanup Alternatives (Section 6)
- Evaluation of Cleanup Alternatives (Section 7)
- Preferred Cleanup Alternatives (Section 8)
- Community Participation (Section 9)
- Glossary
- References.

This Proposed Plan summarizes information that can be found in greater detail in the **Remedial Investigation** for the site, dated December 2014 (EA 2014), and the **Feasibility Study**, dated July 2016 (EA 2016). These reports and other historical documents for the site are available to the public in the **Administrative Record** for FFA (see box above for location).

Figure 2 summarizes the process for public participation during development of a cleanup plan. Responses to public comments on this Proposed Plan will appear in a responsiveness summary in the **Decision Document**.

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
1 August – 31 August 2016

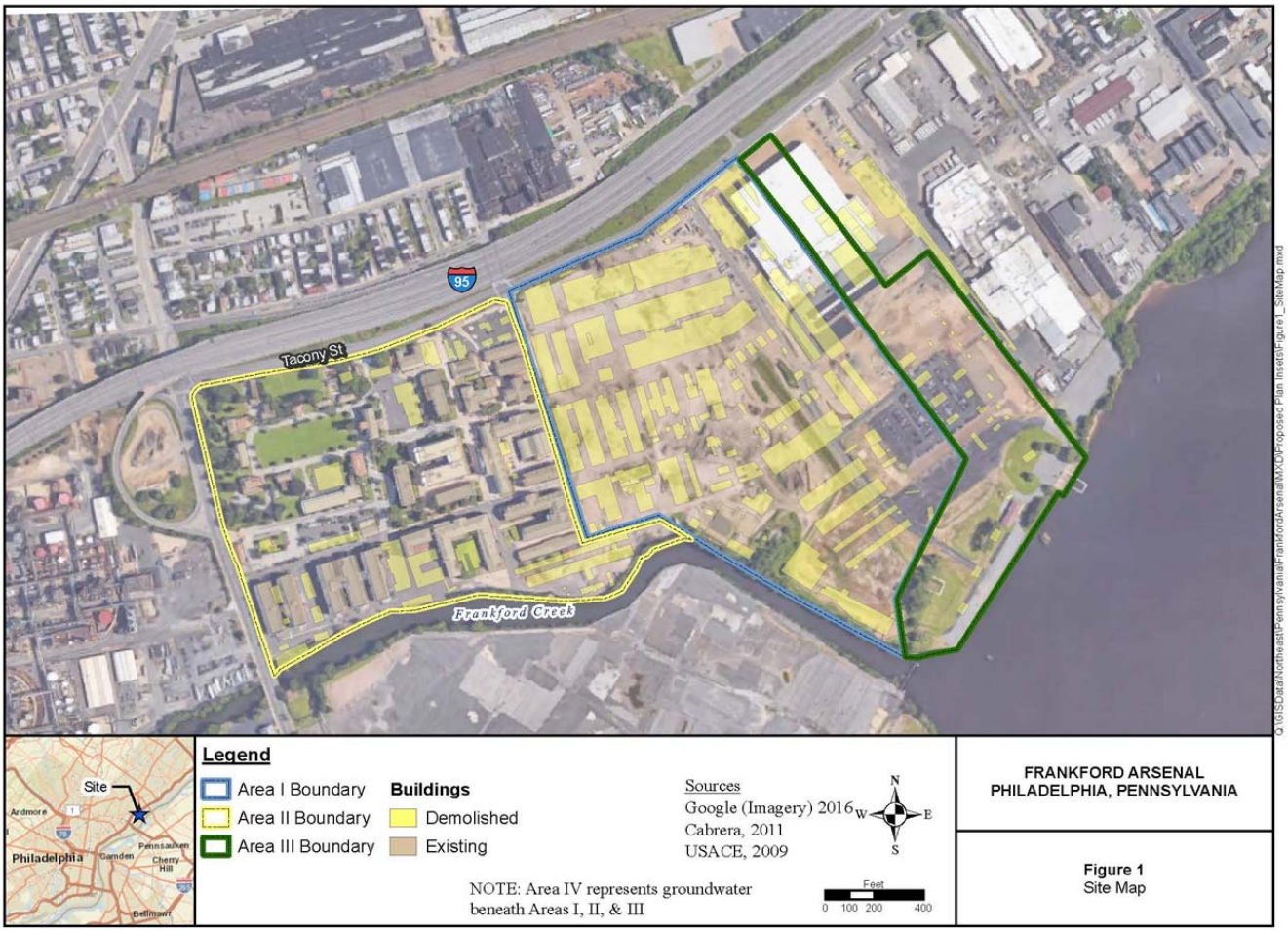
USACE will accept written or oral comments on the Proposed Plan during a 30-day public comment period. Oral comments can be submitted during the public meeting. Written comments should be addressed to:

Mr. Todd Beckwith, Project Manager
U.S. Army Corps of Engineers, Baltimore District
P.O. Box 1715
Baltimore, MD 21203-1715
email: Todd.T.Beckwith@usace.army.mil

PUBLIC MEETING: 18 August 2016

A public meeting will be held to discuss the Proposed Plan for the FFA Area II. The meeting will be held at the Lloyd C. Wilson Jr. American Legion Post 224, 2006 Orthodox Street, Philadelphia, Pennsylvania, from 6 p.m. to 8 p.m. Copies of the Proposed Plan and the presentation will be available at the meeting.

For more information on the Site, see the Administrative Record at the following location:
Frankford Branch of the Free Library of Philadelphia
4634 Frankford Avenue
Philadelphia, Pennsylvania 19124-5804
215-685-1473



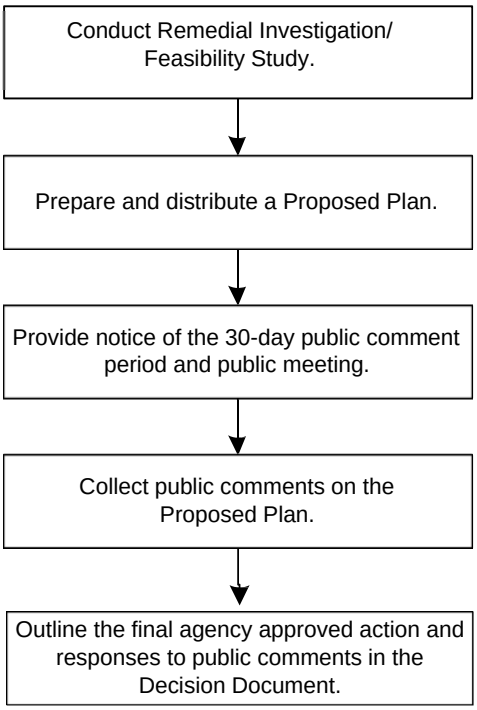


Figure 2: Public Participation Process

2.0 SITE BACKGROUND

2.1 History

The FFA consists of 109.4-acres located in an urban, mixed-use area of northeast Philadelphia, Pennsylvania (**Figure 1**). The main part of the FFA was divided into four areas to facilitate management of investigation and cleanup activities. Three of these areas focus on soil: Area I (47.4 acres owned by Philadelphia Industrial Development Corporation, City of Philadelphia, and Dietz & Watson, consisting of the portion of the site east of Baird Street), Area II (36.9 acres owned primarily by Arsenal Associates, Inc., with a small portion of the area owned by Philadelphia Industrial Development Corporation and consisting of the portion of the site west of Baird Street), and Area III (22 acres owned by the City of Philadelphia and Dietz and Watson). Additionally, groundwater across the entirety of the FFA was designated as Area IV. Area II is the focus of this Proposed Plan.

