SECOND FIVE-YEAR REVIEW REPORT FOR
PRICE BATTERY LEAD SMELTER SUPERFUND SITE
BERKS COUNTY, PENNSYLVANIA

AUGUST 2020

Prepared by

U.S. Environmental Protection Agency
Region 3
Philadelphia, Pennsylvania

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Date

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LIST OF ABBREVIATIONS AND ACRONYMS

ALM	Adult Lead Model
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
days/yr	Days per Year
DLHS	Dust-Lead Hazard Standard
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ERC	Environmental Restrictive Covenant
Exide	Exide Technologies, Inc.
FYR	Five-Year Review
g/day	Grams per Day
GPRA	Government Performance Results Act
GSDi	Geometric standard deviation parameter
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HUD	United States Department of Housing and Urban Development
IC	Institutional Control
IEUBK	Integrated Exposure Uptake Biokinetic Model
MatPb	Maternal blood lead concentration at childbirth
MCL	Maximum Contaminant Level
µg/day	Micrograms per Day
µg/dL	Micrograms per Deciliter
$\mu g/ft^2$	Microgram per Square Foot
µg/L	Microgram per Liter
mg/kg	Milligram per Kilogram
MSC	Medium Specific Concentration
NCP	National Contingency Plan
NHANES	National Health and Nutrition Examination Survey
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PbB	Blood Lead
PbBo	Background blood lead concentration parameter in U.S. women of child-bearing age
ppm	Parts per million
PRP	Potentially Responsible Party
PTW	Principal Threat Waste
RAL	Remedial Action Level
RAO	Remedial Action Objective
RBC	Risk-based Concentration
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager

SWMP	Site-wide Monitoring Plan
SWRAU	Sitewide Ready for Anticipated Use
TCLP	Toxicity Characteristic Leaching Procedure
TBC	To-Be-Considered
UU/UE	Unlimited Use/Unrestricted Exposure

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR Reports. In addition, FYR Reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the second FYR for the Price Battery Lead Smelter Superfund Site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of three operable units (OUs). OU1 addresses lead-contaminated residential soils and residential interiors within and near the Borough of Hamburg; OU2 addresses the facility portions of the Price Battery Site. OU3 is a Site-wide ecological assessment which focuses on sediments and surface water of the Schuylkill River, Mill Creek and Kaercher Creek, as well as the surface soil within the floodplain area at the confluence of Kaercher Creek and the Schuylkill River. OU3 also includes an ecological assessment of the OU1 residential properties. This FYR addresses OU1 and OU2. EPA has not yet selected a remedy for OU3. EPA is currently conducting a remedial investigation/feasibility study (RI/FS) for OU3.

The EPA remedial project manager (RPM) led the FYR. Additional participants from EPA included the EPA community involvement coordinator (CIC), human health and ecological risk assessors, a hydrogeologist and legal counsel. The project manager from the Pennsylvania Department of Environmental Protection (PADEP) also participated in the review. Skeo provided EPA contractor support for this FYR. Exide Technologies, Inc. (Exide), the potentially responsible party (PRP), was notified of the initiation of the FYR. The review began on October 31, 2019.

Site Background

The Site is located in the Borough of Hamburg, Berks County, Pennsylvania (Figure 1). The Site includes the former Price Battery manufacturing facility, adjacent residential areas and other areas within and near Hamburg, Pennsylvania, that were contaminated with antimony, arsenic and lead.

Between 1940 and 1971, operations at the former Price Battery facility included a secondary lead smelter, smokestack and an oxide plant. During operations, battery casings were broken open and the lead plates inside the batteries were removed for smelting. The lead-contaminated battery wastes and casings were used as fill throughout Hamburg and surrounding vicinity. The secondary lead smelter also produced emissions that contaminated residential properties downwind of the facility.

The Site encompasses a mixed commercial/industrial/residential area approximately 1.2 square miles in size located in the vicinity of the former Price Battery facility. The former Price Battery facility property is zoned industrial; residential properties are located north, east and southeast of the former facility. Commercial businesses are located to the west and south of the former facility. Land use in the immediate area outside of the Site is mostly residential or agricultural.

The former Price Battery facility is located at 246 and 251 Grand Street in the Borough of Hamburg. The former Price Battery facility and its related properties (OU2), covers approximately 9 acres. These properties include the Warehouse Parcel, Broom Works Parcel, Main Parcel and Parking Lot Parcel (Figures 1 and 2). The parcels are

currently, or were formerly, owned by Exide. Most of the buildings on the properties, except the warehouse building on the Warehouse Parcel, were demolished in 2007 and 2008 by Exide. Currently, three of the parcels are covered with an impermeable surface, including asphalt and concrete, except for the Broom Works Parcel, which is covered with 8 inches of crushed stone. The Warehouse Parcel is in commercial reuse. The Parking Lot Parcel is a municipal parking lot. The Main Parcel and Broom Works Parcel are vacant and are surrounded by chain-link fences.

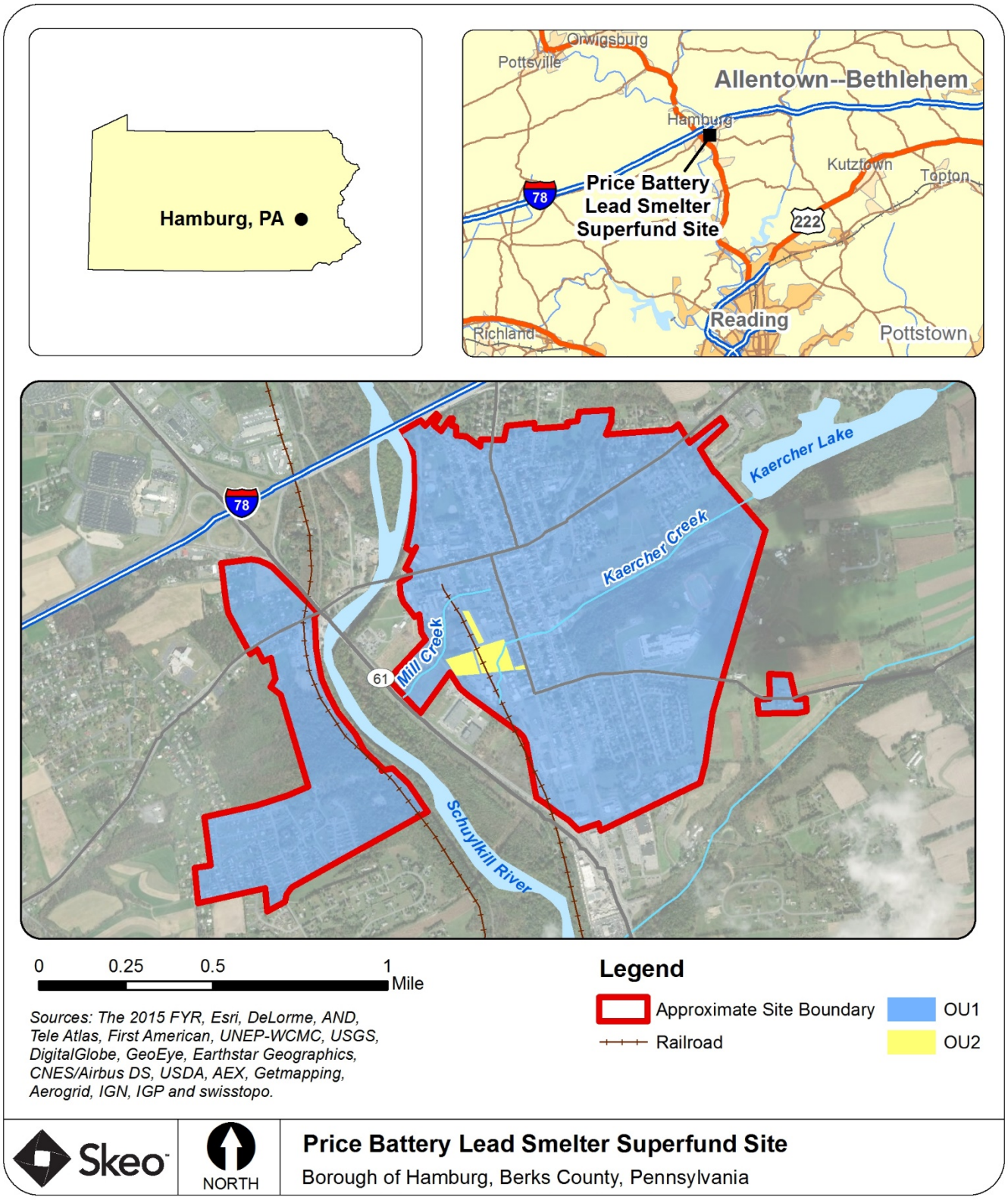
Kaercher Creek flows through the former Price Battery facility property, and Mill Creek flows north of the property before joining the Schuylkill River southwest of Hamburg. Kaercher Lake is located northeast of the Site.

Groundwater occurs in two units, the overburden and the underlying shallow bedrock unit. Groundwater flow in both units is generally west-southwest toward the Schuylkill River. Public water is provided by the Borough of Hamburg (the Borough) from municipal supply wells installed in the bedrock unit located outside of the Borough in Windsor Township. Refer to Appendix A for documents used in preparation of this FYR and Appendix B for the Site's chronology of events.

FIVE-YEAR REVIEW SUMMARY FORM

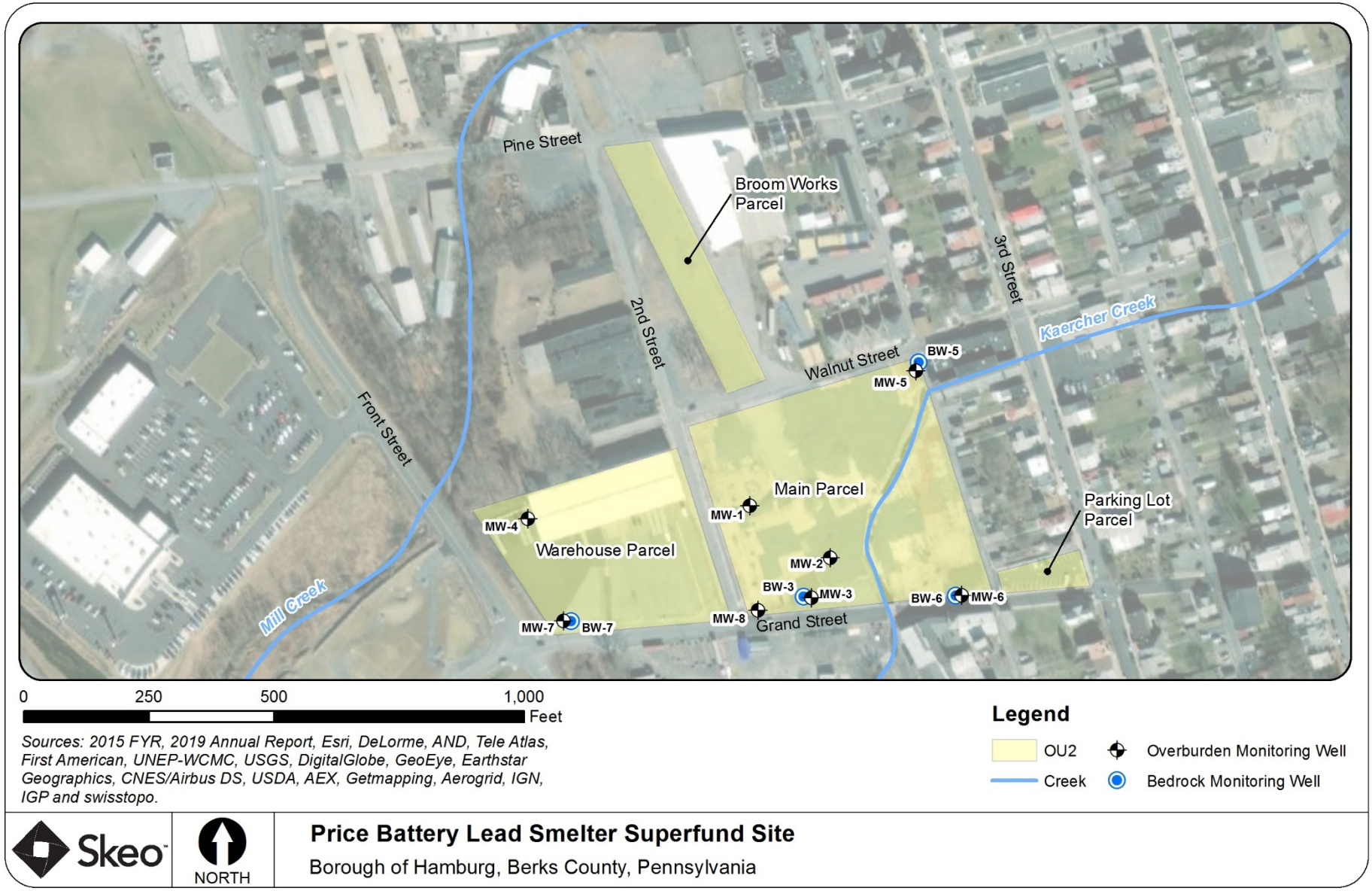
SITE IDENTIFICATION		
Site Name: Price Battery Lead Smelter		
EPA ID: PAN000305679		
Region: 3	**State:** PA	**City/County:** Hamburg / Berks
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the Site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA		
Author name: John Banks, with additional support provided by Skeo		
Author affiliation: EPA Region 3		
Review period: 10/31/2019 – 8/3/2020		
Date of site inspection: 11/26/2019		
Type of review: Statutory		
Review number: 2		
Triggering action date: 8/3/2015		
Due date *(five years after triggering action date)*: 8/3/2020		