In 1816, the FFA was commissioned for military use, and in 1976, the FFA was reported excess to the General Services Administration. No large-scale spills, leaks, or disposal of contaminants are known to have occurred during the military use of Area II. However, small-scale releases of contaminants may have occurred from facilities including ordnance manufacturing facilities, laboratories, material storehouses, oil and paint storage areas, garages and machine shops, and electrical substations. Investigations conducted since 1978 have indicated limited contamination of soils with metals, PAHs, and PCBs, as well as groundwater contamination that is being addressed as part of Area IV.

Exhibit 1: Aerial View of FFA Area II circa 1988

In 1981-1983 the General Services Administration assigned the site to the State of Pennsylvania Fish and Boat Commission (21.36 acres) and to the Philadelphia Authority for Industrial Development (87.37 acres), who sold the property to Arsenal Associates, Inc. in 1983. The Arsenal Associates property, identified as Arsenal Business Center, is operated by the Hankin Management Company. During the past 24 years, Hankin Management Company has leased buildings to various tenants. An area of approximately 1 acre in the southeast corner of Area II was transferred to the Philadelphia Industrial Development Corporation in Spring 2014 as part of a larger land transfer associated with Area I.

The U.S. Army Toxic and Hazardous Materials Agency developed plans to clean up the property for release and unrestricted use in 1979. Rockwell International conducted cleanup of **radiological contamination** and contamination with explosives and metals, focusing on building components and adjacent soil, in 1980 (Rockwell International 1981). No additional soil cleanup actions have been conducted in Area II. However, periodic investigations and evaluations in Area II have been conducted by Arsenal Associates, USACE, and their consultants, including the remedial investigation (EA 2014), which is described in more detail in Section 2.3. Additional details about the cleanup conducted in 1980 and additional historical investigations in Area II, including documents cited in this Proposed Plan, can be found in the administrative record.

Exhibit 2: View of former ordnance production building

2.2 Physical Description

Area II of the FFA is bounded to the east by Baird Street, to the west by Bridge Street, to the north by Tacony Street, and to the south by Frankford Creek, encompassing approximately 36.9 acres (**Figure 1**). The portion of the FFA identified as Area II currently contains 47 buildings of various sizes, ages, and conditions. An additional 35 buildings that were historically located in Area II have been demolished over the years, creating some open space between buildings. In addition to the buildings, the FFA has a network of underground tunnels formerly used for passage between certain buildings, as well as for utilities (e.g., steam transmission, electrical, natural gas, and storm/sanitary sewer systems).

The FFA is relatively flat and slopes gradually downward from the north to the south toward Frankford Creek and the Delaware River. The FFA contains up to 13 feet of fill material that has been built up over time. This fill consists of cinders, silt, bricks, concrete, wood, sand, silt, and gravel. This fill material is generally less than 5 feet deep in the developed areas of Area II. Silt, sand, clay, and gravel laid down by natural processes is present below the fill material.

Most of Area II is covered with asphalt, concrete, buildings, and other improvements. Manicured lawns are present in the northwestern portion of Area II. This portion of Area II was formerly a housing area and parade ground during military use of the site. Landscaped areas surround the buildings in the housing area and other parts of Area II.

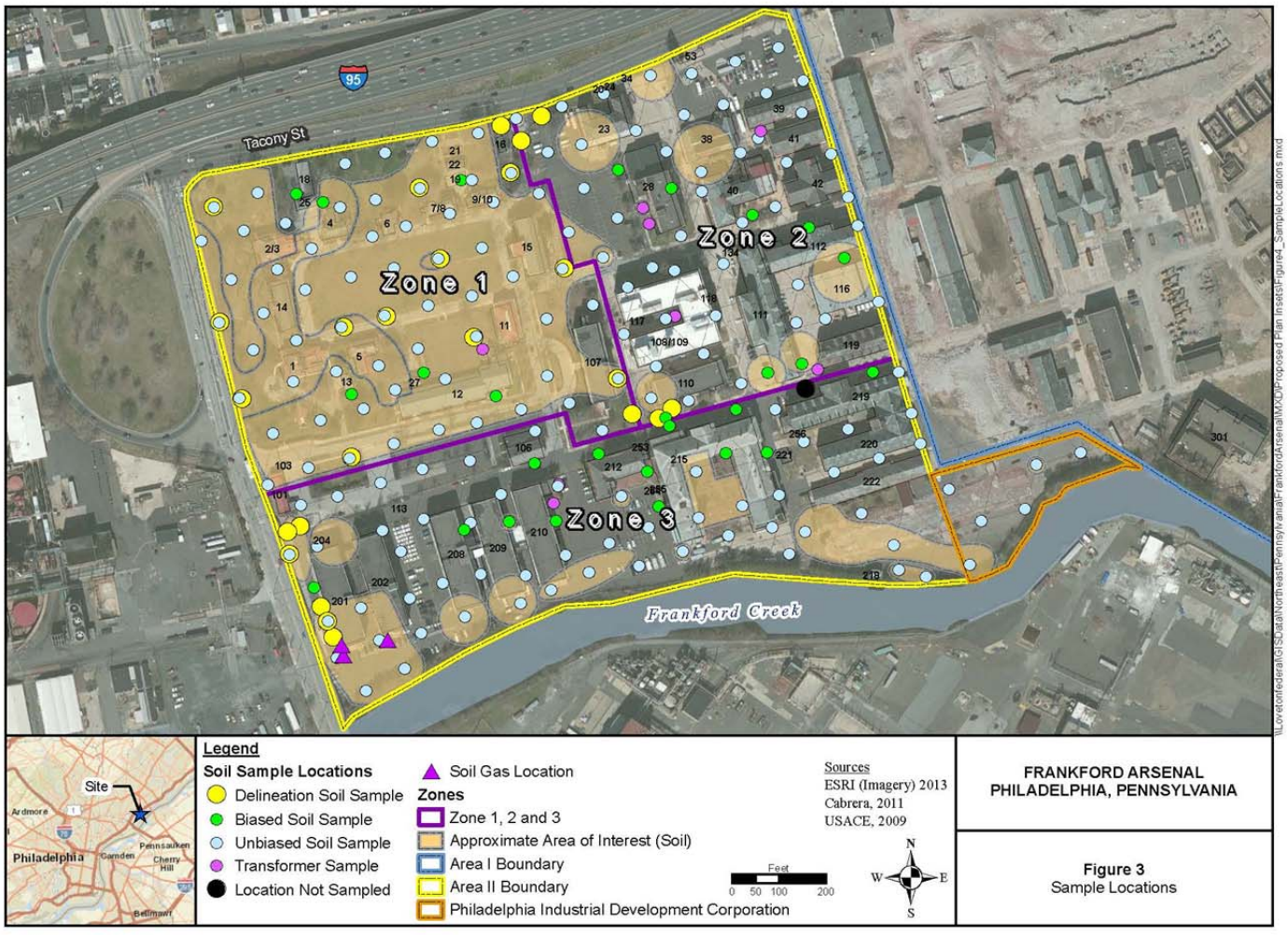
2.3 Site Characteristics

A remedial investigation was conducted between 2011 and 2014 (EA 2014). As part of the investigation, Area II was divided into three zones based on past historical use:

- Zone 1—a mostly residential area in the northwest corner of Area II
- Zone 2—a mostly industrial use area in the northeast corner of Area II that contained research and support operations
- Zone 3— a mostly industrial area next to Frankford Creek that formerly contained ammunition production operations.

The primary goal of the remedial investigation was to assess potential environmental impacts to the FFA resulting from former Department of Defense use of the property. A total of 445 surface and subsurface soil samples were collected to characterize and delineate soil in Zones 1, 2, and 3 of Area II. A set of samples (referred to as unbiased samples) were collected on a set grid across the entire site, and additional samples (referred to as biased samples) were located near potential sources of Department of Defense impact based on a review of historical documentation. Sample locations are shown on **Figure 3**.

Soil samples were analyzed for **volatile organic compounds (VOCs)**, **semivolatile organic compounds**, and metals. Samples collected near electrical substations were evaluated for PCBs.



Sampling data were screened against PADEP **Medium Specific Concentrations (MSCs)** for soil, to identify potential concerns associated with the contaminants present in soil at the site. Analytes that exceeded criteria were identified as COCs.

Metals, primarily lead and arsenic, and PAHs, primarily benzo(a)pyrene, were reported at concentrations greater than MSCs in surface soils (0 to 2 ft bgs) as well as deeper fill materials. VOCs reported at concentrations greater than MSCs, primarily benzene and trichloroethene, were less widespread. PCBs (Aroclor 1260) were detected at a concentration exceeding MSCs in one location in Zone 2.

No source areas or materials that would be expected to act as a reservoir of contamination with the potential to migrate (e.g., to groundwater) have been identified in Area II; therefore, no principal threat wastes have been identified. Principal threat wastes are 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 contamination identified in Area II does not include source materials or principal threat wastes.

Exhibit 3: Collection of soil samples with a direct-push technology drilling rig on the former Parade Ground

3.0 SCOPE AND ROLE OF THE RESPONSE ACTION

As described in Section 2.1, this proposed plan addresses Area II, which is one of four areas at the FFA. The proposed cleanup plan is intended to address all potential risks to human health and the environment that are associated with contaminated soils at Area II within FFA. The cleanup plan presented is intended to be the final cleanup plan for Area II, and does not include or affect any of the other three areas at FFA.

4.0 SUMMARY OF SITE RISKS

This section of the Proposed Plan summarizes the results of the baseline **human health risk assessment (HHRA)** and the **screening-level ecological risk assessment (SLERA)** for Area II. Taking land use into account, the HHRA and SLERA estimate the risks at a site if no cleanup action were taken.

It is USACE's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other cleanup alternatives considered in the Proposed Plan, is necessary to protect public health and the environment from actual or threatened releases of hazardous substances into the environment. The assessments provide the foundation for performing a cleanup by identifying the contaminants that need to be addressed by the cleanup.

HOW IS HUMAN HEALTH RISK CALCULATED?

The HHRA estimates the "baseline risk," which is an estimate of the likelihood of health problems occurring if no cleanup action is taken at a site. A four-step process is used to analyze these risks:

1. Data Evaluation
2. Exposure Assessment
3. Assessment of Potential Health Dangers
4. Risk Characterization.

In Step 1, concentrations of contaminants at the site are compiled and compared to concentrations that are known to affect or to not affect people. During Step 2, potentially exposed human populations and mechanisms of exposure are identified, and the concentrations that people might be exposed to are calculated.

In Step 3, information from Step 2 and information on the toxicity of each chemical are combined to assess potential health risks. For cancer-causing contaminants (i.e., carcinogens), human health risks are generally expressed as the probability of an individual (receptor) developing cancer over a lifetime as a result of exposure to the carcinogen. This is referred to as an "excess lifetime cancer risk". These risks are expressed in scientific notation. For example, an excess lifetime cancer risk of 1×10^{-6} indicates that an individual has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. Based on USEPA guidance, the upper end of the acceptable risk range for carcinogenic chemicals can be interpreted as "on the order of 1×10^{-4}." The potential for toxic non-carcinogenic effects is evaluated by comparing predicted exposure over a specified time period (e.g., life-time) to a "threshold level" (measured usually as a hazard index less than 1), below which harmful effects are not expected.

In Step 4, the likelihood and degree of negative health effects are estimated in the risk characterization step, to determine whether the site presents unacceptable risks that must be addressed through cleanup.

4.1 Baseline Human Health Risk Assessment

The objective of the HHRA was to derive site-specific estimates of exposures and risks to people who may visit, live or work on Area II both now and in the future. The HHRA was conducted in accordance with United States Environmental Protection Agency (USEPA) Risk Assessment Guidance for Superfund Part A (USEPA 1989) and PADEP Remediation Standards.

The current and anticipated future land use in Area II is mixed use, including residential, institutional (school), and commercial. Based on these uses, the following groups potentially exposed to contaminants in Area II were evaluated during the HHRA for each zone (Zones 1, 2, and 3 shown on Figure 3): child and adult residents, trespassers, school students, office/commercial workers, maintenance/landscape workers, construction workers, and daycare students (southeast portion of Zone 3 only).

The results of the HHRA indicated that lead concentrations in soil present concerns for resident children within Zone 1. Each zone was also evaluated to identify any localized areas containing "elevated" contaminant concentrations that may be a concern for human health. The localized areas containing "elevated" contaminant concentrations were identified as areas of concern (AOCs), and are described below.

- AOC 1 was designated based on 16 sample locations within grassy areas of Zone 1 with lead detected at greater than 1,000 **milligrams per kilogram (mg/kg)**, indicating potential concerns for school students and office/commercial workers as well as potential future residents.
- AOC 6 was designated based on a potential concern for future residents' exposure to PCB Aroclor 1260 in one of the transformer areas in Zone 2. The sample location of the maximum detected concentration was in the surface soil adjacent to transformer T-1101 west of Building 28.
- AOC 10 was designated based on two sample locations with lead detected at greater than 1,000 mg/kg within grassy areas of Zone 2.
- AOC 13 was designated based on a potential concern for exposure to benzo(a)pyrene within the southwestern corner of Zone 3. This would be a concern only for potential residential use of this area.
- AOCs 20 and 21 were designated based on five sample locations within Zone 3 with lead detected at greater than 1,000 mg/kg.