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 2: OU2 Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

EPA conducted removal assessment activities at the Site, including the former facility and residential areas, from July to October 2002 and determined the Site was heavily contaminated with lead, arsenic and antimony. Historic airborne deposition of lead-contaminated particulates from the former facility's smelter also contaminated residential properties in a significant portion of the Borough. To address the most immediate risks at the former facility, Exide, the PRP, began a removal action at the former facility in 2003. That same year, EPA began a separate removal action to address residential properties contaminated with lead in the vicinity of the former facility. Cleanup activities completed as removal actions are addressed further in the Response Actions section of this FYR Report. EPA listed the Site on the National Priorities List (NPL) in April 2005.

Beginning in 2005, and concurrent with the ongoing removal actions described above, EPA began a RI/FS for OU1. A human health risk assessment (HHRA) identified cancer risks and non-cancer hazards associated with residential exposure to arsenic and antimony in soil and indoor dust. Modeling also predicted that a significant number of residential properties within an approximate 1.2 square mile area around the former facility had soil and dust levels that might cause blood lead levels to exceed acceptable levels. These results were the basis of action for OU1.

The PRP completed a screening level ecological risk assessment of the four OU2 parcels in June 2010, an RI for OU2 in February 2011 and a baseline HHRA in April 2011. The baseline HHRA evaluated several receptors: current Utility Worker, future Office Worker 1 (exposed to soil depths 0 to 1.25 feet), future Office Worker 2 (exposed to soil depths 0 to 10 feet) and future Construction Worker 1 (exposed to soil depths 0 to 17 feet, including dermal exposure to groundwater). The baseline HHRA also evaluated a hypothetical residential exposure to groundwater as a drinking water source. The baseline HHRA and ecological risk assessment found that the former facility manufacturing operations contaminated soil and sediments with lead, arsenic and antimony above levels that are protective of human health and the environment. Table 1 presents the basis for action for OU2, by media. EPA determined that there was no basis for action for groundwater for OU2, other than continued monitoring.

Table 1: Basis for Action for OU2, by Media

Soils	Sediment
• Lead results were above the established OU1 site-specific residential cleanup value of 572 milligrams per kilogram (mg/kg); therefore, residential risks from soil exposures under baseline conditions at the Exide-owned parcels would be unacceptable. • Unacceptable risks posed by lead-contaminated soil were found to exceed the target probability of 5% for the Officer Worker 1, Officer Worker 2 and Construction Worker in Main Parcel A, Main Parcel B and the Warehouse Parcel[a] • Unacceptable cancer risks posed primarily by arsenic-contaminated soil were found to exceed the acceptable cancer risk range for Office Worker 1 and Office Worker 2 in Main Parcel B. • Unacceptable non-cancer risks posed by antimony and arsenic were found to exceed a hazard index (HI) of 1 for Officer Worker 1, Office Worker 2 and the Construction Worker in Main Parcel A and Main Parcel B.	• Lead results were above the established OU1 site-specific residential cleanup value of 572 parts per million (ppm), with a maximum result of 1,770 ppm lead. • Lead, arsenic and antimony exceeded EPA freshwater sediment screening levels for ecological receptors. • Unacceptable ecological risks posed primarily by lead and arsenic were found to exceed a hazard quotient (HQ) of 1 for ecological receptors. • Accumulated contaminated sediment in Kaercher Creek and pipes[b] may be transported to downstream ecological receptors.

Soils	Sediment
Notes: a) The 2011 HHRA divided the Main Parcel into Main Parcel A and Main Parcel B for purposes of the risk assessment. The two areas were each evaluated as a separate exposure area based on differences in lead concentrations (i.e., hot spot area). No unacceptable risks were found at the Broom Works and Parking Lot Parcels for commercial/industrial reuse. b) A total of 12 pipes were identified during the remedial investigation in the concrete sidewall within the covered area of Kaercher Creek (the portion of Kaercher Creek underlying the facility foundation) within the Main Parcel. A representative sampling of the pipes revealed contaminant concentrations above their respective ecological screening levels or human health screening levels.	

Response Actions

Removal Actions

PRP Removal Action, 2003-2007

EPA entered into an Administrative Order on Consent (AOC) with Exide in 2003 to perform a removal action at the facility, including restricting access to the Price Battery facility and mitigating the threat due to the presence of hazardous substances. EPA required Exide to mitigate the threat of direct exposure to lead contamination in soils greater than 1,000 milligrams per kilogram (mg/kg). Exide capped soils and installed a perimeter fence on the Broom Works parcel, paved previously unpaved areas on the Warehouse Parcel, capped sediments in Kaercher Creek on the Main Parcel with gabion mattresses,[1] and removed waste materials from the Main Parcel, including from any sumps and trenches, for off-site disposal. Institutional controls were also placed on the Exide-owned parcels to prohibit unacceptable uses of the property. Table C-1 in Appendix C includes additional information about the PRP removal action.

EPA Removal Actions, 2003-2010

Residential Properties

EPA began a removal action in May 2003, to address residential properties contaminated with lead in the vicinity of the former Price Battery facility. From May 2003 through October 2004, EPA excavated residential soils contaminated with lead above 400 milligrams per kilogram (mg/kg) from residential yards and decontaminated residential interiors. An action level for lead dust on floors of 40 micrograms per square foot ($\mu g/ft^2$) was used for all interior decontamination consistent with U.S. Department of Housing and Urban Development (HUD) guidelines for lead-based paint abatement, at that time. In the absence of a site-specific cleanup level for lead in soil at the commencement of the removal action, EPA conservatively used the 400 mg/kg screening level for lead in soil at residential properties as the cleanup level in order to start work as quickly as possible until a residential site-specific lead-in-soil cleanup level was determined for the Site.

During the removal activities, EPA collected additional information in order to perform a risk assessment and calculate a residential site-specific cleanup level for lead in soil that would be protective of children who might be exposed to lead contamination in soil. This site-specific risk assessment established a residential lead cleanup level of 572 mg/kg. Beginning in April 2005, the removal action consisted of excavating lead-contaminated soils above 572 mg/kg for the soil to be considered clean. In some cases, physical barriers such as tree roots, foundations, etc., prohibited excavation of soils to the cleanup standard. In cases where all lead-contaminated soil above 572 mg/kg could not be removed, a visual barrier (i.e., orange construction fencing) was placed on the ground surface at the bottom of the excavated area to indicate the remaining soils potentially contained lead above 572 mg/kg. The removal action was completed on September 30, 2010. At that time, EPA's activities transitioned to remedial action to complete cleanup of the remaining residential properties. EPA performed outreach to the citizens of Hamburg, Hamburg Borough Council, health officials, the media, non-profit groups, and others during the removal and remedial actions in an effort to convey information about the hazards of lead exposure and particularly how lead affects the health of children.

[1] Gabion is a wire mesh basket or mattress filled with rocks or in some cases masonry materials to stabilize banks and/or beds of surface water channels, divert floodwater away from certain sections of a channel, or retain land slopes.

Kaercher Creek

EPA performed a separate removal action along Kaercher Creek from May 2004 to December 2004. In 2002, EPA performed a removal sampling assessment where lead battery waste was observed both in the Kaercher Creek sediment and on the slopes of both banks. The range of sediment and soil lead concentrations was between 19 parts per million (ppm) and 45,000 ppm. Approximately one foot of sediment from the creek was excavated and removed for disposal. A geotextile fabric was installed to prevent the migration of contaminated sediments. The creek was backfilled with rip-rap limestone to create a cap over the contaminated sediment and soil. Topsoil and clean fill were used to cap the streambanks and floodplain. Streambanks were restored by planting native grasses and trees.

Remedial Actions

OU1 – Residential Portion

EPA issued an Interim Record of Decision (ROD) in September 2009 to address the cleanup at the remaining residential properties. The selected interim remedy for OU1 included soil excavation and specialized interior cleaning to remove lead-contaminated soils and dust from residential properties, consistent with the ongoing removal actions. The 2009 Interim ROD also provided for institutional controls and ongoing public education regarding lead exposure risks. The Interim ROD allowed future response work to be performed under remedial authority, instead of removal authority, and enabled EPA to continue to address immediate Site risks while additional work was performed to determine the full nature and extent of the contamination at the Site. Table 2 summarizes remedial action objectives (RAOs) for the OU1 cleanup. Table 3 summarizes the major remedy components from the 2009 Interim ROD.

Ecological risks were not evaluated for OU1. The primary purpose of the 2009 Interim ROD for OU1 was to address human health risks associated with exposure to residential soils and interior dust contaminated with lead as quickly as possible. Therefore, the 2009 Interim ROD for OU1 deferred the ecological assessment to a subsequent OU (i.e., OU3) for the Price Battery Site.

EPA issued a final ROD for OU1 and OU2 in September 2015. Because no additional cleanup measures were necessary following implementation of the OU1 interim remedy, EPA selected No Further Action for OU1. The ROD established the OU1 interim remedy as the final remedy for OU1.

OU2 – Facility Portion

EPA also selected a remedy for OU2 in the September 2015 ROD. The overall purpose of the OU2 remedy was to make the OU2 parcels protective for non-residential use consistent with the exposure scenarios evaluated in the baseline HHRA for the Main Parcel and Warehouse Parcel. The OU2 remedy included excavation of principal threat waste (PTW) lead-contaminated soils and soils exceeding remedial action level (RAL)[2] cleanup levels for lead calculated specifically for the facility portion of the Site. Table 2 summarizes the medium-specific RAOs for the OU2 cleanup. Table 3 summarizes the major remedy components.

[2] The Remedial Action Level (RAL) is the concentration above which soil must be addressed so that the post-remediation *average* concentration meets the specified target cleanup level (i.e., meets the site-specific risk-based concentration (RBC)). The RAL is a site-specific cleanup level (i.e., a remedial trigger concentration) that ensures the post-cleanup average concentration within an exposure area achieves the target cleanup level with a specified level of confidence.