Overall, three COCs were identified for soil based on the identification of localized areas containing "elevated" concentrations of lead, benzo(a)pyrene, and Aroclor 1260 (see insert box on next page).

The locations of AOCs are shown on Figure 4. At the time the baseline HHRA was completed, the reasonable anticipated land use for all of AOC 21 was assumed to be residential. However, since the property ownership change described in Section 2.1, a small portion of land (approximately 1 acre) that was once planned for residential use is now owned by the Philadelphia Industrial Development Corporation, and planned for commercial or industrial reuse. The baseline HHRA did not identify an unacceptable risk for the industrial/ commercial land use at AOC 21; therefore, the portion of AOC 21 that is owned by the Development Corporation does not require remedial action and is not being addressed in this Proposed Plan. Figure 4 shows the new boundary of AOC 21. With this change, all AOCs are located on property owned by Arsenal Associates.

4.2 Screening Level Ecological Risk Assessment (SLERA)

A SLERA was performed for Zone 1. Zones 2 and 3 mostly contain buildings and parking lots, with limited areas of grass. These limited grassy areas in Zones 2 and 3 do not provide sufficient areas for many animals to live and thrive. Risks in Zone 1 were determined for land-based plants and invertebrates (e.g., earthworms) and land-based birds (e.g., robins) and mammals (e.g., shrews). Lead is the primary COC in Zone 1 that could

HOW IS ECOLOGICAL RISK CALCULATED?

A SLERA is a screening process that uses conservative assumptions. This process is so conservative that most detected chemicals or metals are often determined to pose potential risk for **ecological receptors**, whereas, more realistic analysis may reveal that many of these chemicals and metals really do not pose a risk. Therefore, a second step of the SLERA process can be performed to using more realistic assumptions and provide a more realistic determination of potential risks to ecological receptors at a site.

An ecological risk assessment estimates the negative effects on the environment as a result of exposure to COPCs. Assessments typically include:

1. Problem formulation: Site information is evaluated to determine the potential for risks to plant and animal populations.
2. Analysis: Types and levels of exposure are determined and assessments are made as to whether the level of exposure is likely to cause harmful effects to plant and animal populations.
3. Risk Characterization: population risks are estimated using exposure profiles and exposure effects, and the level for harmful effects is identified based upon the documented effects for ecological populations (no effect and lowest observed adverse effects).

Finally, using the weight of evidence including the SLERA conclusions, a risk management decision is then made by the stakeholders for the site.

cause negative effects to invertebrates in soil. The assessment of exposed surface soil samples in Zone 1 suggests that high lead concentrations do not represent an unacceptable risk to populations of plants and soil invertebrates, but may represent risk to the robin and shrew due to food web exposure. Based on results of the SLERA, potential risks to robins and shrews were identified in Zone 1 from exposure to lead in surface soils.

5.0 Remedial Action Objectives

In order to develop cleanup alternatives to address contaminated soil at Area II, **Remedial Action Objectives (RAOs)** were developed to provide goals for protecting human health and the environment. The RAOs for Area II soils are:

- Prevent human exposure via direct contact of residential receptors to impacted soil that exceeds the **Preliminary Remediation Goals (PRGs)** (see Section 5.1).
- Eliminate or reduce potential ecological risks associated with exposure of organisms to lead in soil (AOC 1 only).

5.1 Preliminary Remediation Goals

PRGs are contaminant concentration levels that are based on available information such as site-specific **background concentrations**, frequently used standards (**Applicable or Relevant and Appropriate Requirements [ARARs]**), guidance and advisories (**To Be Considered [TBC] guidance**), or concentrations calculated to pose potential risk at a given site. PRGs are in turn used to determine the feasibility of proposed cleanup actions.

The PRGs necessary to obtain the RAO for each COC were identified and developed for soil during the feasibility study process after reviewing ARARs and TBC guidance. The PRGs are summarized as follows:

Lead—Lead is the most prevalent COC in Area II, and it is present in four AOCs (AOC 1, 10, 20 and 21) at levels requiring further action. Consistent with site-specific background concentrations, a PRG of 1,000 mg/kg was selected for lead. Removal of soil lead concentrations greater than 1,000 mg/kg will result in protectiveness of human health.

Benzo(a)pyrene — Benzo(a)pyrene is the COC for AOC 3 in Area II. The background values of 0.9 mg/kg for surface soil and 1.3 mg/kg for subsurface soil for benzo(a)pyrene were selected as the PRGs.

WHAT ARE THE "CHEMICALS OF CONCERN"?

USACE has identified three COCs that pose the greatest potential risk to human health at the site: lead, Aroclor 1260, and benzo(a)pyrene. Lead was also identified as a COC for animals in Zone 1.

Lead, detected in soil at concentrations ranging from 0.81 to 15,600 mg/kg, is a metal commonly associated with paint (pre-1978) and dust from industrial operations. Onsite sources include the production of bullets with a lead core, as well as plating and metallurgical laboratory operations. The FFA is located within a historically industrialized area of Philadelphia; other background sources of airborne lead (such as lead from car or industrial stack emissions or naturally occurring lead in soils) are possible, but not easily individually identifiable.

Benzo(a)pyrene, detected in soil at concentrations ranging from 0.15 to 8.9 mg/kg, is a PAH. PAHs form during the incomplete burning of oil, coal, gas, garbage, wood, or other organic substances (such as charbroiled meat and tobacco). PAHs generally occur as complex mixtures and not as individual compounds. PAHs are used to make dyes, plastics, and pesticides and are contained in asphalt. They can also be found in roofing tar, coal, coal tar pitch, creosote, and crude oil. No single point source for PAHs can be identified because they are so widely used. PAHs are present in the fill material at the site.