Table 2: OU1 and OU2 RAOs

OU	Medium	RAO
OU1	Soil	• Prevent ingestion, inhalation or direct contact with surface soil or subsurface soil with lead concentrations above a site-specific risk-based remedial goal of 572 mg/kg (or 600 mg/kg average). • Permanently and/or significantly reduce the toxicity, mobility or volume of characteristic hazardous waste.
	Interior House Dust	• Prevent ingestion, inhalation or direct contact with interior house dust above EPA lead hazard levels for floors.
OU2	Soil	• Prevent direct human exposure to soils above preliminary remediation goals for lead and risk-based concentrations (RBCs) for antimony and arsenic[3]. • Prevent future impact to stream sediment and surface water by soil erosion from the facility. • Protect ecological receptors from exposure to contaminated soils above ecologically protective values.
	Groundwater	• Monitor groundwater to ensure that the isolated groundwater contaminant concentrations do not change.
	Sediment	• Minimize the potential for exposure of human receptors to sediment containing contaminants of concern (COCs) in excess of the residential soil screening levels. • Eliminate existing on-site accumulations of contaminated sediment in Kaercher Creek and pipes, which sediments could be transported to downstream ecological receptors. • Prevent on-site exposure of ecological receptors to sediment containing COCs above EPA freshwater sediment screening benchmarks.

Table 3: OU1 and OU2 Remedy Components from the 2009 Interim ROD and 2015 ROD

OU	Remedy Components
OU1	• Excavation, backfilling and revegetation of lead-contaminated soils at residential or residential-type properties exceeding the site-specific cleanup goal of 572 mg/kg. • Disposal of excavated soils in an approved off-site permitted disposal facility based on toxicity characteristic leaching procedure analysis. • Specialized interior cleaning of residential properties exceeding interior dust cleanup levels of 40 μg/ft^2 for floors. • Temporary relocation of residents during specialized interior cleaning. • Public education in the form of community meetings, pamphlets, brochures, etc., informing property owners, renters and the community of the hazards associated with lead exposure, including lead-based paint, and preventative measures to reduce exposure. • Institutional controls to limit access for future development, improvement, and use of unremediated properties or properties where residual risk may remain after cleanup. Institutional controls will include activity and use restrictions enacted through proprietary (e.g., easements, covenants) and/or governmental (e.g. zoning requirements or Registry) controls to prevent use of the property that will pose an unacceptable risk to receptors (i.e., for residential use). The exact type of institutional controls implemented will be determined by EPA in consultation with PADEP and local government agencies.

[3] A risk-based concentration (RBC) is the average concentration in an exposure area that will result in an acceptable risk to a particular receptor (for lead, this term is referred to as the preliminary remediation goal (PRG), but the term RBC will be used for consistency). Lead-in-soil RBCs are site-specific risk-based target cleanup levels that must be met *on average* throughout the exposure area. It is acceptable to leave concentrations that exceed the cleanup level (site-specific RBC) for lead-in-soil, as long as the post-remediation *average* concentration in an exposure area does not exceed the site-specific RBC for lead-in-soil.

OU	Remedy Components
OU2	*Soil* • Removal of concrete pavement, floor slabs and foundations overlying soils above the RAL and PTW contaminated soils. Cleaning to remove residual contamination (based on visual observations), crushing and stockpiling of the removed concrete pavement, floor slabs and foundations. Reuse of crushed material on-site as backfill after meeting PADEP statewide health standards for non-residential soils. • Excavation and off-site disposal of soils from the Main Parcel and Warehouse Parcel that exceed the lowest calculated RAL (8,669 mg/kg) for lead in soil, including PTW soils, except to the extent that contaminated soil cannot be removed because of field conditions. • Analyze excavated soils using the Toxicity Characteristic Leaching Procedure (TCLP). Soils which exceed the TCLP criteria may be stabilized on-site to render the soil non-hazardous or transported to an off-site RCRA-permitted facility for appropriate treatment and disposal. • Post-excavation confirmation sampling of excavation floor and sidewalls to ensure RAL levels have been achieved. Recalculate the exposure point concentration (EPC) utilizing confirmation sample results collected after excavation. • Backfill of resulting excavations with reclaimed crushed concrete and clean fill material to grade. • Restoration of Site surfaces using concrete, asphalt, buildings and landscaping in a manner consistent with plans for Site redevelopment and suitable for preventing erosion of soils above residential remediation standards and as specified by erosion and sediment control requirements. • Institutional controls to ensure that the remedy provides an adequate measure of protection considering current and anticipated commercial/industrial future use of the Site. *Sediment* • Removal of accumulated sediment from the gabion mattress and from underground pipes and penetrations. Grouting of underground pipes, as necessary, to further prevent contaminated sediment within any pipes from entering Kaercher Creek. • Disposal of accumulated sediment off-site or use as backfill in on-site soil excavation areas if requirements are met. • Grouting of gabion mattress to ensure long-term stability of the creek bed. • Annual inspections to confirm that the gabion mattress and channel walls remain stable and remove accumulated trash and debris to maintain the hydraulic capacity of the channel. • Institutional controls to prohibit removal of the gabion mattress or excavation of soils within or along the creek. *Groundwater (No active cleanup measures)* • Installation of new monitoring wells to the current monitoring well network after soil remediation is implemented. Redevelop or replace monitoring well BW-3 to address turbidity problems in the well. • Quarterly groundwater sampling. After eight consecutive quarters, conduct a statistical evaluation to determine contaminant concentration trends and continue statistical evaluation annually. Re-evaluate need for continued monitoring at five-year intervals.

Cleanup Levels

OU1

Table 4 summarizes the OU1 residential cleanup levels. EPA developed the cleanup level for lead in soil using the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children. EPA also established cleanup levels for antimony and arsenic. However, elevated lead concentrations in soil generally correlated with elevated concentrations of arsenic and antimony. Therefore, EPA only used the lead cleanup level for soil as the basis to determine whether the residential cleanup goals had been achieved.

Table 4: OU1 Residential Cleanup Levels

COC	Soil (mg/kg)	Indoor Dust (µg/ft^2)
Lead	572 (600 average)	40 (for floors)
Antimony	31	n/a
Arsenic	15	n/a
Notes: Source is 2009 OU1 Interim ROD n/a - not applicable		

OU2

For OU2, the 2015 ROD established lead-in-soil risk-based target cleanup levels (i.e., site-specific risk-based concentrations, or RBCs) that must be met on average through the exposure area (Table 5). The ROD clarified that lead concentrations exceeding the site-specific RBC could remain in soil provided that the post-remediation average concentration in an exposure area does not exceed the site-specific RBC for lead in soil. The baseline divided the Main Parcel into Main Parcel A and Main Parcel B for purposes of the risk assessment. The two areas were each evaluated as a separate exposure area based on differences in lead concentrations (i.e., hot spot area). The other exposure areas evaluated were the Warehouse, Broom Works, and Parking Lot Parcels, respectively.

The ROD also established a site-specific RAL for lead, which is the concentration above which soil must be addressed so that the post-remediation average concentration meets the site-specific RBC. Table 5 presents the site-specific soil lead RBCs and RALs for OU2. EPA established different site-specific RBCs and RALs for the different receptors and exposure areas evaluated in the OU2 baseline HHRA.

Elevated levels of antimony and arsenic were generally correlated with elevated levels of lead, and the baseline OU2 HHRA concluded that performing a remedial action to meet the site-specific RALs for lead in soil will result in average concentrations of antimony and arsenic below the lowest site-specific RBCs identified for these constituents (100 mg/kg for arsenic, 46 mg/kg for antimony).

Table 5: OU2 Site-Specific Commercial/Industrial Lead-in-Soil RBCs and RALs[a]

Receptor[b]	Soil Depth	RBC[c] (mg/kg)	RAL[c] (mg/kg)		
			Main Parcel A	Main Parcel B	Warehouse
Office Worker 1	0-1.25 feet	2,240	27,615	12,285	**8,669**[d]
Office Worker 2	0-10 feet	2,240	35,000	25,300	28,500
Construction Worker	0-17 feet	941	35,000	8,748	9,313

Notes:

Source is Table 8 of the 2015 ROD

a) Two office worker scenarios were evaluated, using exposures to different soil depths, because the specific future use of the properties was unknown at the time.
b) No unacceptable risk from lead, arsenic or antimony was identified for the commercial exposure scenarios in the baseline HHRA on the Broom Works Parcel or the Parking Lot Parcel.
c) Site-specific RBCs and RALs were developed using EPA's Adult Lead Model (ALM).
d) The September 2019 Remedial Action Report, OU2 states that the value of 8,669 mg/kg is in bold text to show that this is the site-specific RAL that was selected for all areas for the OU2 remedial action.

Table 6 identifies the cleanup levels for sediment for the Main Parcel portions of Kaercher Creek and sediment contained in the pipes. Because the ecological-based levels are lower than the site-specific human health-based residential cleanup levels developed for OU1, EPA selected the more stringent of the two values as cleanup levels for protection of human health and ecological receptors in OU2 sediment.

Table 6: OU2 Sediment Cleanup Levels

COC	Human Health-based Cleanup Level[a] (mg/kg)	Ecological-based Cleanup Level (mg/kg)
Lead	572	35.8[b]
Arsenic	15	9.79[b]
Antimony	31	3.0[c]

Notes:
Source is Table 10 of the 2015 ROD
a) Site-specific residential levels developed by EPA for OU1
b) Level based on National Oceanic and Atmospheric Administration (NOAA) Threshold Effects Concentrations
c) Level based on NOAA Upper Effects Concentration

The 2015 ROD did not require active cleanup of groundwater. However, the remedy called for groundwater monitoring to ensure that the isolated groundwater Site-related contaminant concentrations do not change. Monitoring reports compare detected concentrations to federal maximum contaminant levels (MCLs) and the PADEP medium specific concentrations (MSCs) for non-residential used aquifers.

Status of Implementation

OU1
The OU1 interim remedial action began in August 2010. The interim remedial action overlapped with the EPA removal action so that contractors could clean up residential properties already scheduled for cleanup under the removal action.

EPA remediated 555 residential yards, or portions thereof, during the removal action and interim remedial action combined. Excavation depths generally ranged from 6 to 18 inches in individual yards with excavation depths to 2 feet or more in several yards. The cleanup objective of 572 mg/kg lead-in-soil (or 600 mg/kg average) was achieved in those residential yards where the owner provided access and permission to conduct the residential cleanup. In cases where lead-contaminated soil above the cleanup goal could not be removed (e.g., tree roots, building foundations, etc.), a visual barrier (orange construction fencing) was placed to indicate that remaining soils were potentially above the cleanup goal.

A total of 402 residential interiors, or portions thereof, were cleaned during the removal action and interim remedial action combined. EPA developed a database containing the cleanup status of all residential properties (both exterior and interior) within OU1. The residential cleanup finished in October 2013.

OU2
EPA issued a Unilateral Administrative Order to Exide in March 2016, requiring Exide to implement the OU2 remedial action. EPA approved Exide's remedial design in June 2018. Remedial action construction began in September 2018 and was substantially complete by April 2019. Remaining punch-list items were complete by June 2019.

Exide conducted the remedial action on the Main Parcel and the Warehouse Parcel. The work focused on excavation of soils exceeding the lowest site-specific RAL of 8,669 mg/kg total lead. The remedial action included the demolition of 2,691 cubic yards of concrete slabs/footers, and the excavation of 7,975 cubic yards of contaminated soils. The soils were stabilized with a chemical reagent to render them non-hazardous. Exide transported 18,053 tons of waste (rubble and stabilized soil) off-site to a permitted disposal facility and sent 964 tons of asphalt off-site for recycling. Figure D-1 in Appendix D shows the areas excavated.

Exide collected post-excavation samples after the removal of impacted soils. The post-excavation sample data, as well as historic soil data results (in areas not removed as part of the excavation) and backfill data and/or concrete reuse data were used to calculate a final exposure point concentration (EPC) for each exposure area (Main Parcel

A, Main Parcel B and Warehouse). The EPC calculations demonstrated that the cleanup level for each exposure area and exposure scenario had been met (Table 7). Because lead is the primary driver for exposure risk and is the primary contaminant for OU2, lead was the only COC that was evaluated during post-excavation testing.

Table 7: Post-remediation Lead EPCs, OU2

Receptor	Soil Depth	RBC (mg/kg)	Post-Remediation EPC (mg/kg)		
			Main Parcel A	Main Parcel B	Warehouse
Office Worker 1	0-1.25 feet	2,240	572	1,080	2,195
Office Worker 2	0-10 feet	2,240	271	510	769
Construction Worker	0-17 feet	941	243	499	759
Notes: Source is the September 2019 OU2 Remedial Action Report					

Exide restored the excavations using a combination of recycled masonry fill (demolition concrete that was tested and approved for reuse), imported soil and stone backfill materials. At the completion of work, all excavation areas on the Main Parcel were restored/covered with a layer of crushed stone fill. Excavation areas on the Warehouse Parcel were restored with asphalt paving to match the pre-existing asphalt cover prior to implementation of the remedial action. Exide installed a new perimeter fence around the entire Main Parcel, as well as an interior fence at the top of the Kaercher Creek bank.

The OU2 cleanup also included sediment removal from the Kaercher Creek, grouting of gabion mattresses installed as part of the removal action in 2003, removal of former building floor slabs that formed a concrete "roof" over the creek, and removal and replacement of an approximately 90-foot-long section of cinder block creek wall with a vinyl sheet pile wall.[4,5] Sediment was removed from the gabion mattresses to the extent possible (typically the upper 3 inches of the gabion) as well as from openings of all pipes penetrating the side walls of the creek channel. Once sediment was removed, the ends of the pipes were plugged with grout. Exide repaired or replaced any damaged gabion mattresses, prior to grouting the gabion matrasses effectively capping the sediments in-place underneath the grout.

Exide finalized the final Remedial Action Report for OU2 in September 2019. After completion of construction, Exide began annual inspections of the gabion mattresses and drainage channel and implemented the groundwater monitoring program.

Exide is in the process of implementing institutional controls in the form of Environmental Restrictive Covenants (ERC) pursuant to the Pennsylvania Uniform Environmental Covenants Act, Act No. 68 of 2007, 27 Pa. C.S. §§ 6501 – 6517 (UECA) for the Exide-owned properties that comprise OU2. Exide submitted revised draft language for the ERCs in March 2020 for EPA and PADEP review. The restrictions in the current Declaration of Use and Deed Restriction will be incorporated into any new institutional controls.

Institutional Control (IC) Review

OU1

The 2009 Interim ROD required institutional controls limiting access for future development, improvement and use of unremediated properties or properties where residual risk may remain after cleanup. The Interim ROD noted that the exact type of institutional control will be determined by EPA in consultation with PADEP and local government agencies.

[4] The former concrete floors covering the creek channel of Kaercher Creek are referred to as the creek "roof." The creek roof covered about 280 feet of the creek channel beginning at Peach Alley.

[5] On the southern side of the creek channel, an 80-foot-long section of the creek wall was originally constructed of cinder block. The remedial design originally proposed reconstructing this section of the wall with grouted gabion baskets; however, installation of a vinyl sheet pile was subsequently proposed and approved by EPA.

EPA provided a Registry to the Borough of Hamburg, consistent with the requirements of the OU1 Interim ROD, identifying both remediated and unremediated properties (where access for cleanup was not granted). The Borough uses the Registry during its property transfer inspection process and notifies potential buyers about the cleanup status of each property. The Borough's property transfer inspections are required by a Borough ordinance. Although the EPA Registry component of the inspection is not specifically included in the ordinance, Borough officials have indicated that it may be possible to include the requirement as part of the ordinance.

During the OU1 interim remedial action, EPA conducted public education in the form of community meetings, pamphlets, brochures, etc., informing property owners, renters and the community of the hazards associated with lead exposure, including lead-based paint, and preventative measures to reduce exposure.

One property (a large vacant lot), previously identified as parcel number 46449405091653, also has an environmental covenant in place, recorded with the Berks County Recorder of Deed in 2012 (Instrument Number 2012012285). The environmental covenant restricts use of a portion of the northwest corner of the property because of lead contamination in deeper soil. After 2012, parcel 46449405091653 was consolidated with several adjacent parcels and is now part of parcel 46449405092520 but the environmental covenant runs with the land.

OU2

The 2015 ROD required institutional controls to ensure that the OU2 remedy provides an adequate measure of protection in consideration of current and anticipated commercial/industrial future use. The ROD indicated that institutional controls will include activity and use restrictions enacted through proprietary (e.g., easements, covenants) and/or governmental (e.g., zoning requirements) controls to prevent use of the property that will pose an unacceptable risk to receptors.

Deed restrictions are in place for the four OU2 parcels. A Declaration of Use and Deed Restriction was placed on all the Exide-owned parcels in 2004, as required by the November 2002 Removal Action Memorandum and the Removal AOC. The deed restriction is still in effect and prohibits the use of the parcels owned by Exide at the time the restrictions were recorded, including the Warehouse and Parking Lot Parcels, for residential, recreation, school, daycare or other uses that could potentially expose children to contamination. The institutional controls also include notification to future property owners that contaminated soils remain in-place and that special handling of these soils would be required if these soils are disturbed during redevelopment construction activities. Ownership of the Parking Lot Parcel was transferred to the Borough, and the Warehouse Parcel was transferred to a private party. During the transfer the receiving party was notified of the deed restrictions and environmental obligations and access requirements retained by Exide for the property.

Exide plans to replace the current deed restrictions with new Environmental Restrictive Covenants (ERCs) that provide the same general restrictions, but which comply with the Pennsylvania Uniform Environmental Covenants Act, which was promulgated after the original deed restrictions were established.

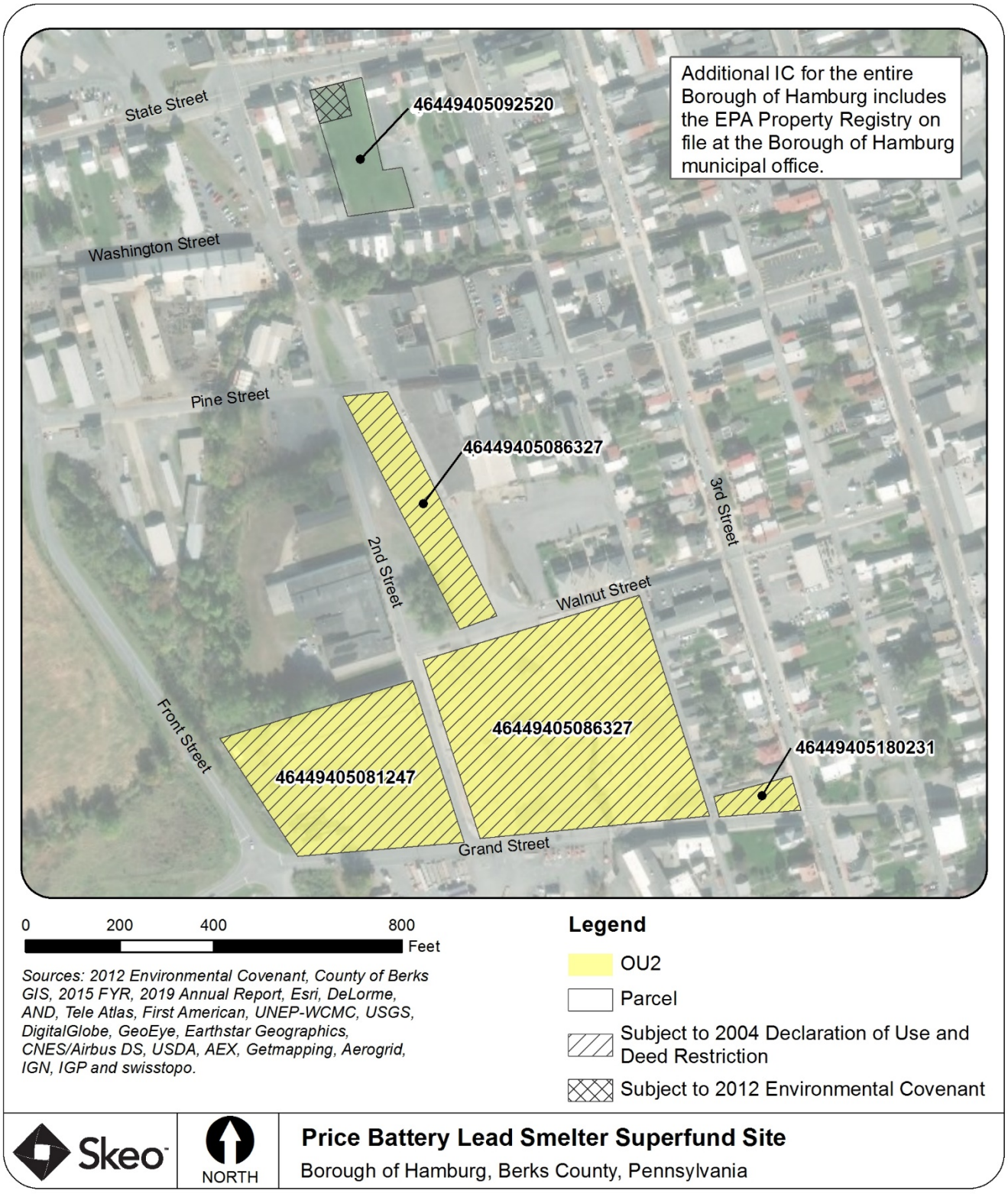
Table 8 summarizes planned and implemented institutional controls for the Site. Figure 3 shows the areas of OU2 with deed restrictions.

Table 8: Summary of Planned and/or Implemented Institutional Controls (ICs)

Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
OU1 soil and dust (unremediated areas)	Yes	Yes	Parcels where EPA was not granted permission or access for cleanup	Restrict activities that would result in exposure to contamination (2012 Environmental Covenant); notify potential buyers of lead contamination on residential properties (Registry)	EPA Property Registry on file with the Borough of Hamburg* (in-place) For county parcel 46449405091653 (now part of parcel 46449405092520): Environmental Covenant (in-place 2012)
OU2 soil and sediment	Yes	Yes	Broom Works Parcel and Main Parcel (46449405086327) Warehouse Parcel (46449405081247) Parking Lot Parcel (46449405180231)	Prevent use of property that would pose an unacceptable risk to receptors; notify future property owners that contaminated soils remain in-place and that special handling of the soils is required if disturbed during redevelopment; prohibit residential use of the properties; prohibit removal of the gabion mattress or excavation of soils within or along the creek	Declaration of Use and Deed Restriction (in place 2004) Environmental Restrictive Covenants consistent with the Pennsylvania Uniform Environmental Covenants Act (planned)

***** The Registry supplements existing Pennsylvania real estate transfer disclosure requirements to ensure that prospective buyers are aware of potential contamination.

Figure 3: Institutional Control Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Systems Operations/Operation and Maintenance (O&M)

OU1
O&M activities were not needed following the OU1 cleanup. The only maintenance activity was the continued watering and maintenance of re-installed sod, which was the homeowner's responsibility, for which the homeowner was provided a hose, sprinkler and sod care instructions.