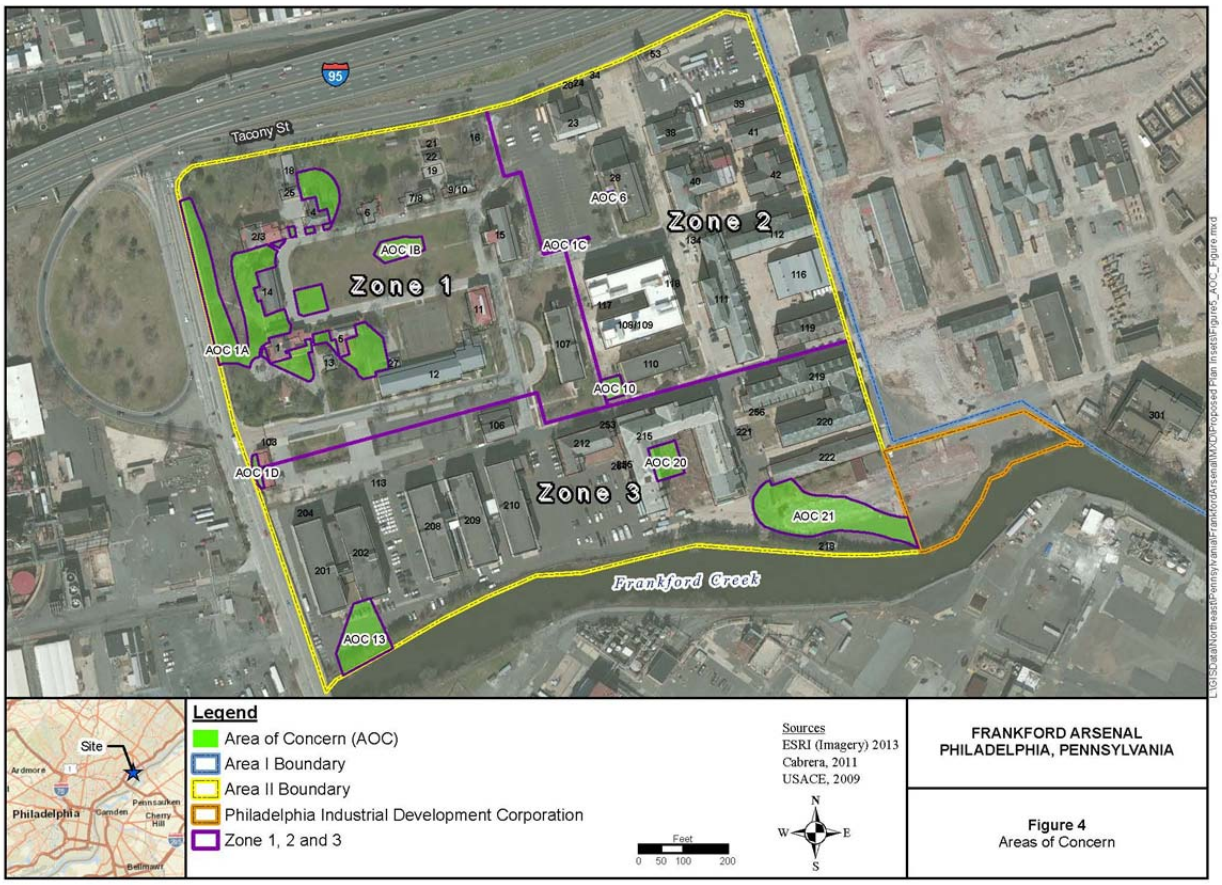
Aroclor 1260, detected in soil at concentrations ranging from 0.23 to 38 mg/kg, is a PCB. PCBs were widely used as lubricants and coolants in electrical equipment, including transformers, because they do not burn easily and are good insulating materials. Their manufacture ceased in the United States in August 1977. Aroclor 1260 in soil at FFA is the likely result of a release from the PCB transformer previously located in the substation.

Aroclor 1260—Aroclor 1260 is the COC for AOC 6 in Area II. A site-specific risk-based PRG of 2.2 mg/kg was selected for Aroclor 1260.

6.0 SUMMARY OF CLEANUP ALTERNATIVES

The following three cleanup alternatives for soil at Area II were identified in the feasibility study (EA 2016) for further analysis:

- Alternative 1 – No Action
- Alternative 2 – Excavation and Disposal
- Alternative 3 – Installation of a Cap and **Future Use Restrictions.**



The alternatives are numbered to correspond with the numbers in the feasibility study report. A brief description of each alternative is provided below. Note that these alternatives do not share any substantial elements in common. Based on the evaluation presented in Section 7, Alternative 2 is preferred for implementation at four of the AOCs in Area II (AOCs 1, 6, 10, 20), while Alternative 3 is preferred for the other two AOCs (AOCs 13 and 21).

6.1 Alternative No. 1 – No Action

The No Action alternative (Alternative 1) is developed to provide a baseline against which the other cleanup alternatives are compared. The No Action alternative includes no cleanup activities or long-term monitoring or maintenance.

Estimated Construction Timeframe: Not Applicable; no construction is included in this alternative.
Estimated Time to Achieve RAOs: Not Applicable; this alternative would not achieve RAOs.

6.2 Alternative No. 2 – Excavation and Disposal

Alternative 2 consists of the excavation and disposal of soil that contains COCs at concentrations exceeding the PRGs. Soils would be removed via excavation and disposed offsite at a permitted landfill capable of containing the COCs. Following excavation and analysis to confirm that PRGs have been met, clean soil would be used to fill the excavation and restore the area to its current ground surface elevation. Implementation of this alternative would require that the property owner provide unhindered access to each AOC. Additional investigations would be required before the cleanup begins, to locate the numerous underground utilities present in each AOC. Additional investigation of contamination at depths greater than 2 feet below the surface soil would also be required at AOC 10, where there is limited analytical data at depth.

The total estimated amount of soil to be excavated for each AOC (based on the area and depth of soils above COCs) is as follows, and costs to excavate this amount of soil from each AOC are summarized in Table 1:

- AOC 1 – 2,038 **bank cubic yards**
- AOC 6 – 62 bank cubic yards
- AOC 10 – 559 bank cubic yards
- AOC 13 – 2,344 bank cubic yards
- AOC 20 – 453 bank cubic yards
- AOC 21 – 7,574 bank cubic yards.

Estimated Construction Timeframe: Less than 6 months.
Estimated Time to Achieve RAOs: Less than 6 months.

6.3 Alternative No. 3 – Installation of a Cap and Future Use Restrictions

Alternative 3 includes installation of a cap at the ground surface, to form a physical barrier that prevents contact with soils exceeding the PRGs. A cap of clean fill covered by topsoil or other cover (such as asphalt) would be installed over soil with COC concentrations greater than the PRGs. Removal of some material from the soil surface could be performed prior to installation of the cap, to allow maintenance of the current ground surface elevation and slope where possible. Installation of a cap on top of the current ground surface, for example in AOCs 1, 10 and 20, would change the ground surface elevations. Because capping would change the ground surface, additional engineering would be required to divert water away from existing historical buildings during times of frequent or large rain. Additional investigations would be required before the cleanup begins, to locate underground utilities present in contaminated soil in each AOC, as utilities may impact cap maintenance activities.

Additionally, because soil COC concentrations greater than PRGs would remain in place, maintenance of the cap would be required to prevent future exposure, and an **environmental covenant** would need to be placed on the deeds of the parcels of land. The covenant would include restrictions, such as a soil management plan and activity use limitations (e.g., restricting digging activities), for the portion of the site where contaminants remain under a cap, to limit exposure to remaining impacted soils. The protectiveness of the cleanup action to human health and the environment would be assessed in 5-year reviews. Since soils exceeding the PRGs would remain, multiple 5-year reviews would be required as long as future uses of Area II remained restricted.