OU2
Exide conducts O&M activities and groundwater and sediment monitoring consistent with the OU2 Final Site Management Plan, prepared April 2018 and revised October 2019. The OU2 Final Site Management Plan incorporates an Institutional Controls Implementation and Assurance Plan, an O&M Plan and a Site-wide Monitoring Plan (SWMP).

O&M consists of routine inspections of the perimeter fencing, grouted gabion mattresses, concrete and sheet pile creek walls, monitoring wells and stormwater drainage. Exide also inspects the Site to determine if Site uses are consistent with the requirements in the institutional controls. Inspections are to occur quarterly for the first two years of the post-remedial action period and semi-annually for years 3 through 5. Inspections began in 2019. Frequency of inspections beyond year 5 will be determined during FYRs of the remedy. Exide submits results of the inspections to EPA and PADEP within 60 days of each inspection.

During the first year of the inspections in 2019, no significant issues were identified for the concrete and sheet pile creek walls. During the third quarter 2019 inspection, approximately 20 feet of perimeter fencing was observed to be damaged due to a car accident. Exide subsequently repaired the fencing to secure the Site. Some settlement of the backfill soil and asphalt was also observed in an area of approximately 3 feet wide by 5 feet long on the south side of the excavation area on the Warehouse Parcel. A small void appeared to be forming below the asphalt, but no soil was exposed. Exide worked with the Warehouse Owner to perform a temporary repair to the asphalt surface and plans to evaluate the settlement and need for a more involved repair over the next 12 months.

The SWMP focuses on monitoring on-site groundwater to ensure groundwater quality is stable or improving and periodic evaluation of the creek gabions to ensure they remain securely in place and protective of the environment. The SWMP indicates that groundwater sampling will occur quarterly for the first two years following completion of the remedial action, and with EPA approval, semi-annually for years three through five and annually thereafter until Exide can demonstrate to EPA that soils left in place are not detrimentally impacting groundwater. Statistical evaluations of the data will be performed after the first eight sampling events and annually thereafter. Eight shallow monitoring wells and four bedrock wells are included in the monitoring program (Figure 2). Groundwater samples will be analyzed for RCRA 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) and antimony during the first eight quarters of sampling. After the eighth quarterly event, a statistical evaluation to determine contaminant concentration trends will be performed. Thereafter, the statistical analysis will be performed annually and the need for continued groundwater monitoring will be reevaluated at five-year intervals. Analytical parameters for metals may be reduced to include site-specific parameters only (lead, arsenic and antimony).

Sediment sampling in Kaercher Creek will occur in 2019, 2020 and then every five years as warranted based on review of the data. Samples will be analyzed for total lead.

III. PROGRESS SINCE THE PREVIOUS REVIEW

Table 9 includes the protectiveness determinations and statements from the 2015 FYR. Table 10 includes the recommendations from the 2015 FYR and the status of those recommendations. Protectiveness of the OU2 remedy was not evaluated in the 2015 FYR because the remedy had not yet been implemented.

Table 9: Protectiveness Determinations/Statements from the 2015 FYR

OU #	Protectiveness Determination	Protectiveness Statement
OU1	Short-term Protective	The interim remedy at residential areas (OU1) currently protects human health and the environment in the short-term. All residential properties where access was granted have been cleaned up to meet the cleanup standards that are protective of children/human health. Both interior and exterior cleanups were performed to protect people from exposure to lead in soils and lead dust in residences. A Registry was provided to the Borough of Hamburg consistent with the institutional control requirements of the 2009 Interim ROD, identifying which properties are unremediated or have been remediated. This Registry supplements existing Pennsylvania real estate transfer disclosure requirements and ensures that potential buyers are aware of potential contamination. For the remedy to be protective over the long term, institutional controls should be formally incorporated into the Borough of Hamburg residential building occupancy and permit process.

Table 10: Status of Recommendations from the 2015 FYR

OU #	Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)[a]
OU1	Institutional controls should be formally incorporated into the Borough of Hamburg residential building occupancy and permit process.	Work with the Borough of Hamburg to include a formal "lead remediation status notification" into its residential building occupancy and building permit process so that the lead remediation status is indicated within such permits issued by the Borough to homeowners or prospective purchasers.	Completed	The Borough conducts property transfer inspections, as required by a Borough ordinance. A component of this inspection, although not specifically required by the ordinance, includes checking the lead remediation status of the property on EPA's Registry and providing that status to prospective purchasers. The Borough has indicated that it may be possible to add the lead remediation status component of the inspection to the ordinance.	11/26/2019
a) Date of meeting with Borough of Hamburg related to possible Borough Ordnance. This recommendation has been re-identified as an Other Finding in Section VI of this FYR.					

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was published in the *Reading Eagle* newspaper on March 20, 2020 (Appendix E). It stated that the FYR was underway and invited the public to submit any comments to EPA. The results of the review and the report will be made available at the Site's information repository, the Hamburg Public Library, located at 35 North 3rd Street in Hamburg, Pennsylvania.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. EPA conducted an in-person interview with Hamburg Borough officials on November 26, 2019. Interviews with the PRP and O&M contractor were completed via email. Appendix F includes completed interview forms for the PRP and O&M contractor.

The FYR process also included interviews with nearby residents living within one block of the Site. The EPA CIC conducted the interviews by telephone on February 14, 2020. While reaching out to a number of people, the CIC was only able to speak with two residents. The purpose was to document the perceived status of the Site, any perceived problems or successes with the remedy, as well as knowledge of institutional controls at the Site. The interviews are summarized below.

Hamburg Borough officials – the Codes Administrator and Zoning Officer and the Borough Manager – have a favorable impression of the Site's cleanup. They believe communication with EPA has been positive. Fact sheets provided to the community have been useful tools for communication. There have been no comments or concerns from the community since the previous FYR. Borough officials expressed interest in the Exide-owned properties for potential reuse opportunities in the future, but also asked about restrictions on the properties. They were interested in learning more about excavation limitations and soils management. The Borough officials also described the current process for property transfers within the Borough, which includes a property transfer inspection and check of EPA's Registry for lead remediation. Borough officials indicated that the requirement for a property transfer inspection is required by a Borough ordinance. Borough officials also noted that, although the EPA Registry component of the inspection is not specifically included in the ordinance, it is currently included in practice, and it may be possible to formally add it to the ordinance.

The Exide representative noted that the Site's cleanup (specific to OU2) was completed in 2019 and is performing as designed. The representative noted that cleanup was complicated by the requirement to re-calculate EPCs as the remediation progressed, issues related to creek remediation and winter weather. However, the cleanup addressed risks while also leaving the property in a condition for continued and/or future commercial/industrial use. The Exide representative felt well-informed about the Site's activities and remedial progress.

The O&M contractor noted that more waste material than anticipated and winter weather created some delays and additional costs during the OU2 cleanup. However, ongoing Site maintenance is anticipated to be minimal. The O&M contractor noted that the remedy appears to satisfy risk assessment criteria that were determined to be protective of anticipated future users. During recent groundwater monitoring, low levels of total lead were detected, but not dissolved lead. The O&M contractor noted that there have been no O&M difficulties and the frequency of inspections and sampling will decrease over time.

Resident No. 1 lives near the Site and was familiar with the construction work that took place at the former facility property in 2018 and 2019. The resident stated how pleased they are to see Kaercher Creek now open and flowing well. The resident stated they are hoping the opening of the Creek could potentially reduce flooding in their basement. The resident did not have any concerns related to the Site and cleanup but did ask questions about future redevelopment. The CIC provided information regarding the institutional controls in place and the requirements for redevelopment on the property. The resident was appreciative of the information and stated they would like to see the Creek remain open should the Site be redeveloped in the future.

Resident No. 2 also lives near the Site and is familiar of the Site's history and cleanup. The resident does not have any concerns related to the Site or the work that has taken place. The main question the resident asked was what will become of the Site and if it will remain vacant. The CIC provided information regarding the institutional controls in place and the requirements for redevelopment on the property. The resident had no further questions.

Data Review

This data review evaluates groundwater and sediment data collected during the first year of OU2 post-remedial action monitoring and presented in the 2019 Annual Report Operable Unit Two (OU-2), dated September 30,

2019, prepared by Exide contractor Advanced GeoServices (2019 Annual Report). Subsequent quarterly sampling summary reports for the fourth quarter 2019 (4Q2019 Sampling Summary Report, December 17, 2019) and first quarter 2020 (1Q2020 Sampling Summary Report, April 1, 2020) prepared by Advanced GeoServices were also reviewed. Figure 2 shows the groundwater sampling locations.

Only isolated well impacts have been noted in groundwater and there is no widespread groundwater plume. Current data demonstrate that metals concentrations are lower than concentrations detected during baseline sampling. Future sampling efforts will allow for a more meaningful trend evaluation over time and evaluation of the effectiveness of the source removal remedial action. Further discussion of recent sampling data is presented below.

Groundwater
The OU2 groundwater monitoring network includes eight shallow overburden wells (MW wells) and four bedrock wells (BW wells). Groundwater flow direction in the shallow and bedrock groundwater zones is primarily to the west-southwest across the Site.

Quarterly groundwater sampling events occurred in April, July and October 2019, and February 2020. The quarterly reports compare detected concentrations to federal MCLs and the PADEP MSCs for non-residential used aquifers (total dissolved solids <2,500 milligrams per liter). There currently is no MCL promulgated pursuant to the Safe Drinking Water Act, and codified at 40 C.F.R. Part 141, for lead. The EPA Region III risk-based screening level (RSL) for lead in tapwater is 15 micrograms per liter (µg/L), but the RSL is a non-enforceable standard. Therefore, lead concentrations in groundwater are compared to the PADEP MSC for lead in groundwater as the promulgated enforceable standard.

During the April 2019 sampling event, total antimony was detected above the MCL of 6.0 µg/L in wells MW-1 (6.6 µg/L) and BW-3 (16.2 µg/L). Total and dissolved arsenic were detected above the MCL of 10 µg/L in MW-6 at their highest concentrations of 25.9 µg/L (total) and 16.0 µg/L (dissolved). Total lead was detected above the MSC in six overburden wells and two bedrock wells with a concentration range of 5.3 µg/L - 47.9 µg/L. All wells were non-detect for dissolved lead, except for MW-3 (8.9 µg/L).

In the July 2019 sampling event, only shallow well MW-1 (7.2 µg/L) had a total lead concentration above the PADEP MSC. There were no detections of dissolved lead in any wells. All other detected metals concentrations, total and dissolved, were below their respective MCLs in all wells.

In October 2019, total antimony was detected at MW-1 at a concentration of 7.3 µg/L which is above the MCL (6 µg/L). This is the only antimony sample result (total/dissolved) that exceeded the MCL. Arsenic (total/dissolved) was not detected at concentrations above the MCL/MSC in any well/sample. Total lead concentrations were detected above the MSC (5 µg/L) in MW-1 (5.2 µg/L), MW-2 (5.9 µg/L), and MW-7 (12.6 µg/L). Total lead was not detected above the reporting limit (5 µg/L) in the field duplicate sample MW-1D. There were no detections of dissolved lead in any of the wells.

The most recent groundwater sampling was performed in February 2020. No sample results for total/dissolved antimony, arsenic and lead were detected at concentrations above their respective MCL and/or MSC in any well/sample.

The total concentrations of detected metals are generally higher than the dissolved concentrations, which indicates that suspended solids contribute to the potential groundwater impacts. However, in general, the total and dissolved concentrations of antimony, arsenic and lead have remained stable or decreased. Future groundwater sampling data will allow for a more meaningful trend evaluation over time.

Sediment
A sediment sampling event occurred in August 2019 and included five grab samples homogenized into one composite sample, analyzed for total lead. Although not required by the SWMP, an upstream sediment grab

sample was also collected from Kaercher Creek at a point where the creek flows onto the Exide property (immediately below the Peach Alley overpass). The grab sample was also analyzed for total lead. The lead concentration of the composite sediment samples was 303 mg/kg (duplicate result was 274 mg/kg). The lead concentration of the grab sample collected below the Peach Alley overpass was 983 mg/kg. Both samples had lead detections above the lead sediment cleanup level of 35.8 mg/kg. The 2019 Annual Report notes that there does not appear to be a pathway through which lead-impacted material on the Main Parcel is migrating to Kaercher Creek. Kaercher Creek sediment on the Main Parcel is effectively capped in-place underneath the grouted gabion mattresses. The report states that it is believed that the lead detected in sediments on the Main Parcel was washed onto the Main Parcel from a source upstream. Additional sediment samples will be collected in the second or third quarter of 2020.

Additional evaluation of Kaercher Creek outside of the Exide properties is currently being conducted by EPA as part of the OU3 RI/FS.

Site Inspection

The Site inspection took place on November 26, 2019. In attendance were the EPA RPM, the EPA CIC, the PADEP project manager and representatives from Exide (the PRP), Advanced Geoservices (the PRP's contractor) and Skeo (EPA's FYR contractor). The purpose of the Site inspection was to observe current Site conditions as part of an assessment of the protectiveness of the remedy. Appendix H includes photographs from the Site inspection. Appendix G is a Site inspection checklist.

Site inspection participants met at the Main Parcel of OU2, located at the intersection of Walnut Street and Second Street in Hamburg. The Main Parcel is currently vacant. The PRP demolished all former manufacturing buildings prior to the start of the OU2 RI/FS. The parcel is covered with concrete foundations, concrete pavement and stone, and is surrounded by a chain-link fence with locked gate. No trespassing signs were visible on the fence exterior. Site inspection participants also observed the grouted gabion mattresses in the creek, concrete walls of the creek, and sheet pile wall conditions. No issues of concern were identified. No debris or blockages were observed in the creek.

Site inspection participants also observed the Parking Lot Parcel, Broom Works Parcel and Warehouse Parcel. The Parking Lot Parcel is currently in use as a paved parking lot by the Borough with unrestricted access. The Broom Works Parcel and Warehouse Parcel are surrounded by chain-link fence and have restricted access. The Broom Works Parcel is currently undeveloped. The PRP indicated that damage to the fence observed at the Broom Works Parcel would be repaired soon (it was subsequently repaired in December 2019). The Warehouse Parcel is currently used by a trucking company. The asphalt pavement, considered part of the OU2 cap on the Warehouse Parcel, was in good condition. Monitoring wells at the Site were locked and in good condition. The PRP contractor stated that trespassing has not been an issue at OU2.

Site inspection participants observed residential areas that were part of OU1 from the vantage point of the Main Parcel.

Following the Site inspection, EPA personnel interviewed the Hamburg Codes Administrator and Zoning Officer and the Borough Manager at the Borough office. Skeo personnel also visited the designated Site repository, Hamburg Public Library, located at 35 North 3rd Street in Hamburg, Pennsylvania. The most recent documents available for review were from 2015.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

OU1
Yes, the remedy for OU1 (residential portion) is functioning as intended by the decision documents. All residential properties whose owners granted access for cleanup meet the cleanup standards specified in the 2009 Interim ROD. Both interior and exterior cleanups were performed to protect people from exposure to lead in soils and lead dust in residences. The RAOs selected in the 2009 Interim ROD have been met at all eligible residential properties whose owners provided access.

The 2009 Interim ROD called for institutional controls limiting access for future development improvement and use of unremediated properties or properties where residual risk may remain after cleanup. Currently, the Borough has a Registry of the cleanup status of individual properties within OU1. The Borough uses the Registry during its property transfer inspection process and notifies potential buyers about the cleanup status of each property. This practice should be included in a Borough ordinance to ensure that it remains a part of the property transfer inspection process in the future. EPA also responds to information inquiries from potential buyers of unremediated properties.

Because there were no known additional residential properties (for which owners provided access) requiring cleanup, and the 2009 Interim ROD provided for institutional controls, EPA issued a No Further Action Final ROD on September 29, 2015 establishing the interim remedy as the final remedy for the Price Battery Site OU1.

During the OU1 interim remedial action, EPA performed public outreach, informing property owners, renters and the community of the hazards associated with lead exposure, including lead-based paint, and preventative measures to reduce exposure.

OU2
Yes, remedy construction for OU2 (facility portion) finished in 2019 and is functioning as intended by the decision documents. Contaminated soil above commercial/industrial cleanup goals was removed from the former facility parcels, reducing the source of exposure and preventing future impact to the stream from erosion. Removal of contaminated sediments from Kaercher Creek significantly reduced exposures to lead-contaminated sediment within the boundary of the former facility. O&M of OU2 remedy components, including regular inspections of the gabion mattresses, concrete and sheet pile creek walls, continues to be conducted to ensure the long-term integrity of the remedy. Installation of vinyl sheet pile in the creek was not originally specified in the ROD; however, EPA approved the creek stabilization measure during remedy implementation.

The PRP initiated long-term monitoring groundwater activities following the OU2 soil cleanup. In general, over the past four quarters of sampling after completion of the OU2 soil cleanup, the total/dissolved concentrations of antimony, arsenic and lead have remained stable or decreased. The most recent groundwater sampling was performed in February 2020, and no sample results for total/dissolved antimony, arsenic and lead were detected at concentrations above their respective MCL and/or MSC in any well/sample. Groundwater monitoring will continue, and future groundwater sampling data will allow for a more meaningful trend evaluation over time.

Sediment data collected in August 2019 from Kaercher Creek on the Main Parcel reported lead above the cleanup level of 35.8 mg/kg selected in the 2015 ROD. A higher lead concentration was reported in the upstream sample that was collected at a point where the creek flows onto the Exide property. However, Kaercher Creek sediment on the Main Parcel is effectively capped in-place underneath the grouted gabion mattresses. It is thought the lead detected in sediments on the Main Parcel were washed onto the Main Parcel from upstream. Additional evaluation of Kaercher Creek outside of the Exide properties is currently being conducted by EPA as part of the OU3 RI/FS.

Institutional controls for the OU2 parcels are in place in the form of deed restrictions that prohibit residential, recreational, school, daycare and other uses that could potentially expose children to residual contamination on the OU2 parcels. Exide plans to replace the current deed restrictions with new ERCs that provide the same general restrictions, but which comply with the Pennsylvania Uniform Environmental Covenants Act.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?

Question B Summary:

OU1

The OU1 Interim ROD (as later finalized by the 2015 ROD) selected a residential lead-in-soil cleanup level of 572 mg/kg. The site-specific level was developed using the IEUBK Model for Lead in Children. According to the September 2004 Final Risk-Based Preliminary Remediation Goals Report, a blood lead level of 10 micrograms per deciliter (µg/dL) was used as the target value/level in the development of the lead cleanup level. At the time, this level was based on a 1994 EPA directive (OSWER Directive #9355.4-12). In December 2016, EPA issued Directive 9200.2-167, *Updated Scientific Consideration for Lead in Soil Cleanups*, which noted that the information provided in the 1994 directive regarding blood lead levels may not be adequately protective for children and adults, as it does not reflect current scientific consensus and national public health recommendations regarding lead exposure and adverse health effects. The current scientific literature on lead toxicology and epidemiology provides evidence that adverse health effects are associated with blood lead levels less than 10 µg/dL. However, EPA has not yet issued additional guidance updating the target blood lead level for use in the IEUBK Model. Therefore, this FYR evaluates the residential lead-in-soil cleanup level using other updated guidance (such as the maternal blood lead concentration at childbirth (MatPb) in the IEUBK model) (Appendix I). Using the 2017 updated MatPb in the IEUBK model along with the site-specific assumptions used in the 2009 Interim ROD, the residential cleanup goal increased only slightly to 578 mg/kg versus the interim ROD cleanup level of 572 mg/kg (Table I-1). Therefore, the residential lead-in-soil cleanup level remains valid.

If EPA lowers the acceptable target blood lead level below 10 µg/dl, EPA will reassess the protectiveness of the calculated residential site-specific lead cleanup level in accordance with any updated guidance, as appropriate. Until such guidance is updated, the OU1 remedy is currently protective for those residential properties which were remediated. Remediated residential yards were excavated, in general, a minimum of 6 - 24 inches below ground surface and backfilled with clean soil. The clean soil effectively reduces exposure to residential yard lead contamination and prevents tracking of lead-contaminated soil into the home.

The OU1 Interim ROD also selected an interior lead dust cleanup level of 40 µg/ft^2. During selection of this cleanup level, EPA considered the Department of Housing and Urban Development (HUD) Guidelines for the Evaluation of Control of Lead-Based Paint Hazards in Housing (HUD Guidelines) as to-be-considered (TBC) criteria for the Site. On June 21, 2019, EPA announced new standards for lead in dust on floors and windowsills to protect children from the harmful effects of lead exposure. The final rule, which became effective January 6, 2020, revised the dust-lead hazard standard (DLHS) from 40 µg/ft^2 to 10 µg/ft^2 for floors.[6]

The DLHS addresses lead hazards posed by lead-based paint and resulting lead-contamination of dust in the residential environment and provides dust clearance standards for lead-based paint abatement projects; and therefore, not directly applicable to the Price Battery Site residential cleanup, since limited authority is available under Superfund to address lead-based paint hazards. However, lead-based paint dust standards for floors were used as TBC criteria with respect to establishing the criteria to be used in evaluation and cleanup and clearance sampling conducted as part of the OU1 interim remedial action.

[6] https://www.epa.gov/lead/hazard-standards-lead-paint-dust-and-soil-tsca-section-403

The OU1 interim remedial action involved the cleanup of lead-contaminated residential soils and interior lead-contaminated dust as a result of Price Battery Site-related contamination, and consequently, prevents further tracking of Site-related contamination from the yard into the home. Therefore, the source of Site-related interior lead dust contamination has been eliminated (for those homes which provided access), and the interior remediation remains protective. The DLHS would apply to homes that continue to have unabated lead-based paint hazards at the homes; however, EPA is unable to address lead-based paint hazards under Superfund. Nonetheless, EPA did provide homeowners with copies of educational materials related to lead-based paint hazards.

The OU1 residential cleanup finished in 2013 and met the RAOs identified in the 2009 OU1 Interim ROD at all eligible residential properties whose owners provided access for cleanup. There are no known additional residential properties (for which owners provided access) requiring cleanup.

The 2009 Interim ROD deferred an ecological assessment for OU1 to a subsequent OU (i.e., OU3). The OU1 ecological assessment is being conducted as part of the Site-wide ecological assessment during the OU3 RI/FS which is still ongoing. However, information from the OU3 RI/FS indicates that the OU1 remedy is protective of ecological receptors. Approximately 92 percent of the contaminated residential properties eligible for cleanup were remediated during the OU1 interim remedial action. As a result of the depth of the excavation of contaminated residential soils and the thickness of the backfilled clean soil cover and revegetation, the majority of flora, fauna and terrestrial invertebrates within these remediated areas in OU1 would have limited exposure to potentially contaminated soil below the clean soil cover.

OU2

For OU2, the 2015 ROD established lead-in-soil site-specific risk-based RBCs that must be met on average through the exposure area. The site-specific levels were calculated using the Adult Lead Methodology (ALM) and varied by parcel and exposure scenario. The PRP, with EPA's oversight, completed the OU2 soil cleanup in 2019 and met the lead site-specific RBCs for each parcel. The exposure assumptions used in the derivation of the lead cleanup levels have not changed. The OU2 parcels have been cleaned up for commercial/industrial reuse. There are no direct exposure pathways to lead-contaminated soils; all excavated areas were backfilled and covered either with crushed stone or asphalt. Institutional controls in place to prohibit residential use and fencing around the Main Parcel, Broom Works Parcel and Warehouse Parcel prevents unauthorized access.