The total estimated area to be capped for each AOC is as follows, and costs to excavate this amount of soil from each AOC are summarized in Table 1:

- AOC 1 – 64,605 square feet
- AOC 6 – 447 square feet
- AOC 10 – 2,417 square feet
- AOC 13 – 1,875 square feet
- AOC 20 – 4,894 square feet
- AOC 21 – 33,053 square feet.

Estimated Construction Timeframe: Less than 6 months.
Estimated Time to Achieve RAOs: Less than 6 months.

7.0 EVALUATION OF CLEANUP ALTERNATIVES

Nine criteria were used to evaluate each of the three cleanup alternatives individually and against each other in order to select a cleanup plan. This section of the Proposed Plan evaluates each alternative against the nine criteria, discussing how each alternative compares to the other alternatives being considered.

The nine evaluation criteria are summarized in a text block on the next page. The "Detailed Analysis of Alternatives" can be found in the feasibility study (EA 2016).

1—Overall Protectiveness of Human Health and Environment

Alternatives 2 and 3 would provide adequate protection of human health and the environment. Alternative 2 will remove soil with COC concentrations exceeding the PRGs, eliminating the unacceptable risk to human health and the environment. Alternative 3 will protect human health and the environment by preventing humans and animals (e.g., robins and shrews) from touching or unintentionally eating soils that have COCs exceeding the PRGs.

Alternative 1 (No Action) would not be protective of human health and the environment because it does not include cleanup activities and therefore does not address potential exposure to contaminated soil. Because it does not meet this criterion, Alternative 1 will not be discussed further in this evaluation of alternatives. Alternatives 2 and 3 would be protective of human health and the environment.

2—Compliance with ARARs

No chemical-specific ARARs were identified. For lead and benzo(a)pyrene, the proposed PRGs, which are protective of human health, are equivalent to site specific background concentrations. For PCB Aroclor 1260, the site-specific risk-based PRG was determined to be most appropriate. No location- or action-specific ARARs were identified.

For Alternatives 2 and 3, meeting the PADEP MSC TBC criteria for lead and benzo(a)pyrene is technically impractical from an engineering perspective (i.e., not feasible to cleanup below background concentrations). However, Act 2 also allows for Background or Site-Specific Standards to be demonstrated; removal to PRGs will allow these alternate Act 2 levels to be achieved. Alternatives 2 and 3 would meet the PADEP MSC for PCB Aroclor 1260, as the MSC is greater than the site-specific risk-based PRG.

3—Long-Term Effectiveness and Permanence

Alternatives 2 and 3 would promote achievement of all RAOs, although there is a level of uncertainty associated with the **effectiveness** of Alternative 3. The COC removal under Alternative 2 is a permanent solution for addressing the COCs at Area II. For Alternative 3,

effectiveness would depend on maintenance to ensure that the cap remains in good condition to prevent contact with contamination. The magnitude of risk is low for Alternative 2 and moderate for Alternative 3.

Overall, Alternative 2 would be the most effective and permanent option for achieving the RAOs at Area II, followed by Alternative 3.

4 - Reduction of Toxicity, Mobility, or Volume through Treatment

None of the proposed alternatives permanently destroy or reduce the toxicity of hazardous materials, although they would remove the materials from the site or minimize exposure to them. Mobility of the COCs is reduced under Alternatives 2 and 3. The statutory preference is for treatment of hazardous materials as the principle element; however, this is not a component of any of the proposed alternatives.

5—Short-Term Effectiveness

Alternative 2 would have the most potential short-term negative effects on workers, the surrounding community, and the environment because it is the most invasive and would include removal and transportation of contaminated soil. Air monitoring (specifically for dust), noise controls, and traffic controls would be implemented to minimize impacts to the surrounding community. Alternative 3 would create fewer negative effects on workers, the community, and the environment because only small amounts of contaminated soil would be removed while capping each area.

Alternative 2 would meet the objective for protection of human health when excavation is complete, and Alternative 3 would meet the objective as soon as additional restrictions are in place. Therefore, the RAOs are expected to be met within a year of implementation under either of these alternatives.

Overall, Alternative 3 would have the best short-term effectiveness, followed by Alternative 2.

6—Implementability

Both Alternatives 2 and 3 would be implementable at the site. Alternative 2 relies primarily on proven and reliable technologies and standard equipment. Implementing Alternative 2 may require scheduling soil excavation for specific AOCs during times when the onsite schools are not in session and possibly relocating underground utilities. Alternative 2 is less implementable for AOCs with contaminated soil that is deeper below the ground surface, which would require deeper excavations. Alternative 3 is less implementable for historical areas that are not already covered in concrete or asphalt, where considerations must be made in changing the appearance, including the height and slope of the ground surface. In these areas, a cap could raise the height of the ground surface and would require engineering to divert water away from existing historical buildings. For AOCs that are already covered by a hard surface such as concrete or asphalt (AOC 13 and 21), Alternative 3 is highly implementable. Both Alternatives 2 and 3 would require additional investigations before the cleanup could begin. Alternative 3 would also require long-term maintenance for the cap to remain reliable in the long term.

Overall, Alternatives 2 and 3 would be the most implementable. Alternative 3 would be somewhat less implementable overall, particularly for areas with shallow contamination that is more easily excavated.

SUMMARY OF NCP EVALUATION CRITERIA

Overall Protectiveness of Human Health and the Environment –alternatives are assessed to determine whether they can adequately protect human health and the environment, in both the short-and long -term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site.

Compliance with ARARs –alternatives are assessed to determine whether they attain requirements under federal and state environmental laws that pertain to the site; if not, a waiver must be justified.

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

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

Short-Term Effectiveness –considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

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

Cost – includes the estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of plus or minus 50 percent.

State/Support Agency Acceptance –considers the acceptance of the state or support agency of the preferred alternative.

Community Acceptance –considers the acceptance of the community of the preferred alternative.

Table 1: Alternative Cost Comparison by Area of Concern

		AOC 1	AOC 6	AOC 10	AOC 13	AOC 20	AOC 21
Alternative 2	**Capital Cost**	$832,000	$129,000	$293,000	$1,376,000	$239,000	$2,407,000
	Annual O&M Cost	$0	$0	$0	$0	$0	$0
	Total Cost	**$832,000**	**$129,000**	**$293,000**	**$1,376,000**	**$239,000**	**$2,407,000**
Alternative 3	**Capital Cost**	$708,000	$115,000	$132,000	$25,000	$290,000	$414,000
	Annual O&M Cost	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
	Total Cost	**$829,000**	**$235,000**	**$253,000**	**$146,000**	**$290,000**	**$534,000**

7 – Cost

The costs are approximate and are primarily used for comparison purposes. Estimated **capital costs**, **operations and maintenance (O&M) costs**, and total costs (as adjusted for **present worth** over the specified time periods) of the alternatives are summarized in **Table 1**.