This FYR evaluates the lead-in-soil site-specific risk-based RBCs for the office worker and construction worker using updated parameters for the ALM (Appendix I, Tables I-2 and I-3). The lead site-specific risk-based RBCs for the office worker and construction worker remain valid. It should also be noted that the acceptable blood lead level of 10 µg/dL is currently under review by EPA and it may be revised based on recommendations by the Centers for Disease Control. If EPA lowers the acceptable target blood lead level below 10 µg/dL, EPA will reassess the protectiveness of the calculated site-specific lead cleanup level in accordance with any updated guidance, as appropriate.

The 2015 ROD also selected OU2 sediment cleanup goals, which were the lower of residential human-health-based values and ecological-based values. As shown in Appendix J, Table J-1, the sediment cleanup goals remain valid, although the sediment cleanup goal for antimony (3 mg/kg) is slightly higher than the current EPA Biological Technical Assistance Group (BTAG) sediment screening value of 2 mg/kg. The ecological-based sediment cleanup levels also remain protective of human health (Appendix J, Table J-2).

The 2015 ROD identified the MCLs and Pennsylvania groundwater remedial levels as chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) for the Site groundwater. Annual reports compare detected metals concentrations to both current MCLs and Pennsylvania MSCs.

The RAOs for the soil portion of the OU2 remedy have been met. The RAOs for the sediment portion of the OU2 remedy were also met at the time of the OU2 remedial action completion. Kaercher Creek sediment on the Main Parcel has been effectively capped in-place underneath the grouted gabion mattresses. Although post remediation sampling reveals elevated detections of lead in sediment on the Main Parcel, it is believed that the lead detected in

sediments on the Main Parcel was washed onto the Main Parcel from a source upstream. Monitoring of sediment and groundwater for Site COCs will continue.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

Exide filed for Chapter 11 bankruptcy in May 2020, and Exide has announced plans to sell or abandon certain Non-Performing Properties. Among those properties Exide has indicated it will divest are the Exide-owned portions of the Price Battery Site. EPA is in the process of exploring its enforcement options to secure the completion of O&M and groundwater monitoring activities at the Exide-owned properties.

The Exide bankruptcy, along with its plans to sell or abandon its properties associated with the Price Battery Site may affect future protectiveness of the OU2 remedy if O&M and groundwater monitoring activities cease or are interrupted for a protracted period of time. EPA will continue to coordinate with Exide, and other stakeholders including PADEP and any future owners of the properties, during the bankruptcy process regarding O&M activities.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
OU1

OU(s): OU2	**Issue Category: Operations and Maintenance**			
	Issue: Exide filed for Chapter 11 bankruptcy in May 2020, and Exide has announced plans to sell or abandon certain Non-Performing Properties, among which are the Exide-owned portions of the Price Battery Site. Responsibility for future O&M and groundwater monitoring activities is unclear.			
	Recommendation: EPA will continue to coordinate with Exide, and other stakeholders, including PADEP and any future owners of the properties, during the bankruptcy process regarding O&M activities.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	8/3/2022

OTHER FINDINGS

Six additional recommendations were identified during the FYR. These recommendations do not affect current and/or future protectiveness.

- Update the Site repository with current Site documents.
- Installation of vinyl sheet pile in the creek was not a ROD requirement; however, EPA approved the vinyl sheet pile wall in the remedial design. Consider formalizing the sheet pile wall as an OU2 remedy component in a Memorandum of Insignificant Changes.
- Continue to monitor for settlement of the asphalt surface on the Warehouse Parcel and evaluate need for a more involved repair over the next 12 months.

- Current deed restrictions are to be replaced with new ERCs that comply with the Pennsylvania Uniform Environmental Covenants Act.
- Continue discussions with the Borough of Hamburg to incorporate the EPA Registry into the Borough's property transfer ordinance.
- EPA is re-evaluating the acceptable blood lead level of 10 µg/dL, upon which the Site-specific soil cleanup levels for lead are based. If EPA lowers the acceptable target blood lead level below 10 µg/dL, EPA will reassess the protectiveness of the calculated site-specific lead cleanup level in accordance with any updated guidance, as appropriate.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: OU1	*Protectiveness Determination:* Protective
Protectiveness Statement: The OU1 remedy is currently protective of human health and the environment. All residential properties where access was granted have been cleaned up to meet the cleanup standards that are protective of children/human health. The OU1 remedy is protective of ecological receptors. Institutional controls are in place.	

Protectiveness Statement(s)	
Operable Unit: OU2	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The OU2 remedy is currently protective of human health and the environment. The former facility properties were cleaned up to standards protective of commercial/industrial reuse. The OU2 remedy is protective of ecological receptors. Institutional controls are in place to prohibit residential use and protect the long-term integrity of the remedy. Exide filed for Chapter 11 bankruptcy in May 2020, and responsibility for future O&M and groundwater monitoring activities is unclear. For the remedy to be protective in the long term, the following actions should be implemented: • EPA will continue to coordinate with Exide, and other stakeholders, including PADEP and any future owners of the properties, during the bankruptcy process regarding O&M activities.	

Government Performance Results Act (GPRA) Measure Review:
As part of this FYR, the GPRA measures were reviewed. The GPRA measures and their status are provided as follows:

Environmental Indicators
Human Health: Current Human Exposure Controlled
Groundwater Migration: Contaminated Ground Water Migration Under Control

Sitewide Ready for Anticipated Use
The Site has not achieved Sitewide Ready for Anticipated Use (SWRAU) status.

VIII. NEXT REVIEW

The next FYR Report for the Price Battery Lead Smelter Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

2019 Annual Report, Operable Unit Two (OU-2), Price Battery Superfund Site, Hamburg, Pennsylvania. Prepared for Exide Technologies by Advanced GeoServices. September 30, 2019.

2Q2019 Sampling Summary Report, Price Battery Superfund Site OU2, Hamburg, Pennsylvania. Advanced GeoServices. June 29, 2019.

4Q2019 Sampling Summary Report, Price Battery Superfund Site OU2, Hamburg, Pennsylvania. Advanced GeoServices. December 17, 2019.

1Q2020 Sampling Summary Report, Price Battery Superfund Site OU2, Hamburg, Pennsylvania. Advanced GeoServices. April 1, 2020.

Draft Trip Report for Remedial Action Oversight Activities, Price Battery Superfund Site, Operable Unit 2, Hamburg, Berks County, Pennsylvania. CDM Smith. August 2, 2019.

Final Comprehensive Remedial Investigation Report. Price Battery Site, Operable Unit 1, Hamburg, Berks County, Pennsylvania. February 6, 2014.

Final Human Health Risk Assessment for Price Battery Site. Hamburg, Pennsylvania. Prepared for EPA Region 3 by CDM. October 11, 2005.

Final Site Management Plan, Price Battery Superfund Site OU-2, Hamburg Borough, Pennsylvania. Prepared for Exide Technologies by Advanced Geoservices Corp. April 27, 2018, Revised October 25, 2019.

Five-Year Review Report for Price Battery Superfund Site, Berks County, Pennsylvania. EPA Region 3. August 3, 2015.

Interim Record of Decision. Price Battery Superfund Site. Operable Unit 1, Residential Soils. EPA Region 3. September 30, 2009.

Record of Decision, Operable Unit One – Residential Portion, Operable Unite Two – Facility Portion, Price Battery Superfund Site, Berks County, Pennsylvania. EPA Region 3. September 2015.

Remedial Action Report. Price Battery Superfund Site. Operable Unit 1, Berks County, Pennsylvania. EPA Region 3. September 2014.

Remedial Action Report Operable Unit Two (OU-2), Price Battery Superfund Site, Hamburg, Pennsylvania. Prepared for Exide Technologies by Advanced GeoServices. July 29, 2019, Revised September 23, 2019.

Updated Scientific Considerations for Lead in Soil Cleanups. EPA Office of Land and Emergency Management (OLEM) Directive 9200.2-167. December 22, 2016.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Price Battery owned and operated the battery manufacturing facility and secondary lead smelter	1940s
General Battery Corporation acquired Price Battery	1956
General Battery Corporation merged with Exide	1987
Exide ceased manufacturing at the Site	1995
EPA began a removal assessment	September 2001
EPA issued an Action Memorandum for a Removal Action for the former facility and residential areas using EPA's default residential soil cleanup level for lead of 400 mg/kg	November 2002
EPA signed an AOC with Exide to perform a removal cleanup at the Price Battery facility; the PRP began the removal action	June 2003
EPA listed the Site on the NPL	April 2005
EPA issued an Action Memorandum for a Modification of Scope for the Removal Action for the Price Battery Site revising the residential soil cleanup level for lead to 572 mg/kg	May 2005
EPA began the OU1 RI/FS	September 2005
EPA and Exide signed a second AOC for Exide to perform the RI/FS on all Exide-owned properties, including the former Price Battery facility; the PRP started the OU2 RI/FS	May 2007
The PRP completed a facility removal action	September 2008
EPA signed the OU1 Interim ROD	September 2009
EPA and the Commonwealth of Pennsylvania entered into a Superfund State Contract for OU1	February 2010
EPA began an interim remedial action on-site construction	August 2010
EPA completed a removal action for residential property cleanup	September 2010
EPA transferred residential cleanups from removal authority to remedial authority	October 2010
EPA began the ecological (OU3) RI/FS	September 2012
EPA completed the OU1 residential cleanup	October 2013
EPA issued the OU1 Remedial Action Completion Report	August 2014
EPA issued the first FYR Report	August 2015
The PRP completed the OU2 RI/FS; EPA issued the OU1 and OU2 ROD	September 2015
EPA issued a Unilateral Administrative Order to Exide to perform the remedial design/remedial action for OU2; the PRP began the OU2 remedial design	April 2016
The PRP completed the OU2 remedial design and began the remedial action	June 2018
EPA approves the OU2 Remedial Action Completion Report	September 2019

APPENDIX C – PRP REMOVAL ACTION

Appendix C provides additional information about the removal action conducted by Exide.