8 – State/Support Agency Acceptance

PADEP is the State regulatory agency. USACE has coordinated with PADEP during the remedial investigation/feasibility study process and during identification of remedial action alternatives, including the preferred alternative, for the site. State acceptance will be fully addressed in the Decision Document after all public comments are received.

9 – Community Acceptance

Community acceptance of the preferred alternative will be evaluated based on comments received during the public comment period and the public meeting. All comments will be considered, and significant comments will be described and addressed in the responsiveness summary. The responsiveness summary is included in the Decision Document, which presents the selected cleanup alternative. In light of the comments received, USACE may change a component of the preferred alternative, select another alternative, or select a "new" alternative. If the basic features of the new cleanup alternative are significantly different from what could have been reasonably anticipated from this Proposed Plan, USACE will seek additional public comment on a revised Proposed Plan.

8.0 PREFERRED ALTERNATIVE

As described above, Alternatives 2 and 3 would protect human health and the environment, and are also the most effective and implementable alternatives. However, the implementability and cost comparison between these two alternatives varies somewhat by AOC; therefore, the preferred alternative for each individual AOC is presented below (the primary COC at each AOC is indicated in parentheses). For each AOC, the preferred alternative is consistent with planned future use of the AOC vicinities.

AOC 1 (Lead)

Alternative 2 is the preferred alternative because excavation of contaminated soil is the most effective and permanent cleanup technology. This alternative is also the most implementable, because no future use restrictions, O&M, or 5-year reviews would be required, and because contaminated soils in AOC 1 are shallow (less than 1 foot below ground surface) and therefore easily excavated. The next most effective and permanent alternative is Alternative 3, which would cap the contaminated soils, and thus eliminate the direct contact pathway. However, a cap is less implementable because it would result in the changes to the elevation of areas exceeding the PRGs, and would therefore require additional engineering controls. This is not favorable in the context of the historical setting and future use.

AOC 6 (PCB Aroclor 1260)

Alternative 2 is the preferred alternative because excavation of contaminated soil is the most effective and permanent cleanup technology. This alternative is also the most implementable, because no future use restrictions, O&M, or 5-year reviews would be required, and because contaminated soils in AOC 6 are shallow (less than 3 feet below ground surface) and therefore easily excavated. Additionally, the cost of implementing Alternative 2 at AOC 6 is less than the cost of implementing Alternative 3.

AOC 10 (Lead)

Alternative 2 is the preferred alternative because excavation of contaminated soil is the most effective and permanent cleanup technology. This alternative is also the most implementable, because no future use restrictions, O&M, or 5-year reviews would be required, and because contaminated soils in AOC 6 are shallow (less than 5 feet below ground surface) and therefore easily excavated. The costs for Alternative 2 are somewhat higher than Alternative 3; however, the limited knowledge of how deep contamination extends in soil in this AOC may result in an over estimation of soil with concentrations above the PRG; therefore, costs for Alternative 2 may be less than currently calculated.

AOC 13 (Benzo(a)pyrene)

Alternative 3 is the preferred alternative because capping is the most implementable cleanup technology for this AOC. Areas of the AOC that exceed the PRG are located in soils underneath an existing asphalt paving (2 to 4-in.) and concrete (at least 8 in.) cover. This covering is present on most areas of the AOC. In order to excavate soil from under the asphalt and concrete, these surfaces would need to be removed and then replaced following excavation. In addition, utilities that traverse this area would need to be supported or rerouted. As such, the costs for implementing Alternative 3 at AOC 13 are also much lower than the costs for implementing Alternative 2. Given the thickness of the asphalt and concrete and future use of AOC 13, it is not likely that they will be removed other than to access existing underground utilities. Accessing underground utilities in AOC 13 would not expose residential receptors.

AOC 20 (Lead)

Alternative 2 is the preferred alternative because excavation of contaminated soil is the most effective and permanent cleanup technology and because this alternative is less costly than Alternative 3 for AOC 20. This alternative is also the most implementable, because no future use restrictions, O&M, or 5-year reviews would be required, and because contaminated soils in AOC 20 are shallow (less than 2 feet below ground surface) and therefore easily excavated.

AOC 21 (Lead)

Alternative 3 is the preferred alternative based on cost. A portion of the soils that exceed the PRG are currently located underneath an existing cap of asphalt paving, minimizing the potential for humans to contact the contaminated soil. The need to cap portions of the AOC not covered in asphalt (already covered in fill/building rubble) would be evaluated. As described in Section 4.1, the boundary of AOC 21 proposed for cleanup is different than the boundary identified in the Remedial Investigation Report and Feasibility Study Reports, due to a change in planned reuse for the easternmost portion of AOC 21. Since the baseline HHRA determined that there was no unacceptable risk for the industrial or commercial use of this AOC, no remedial action is required on the easternmost portion of the AOC, which is now planned for commercial/ industrial reuse.

Based on information currently available, USACE believes the Preferred Alternative for each AOC would be protective of human health and the environment, would be cost-effective, and would utilize permanent solutions to the maximum extent practicable.

The Preferred Alternative for each AOC can change in response to public comment or new information.

9.0 COMMUNITY PARTICIPATION

Public input is important to the decision-making process. Nearby residents and other interested parties are encouraged to use the comment period for questions and concerns about the preferred alternative for the Site. The public comments will be summarized and responded to in a responsiveness summary, which will become part of the official Decision Document. More information, including reports referenced in this report, can be found in the administrative record which is located at:

Frankford Branch of the Free Library of Philadelphia
4634 Frankford Avenue
Philadelphia, Pennsylvania 19124-5804
215-685-1473

9.1 How to Submit Comments

The Public Comment Period for the FFA Area II Proposed Plan offers the public an opportunity to provide input to the process of evaluating cleanup alternatives for the Site. The Public Comment Period will begin on 1 August 2016 and end on 31 August 2016. A public meeting will be held on 18 August 2016. The meeting will provide an additional opportunity for the public to submit comments regarding the Proposed Plan.

Comments may be written or submitted orally at the meeting. All interested parties are encouraged to attend the meeting to learn more about the alternatives proposed for the Site. To submit written comments during the Public Comment Period or to obtain further information, please contact the following representative:

Mr. Todd Beckwith
Project Manager
U.S. Army Corps of Engineers, Baltimore District
P.O. Box 1715
Baltimore, MD 21203-1715
email:Todd.T.Beckwith@usace.army.mil

Written comments on the FFA Area II Proposed Plan must be postmarked no later than 31 August 2016.

9.2 Community Acceptance

Community acceptance of the preferred alternative will be assessed during the Proposed Plan comment period and public meeting. Information about community acceptance will be included in the Decision Document.

9.3 Decision Document

Following the public comment period, a Decision Document will be issued. The Decision Document will detail the cleanup alternative selected for the Site. It will also include responses to comments received during the public comment period.

GLOSSARY OF TERMS

Administrative Feasibility — The ability to obtain permits or landowner approval to conduct the cleanup plan or specific parts of the cleanup plan.

Administrative Record — The body of documents that "forms the basis" for the selection of a particular response at a site. Documents that are included are relevant documents that were relied upon in selecting the response action as well as relevant documents that were considered but were ultimately rejected. This file is to be available for public review and a copy maintained near the Site. The Frankford Arsenal Administrative Record file is maintained at the Frankford Branch of the Free Library of Philadelphia.

Applicable or relevant and appropriate requirements (ARARs) — Applicable requirements mean those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at the subject site. Relevant and appropriate requirements mean those cleanup standards that address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. These requirements may vary among sites and alternatives.

Area of concern (AOC) — A specific location where contaminated soil is present that presents unacceptable risks to humans and animals.

Background Concentrations — Typical concentrations of chemicals that are present in nature, like metals in soil, or are present in an urban setting because they have built up over time from many different sources, like PAHs.

Bank Cubic Yards — The volume of soil in the ground before it is excavated. One cubic yard is a cube of material that measures one yard in length, width, and height.

Capital Costs — One-time expenses, as incurred during construction or excavation activities.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)— A federal law enacted in 1980, also known as the Superfund Law, and amended by the Superfund Amendments and Reauthorization Act (SARA) (42 U.S.C §§ 9601-9675) in 1986. CERCLA outlines investigations and cleanup actions for releases or threatened releases of hazardous substances, pollutants, and contaminants.

Contaminants of Concern (COC)— Contaminants that are identified through the risk assessment process as being the primary chemicals of concern that may cause unacceptable human health and/or ecological risk.

Decision Document — A public document that describes the cleanup plan selected for a site. The Decision Document provides the reasons behind selecting the cleanup plan and includes comments received on the Proposed Plan and how these comments were addressed.

Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) — A Department of Defense environmental program that focuses on properties that were formerly owned by, leased to, or otherwise possessed by the Department. The FUDS program only applies to properties that the Department of Defense transferred from its control before October 17, 1986. The U.S. Army Corps of Engineers is the entity charged with performing investigations and cleanup under the DERP-FUDS program.

Ecological Receptors — Any living organisms, other than humans, that could be negatively affected by constituents of potential concern or constituents of concern. Ecological receptors include both plants and animals.

GLOSSARY OF TERMS

Effectiveness — The degree to which something is successful in producing a desired result. In the case of cleanup alternatives, effectiveness evaluates how well the alternative protects human health and the environment from the constituents of concern both while the cleanup is happening and after the cleanup is complete.

Environmental Covenant — A restriction recorded along with the property deed that limits the uses of and activities on the property when included as part of a cleanup plan.

Feasibility Study — A document that develops, screens, and evaluates in detail cleanup options for a site. Preparation of the Feasibility Study usually starts after the Remedial Investigation is completed.

Future Use Restrictions — Physical, legal, or administrative methods that limit specific uses of a property or limit access to contamination on a property to protect humans and animals.

Human Health Risk Assessment (HHRA) — A human health risk assessment estimates the likelihood of health problems occurring due to the presence of constituents of concern if no cleanup action is taken at a site. These health problems include cancer risks (carcinogenic) and non-cancer risks (non-carcinogenic).

Medium Specific Concentration (MSC) — Risk- based standards established by Pennsylvania for regulated substances. A concentration less than the MSC for an individual chemical indicates that it is safe to use the property for the specific use on which the MSC is based. MSCs have been established for soil for residential and non-residential use and for groundwater for drinking water uses or other uses.

milligrams per kilogram (mg/kg) — Units of mass in the metric system that **e**xpress the concentration of a chemical within an environmental medium, such as soil. A milligram is equal to 1/1000 of a gram, and a kilogram is equal to 1000 grams. For example, if a soil sample submitted to a laboratory has a reported result of 1 mg/kg of lead, then there is 1/1000 of a gram of lead for every 1000 grams of soil in the sample.

National Oil and Hazardous Substances Pollution Contingency Plan, (NCP) or National Contingency Plan (40 Code of Federal Regulations [C.F.R.] Part 300) **—** Provides the organizational structure and procedures for preparing for and responding to spills or other releases of oil and hazardous substances, pollutants, and contaminants into the environment.

Non-carcinogenic effects – Negative effect on health unrelated to cancer, as caused by exposure to a chemical

Operations and Maintenance (O&M) Costs – Costs associated with operating and/or maintaining a cleanup action in the long-term, Typically annual costs covering one year of O&M are presented.

Polychlorinated Biphenyls (PCB) — A specific type of chemical that contains 2-10 chlorine atoms attached to biphenyl, which is a molecule composed of two benzene rings. Because PCBs are toxic and stay in the environment a long time without breaking down, PCB production was banned by the U.S. Congress in 1979. According to the USEPA, PCBs have been shown to cause cancer in animals and there is also evidence that they can cause cancer in humans.

Polycyclic Aromatic Hydrocarbon (PAH) — Organic compounds composed of multiple benzene rings, which occur in petroleum products and form during the incomplete burning of organic materials.

Preliminary Remediation Goal (PRG) — A site-specific chemical concentration determined to protect human health and the environment that must be met by a cleanup plan. The final remediation goal is presented in the Decision Document.

Present Worth — The total cost of an alternative over time in terms of today's dollar value.

GLOSSARY OF TERMS

Proposed Plan — A public document that summarizes the findings of the Remedial Investigation and Feasibility Study and identifies the preferred cleanup plan for a site. The purpose of the proposed plan is to provide the public with a reasonable opportunity to comment on the preferred cleanup plan, as well as alternative plans under consideration, and to participate in the selection of the cleanup plan at a site.

Radiological Contamination — Radioactive substances in locations where their presence is undesirable.

Remedial Action Objective (RAO) — Site-specific goal for protecting human health and the environment. Remedial Action Objectives guide the development of cleanup options and must be met by any cleanup plan selected for a site. Remedial action objectives also assist in achieving an acceptable level of protection for human health and the environment..

Remedial Investigation — An in-depth study to determine the location and concentrations of chemicals at a site. Site cleanup criteria are also established.

Screening-Level Ecological Risk Assessment (SLERA) — A screening process used to evaluate the possibility of negative effects on plants and animals due to the presence of chemical contamination using conservative assumptions.

Semivolatile Organic Compounds — Organic chemicals that evaporate slowly under normal atmospheric conditions and are typically found in petroleum products such as gasoline and cleaning products.

To Be Considered (TBC) guidance — Advisories, criteria, or guidance that may be considered when developing cleanup plans or preliminary remediation goals. TBC information may be developed by USEPA, other federal agencies, or states. TBCs are typically considered only if no applicable or relevant and appropriate requirements are available.

Volatile Organic Compound (VOC) — Volatile Organic Compound - Organic chemicals that easily evaporate under normal atmospheric conditions of temperature and pressure. VOCs are typically found in petroleum products such as gasoline and cleaning solvents.

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