Table C-1: Exide Removal Action, 2003

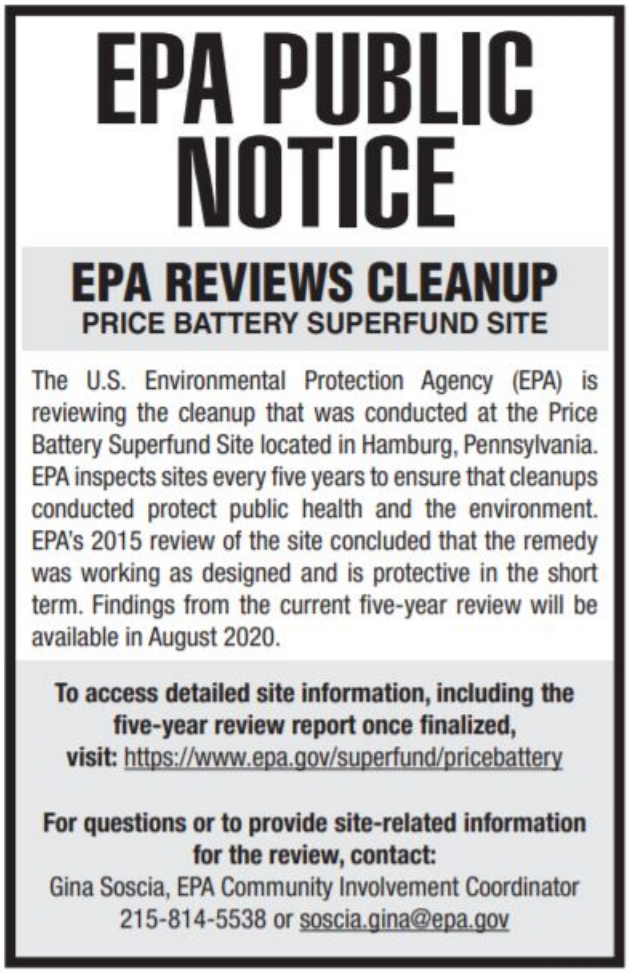
Site Area	Description of Removal Activities
Broom Works Parcel	Surface soils on the Broom Works Parcel contained total lead concentrations as high as 120,000 mg/kg; therefore, Exide capped the Broom Works Parcel soils, and installed a fence around the parcel. The cap consisted of a non-woven geotextile installed over a smoothly graded and compacted soil subgrade and covered by 8 inches of crushed stone.
Kaercher Creek	Exide capped sediments in Kaercher Creek within the property boundary of the Main Parcel. Total lead concentrations detected in the sediments ranged from 4,867 ppm to 24,090 ppm. The cap consisted of approximately 6,500 square feet of 6-inch thick gabion mattresses grouted in place to ensure stability.
Main Parcel	The building cleanup process included the pumping and removal of liquid and solid residual waste materials from the facility sumps, pits and trenches. After removal of the residual waste materials, the sumps, pits, and trenches were cleaned until their surfaces were visually absent of waste, dirt or sediment. The areas were subsequently backfilled with stone and capped with 4 to 6 inches of concrete. Liquid and solid wastes were transported off-site for disposal. Although not a specific requirement of the Removal AOC, Exide had the existing buildings on the Main Parcel decontaminated and demolished to grade in the summer and fall of 2007.
All Exide-owned Parcels	The Removal Action Memorandum and the Removal AOC required institutional controls to restrict land use of the Exide-owned parcels. A Declaration of Use and Deed Restriction was placed on all Exide-owned parcels in 2004. Among other things, the Deed Restriction prohibited use of the Exide properties for residential, recreational, schools, day care facilities, or other uses that could potentially expose children to contamination.

APPENDIX D – OU2 EXCAVATION AREAS

Source: 2019 Remedial Action Report, OU2

APPENDIX E – PRESS NOTICE

Published in the Reading Eagle newspaper on March 20, 2020



EPA PUBLIC NOTICE

EPA REVIEWS CLEANUP
PRICE BATTERY SUPERFUND SITE

The U.S. Environmental Protection Agency (EPA) is reviewing the cleanup that was conducted at the Price Battery Superfund Site located in Hamburg, Pennsylvania. EPA inspects sites every five years to ensure that cleanups conducted protect public health and the environment. EPA's 2015 review of the site concluded that the remedy was working as designed and is protective in the short term. Findings from the current five-year review will be available in August 2020.

To access detailed site information, including the five-year review report once finalized, visit: https://www.epa.gov/superfund/pricebattery

For questions or to provide site-related information for the review, contact:
Gina Soscia, EPA Community Involvement Coordinator
215-814-5538 or soscia.gina@epa.gov

APPENDIX F – INTERVIEW FORMS

PRICE BATTERY LEAD SMELTER SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Price Battery Lead Smelter	
EPA ID: PAN000305679	
Interviewer name:	**Interviewer affiliation:**
Subject name: Matthew A. Love	**Subject affiliation: Property Owner/PRP**
Subject contact information: Tel: (610) 921-4054; Email: matt.love@exide.com	
Interview date: December 16, 2019	**Interview time: 1:20 pm**
Interview location: Exide facility; Reading, Pennsylvania	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: Potentially Responsible Party (PRP)	

1. What is your overall impression of the remedial activities at the Site? The remediation was largely a typical soil excavation and backfill project. The remediation was somewhat complicated by the requirement to re-calculate the exposure point concentration as the remediation progress, issues related to creek remediation (e.g., bypass challenges, demolition of the creek "roof", replacement of the creek wall in one location, etc.), and winter weather. The remedial activities more than adequately addressed risks identified during the Remedial Investigation/Feasibility Study while leaving the property in a condition for continued and/or future commercial/industrial use.

2. What have been the effects of this Site on the surrounding community, if any? Historic air emissions from the former Exide facility impacted soil at properties in the immediate vicinity of the former Exide facility. Those properties were remediated, as appropriate, by the United States Environmental Protection Agency.

3. What is your assessment of the current performance of the remedy in place at the Site? Remediation was just completed in April 2019 and is performing as designed.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup? No.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future? Having been involved in all aspects of the Site remediation, I am well-informed regarding the Site's activities and remedial progress.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy? No.

7. Do you consent to have your name included along with your responses to this questionnaire in the FYR report? Yes.

PRICE BATTERY LEAD SMELTER SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Price Battery Lead Smelter	
EPA ID: PAN000305679	
Interviewer name:	**Interviewer affiliation:**
Subject name: Jan Dobinsky	**Subject affiliation: Engineer for Remediation**
Subject contact information: 610-840-9136 jdobinsky@montrose-env.com	
Interview date:	**Interview time:**
Interview location:	
Interview format (circle one): In Person Phone Mail Email Other:	
Interview category: O&M Contractor	

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

Project cleanup generally conformed to anticipated design conditions. Although there was more waste material generated than anticipated and combined with winter conditions to create some delays and additional costs. Maintenance of the Site is anticipated to be minimal. There are currently no reuse activities onsite, but the Site could be readily used for very basic industrial/commercial purposes like parking or material storage by an end user.

2. What is your assessment of the current performance of the remedy in place at the Site?

It appears to satisfy the risk assessment criteria that was determined to be protective of anticipated future users. Re-establishment of sediment and related ecological benefits within the Creek appears to be occurring.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

Low-levels of total lead are observed in some wells. However, dissolved lead results are "non-detect". Results have been somewhat stable dating back to pre-remediation baseline data.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

Quarterly inspections are performed in conjunction with quarterly groundwater monitoring. Inspections focus on site security and maintaining ground cover as well as the conditions in the onsite portion of the Creek. Inspections and monitoring data are reported to USEPA on a quarterly basis.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

None. Remedy was implemented/completed within the previous year.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

None.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

Over time the frequency of inspection and sampling will decrease.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

None.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR report?

Yes.

APPENDIX G – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Price Battery Lead Smelter	**Date of Inspection:** 11/26/2019
Location and Region: Hamburg, PA 3	**EPA ID:** PAN000305679
Agency, Office or Company Leading the Five-Year Review: EPA Region 3	**Weather/Temperature:** Sunny, approx. 50 degrees F

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: Creek restoration - grouted gabion mattresses, sheet pile wall

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** Jan Dobinsky (Name) Engineer, Montrose Environmental (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☒ by email Phone: _____
   Problems, suggestions ☐ Report attached: Interview form included in an appendix to this FYR Report

2. **O&M Staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency Borough of Hamburg
   Contact John Leonforte (Name) Buiding Inspector (Title) 11/26/2019 (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: Summary included in the FYR Report

   Agency Borough of Hamburg
   Contact Marisa Lenceski (Name) Borough Manager (Title) 11/26/2019 (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: Summary included in the FYR Report

4. **Other Interviews** (optional) ☒ Report attached: _____

Matt Love, Exide

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

   ☒ O&M manual ☒ Readily available ☒ Up to date ☐ N/A

	☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
	☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
2.	**Site-Specific Health and Safety Plan**	☒ Readily available	☐ Up to date	☐ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
3.	**O&M and OSHA Training Records**	☒ Readily available	☐ Up to date	☐ N/A
	Remarks: _____			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
6.	**Settlement Monument Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: Monitoring stations have been established to monitor the concrete walls along the creek within OU2.			
7.	**Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: _____			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: _____			

IV. O&M COSTS

1.	**O&M Organization**	
	☐ State in-house	☐ Contractor for state
	☐ PRP in-house	☒ Contractor for PRP
	☐ Federal facility in-house	☐ Contractor for Federal facility
	☐ _____	

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☒ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: $6412 (Main Parcel and Sediment combined)

☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: None. O&M began in September 2019.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: Damage to fence at Broom Works Parcel. PRP noted that it would be fixed prior to FYR signature. Update: Fence repaired in December 2019

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: No trespassing signs are posted along the fence at the Warehouse Parcel, Broom Works Parcel and Main Parcel.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): self-reporting

Frequency: quarterly

Responsible party/agency: PRP

Contact Matt Love, Exide _____ _____ _____

Name Title Date Phone no.

Reporting is up to date ☒ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: ICs for the OU2 parcels are adequate; Exide plans to update the ICs to be consistent with state requirements

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: None since remedial action.

3. **Land Use Changes Off Site** ☐ N/A

Remarks: None since remedial action.

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☐ Roads adequate ☒ N/A

Remarks: _____

B. Other Site Conditions

Remarks: OU2 areas are in good condition.

VII. LANDFILL COVERS ☒ Applicable* ☐ N/A

*Some areas were capped as part of removal actions prior to remedial action; consists of stone/asphalt caps

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☒ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

Lengths: _____ Widths: _____ Depths: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Area extent: _____ Depth: _____
Remarks: _____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
Area extent: _____ Depth: _____
Remarks: _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
☐ No signs of stress ☐ Trees/shrubs (indicate size and locations on a diagram)
Remarks: Not applicable

6. **Alternative Cover** (e.g., armored rock, concrete) ☐ N/A
Remarks: Caps consist of stone or asphalt

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Area extent: _____ Height: _____
Remarks: _____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident

☐ Wet areas	☐ Location shown on site map	Area extent: _____
☐ Ponding	☐ Location shown on site map	Area extent: _____
☐ Seeps	☐ Location shown on site map	Area extent: _____
☐ Soft subgrade	☐ Location shown on site map	Area extent: _____

Remarks: _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map
☒ No evidence of slope instability
Area extent: _____
Remarks: _____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks: _____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks: _____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side

slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement
   Area extent: _____ Depth: _____
   Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
   Material type:_____ Area extent: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
   Area extent: _____ Depth: _____
   Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
   Area extent: _____ Depth: _____
   Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions
   ☐ Location shown on site map Area extent: _____
   Size: _____
   Remarks: _____

6. **Excessive Vegetative Growth** Type: _____
   ☐ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on site map Area extent: _____
   Remarks: _____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
   Remarks: _____

2. **Gas Monitoring Probes**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
   Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☒ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident

Area extent: _____ Depth: _____

Remarks:

2. **Performance Monitoring** Type of monitoring: quarterly inspections

☐ Performance not monitored

Frequency: quarterly ☐ Evidence of breaching

Head differential: _____

Remarks: No issues of concern.

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

   ☐ Good condition ☐ Needs maintenance

   Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

   ☐ Good condition ☐ Needs maintenance

   Remarks: _____

3. **Spare Parts and Equipment**

   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

   Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

   ☐ Air stripping ☐ Carbon adsorbers

   ☐ Filters: _____

   ☐ Additive (e.g., chelation agent, flocculent): _____

   ☐ Others: _____

   ☐ Good condition ☐ Needs maintenance

   ☐ Sampling ports properly marked and functional

   ☐ Sampling/maintenance log displayed and up to date

   ☐ Equipment properly identified

   ☐ Quantity of groundwater treated annually: _____

   ☐ Quantity of surface water treated annually: _____

   Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

   ☐ N/A ☐ Good condition ☐ Needs maintenance

   Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

   ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

   Remarks: _____

4. **Discharge Structure and Appurtenances**

   ☐ N/A ☐ Good condition ☐ Needs maintenance

   Remarks: _____

5. **Treatment Building(s)**

   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

   ☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☐ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Creek restoration – Gabion mattresses and vinyl sheet pile wall in creek were observed to be in good condition. No obstructions in the creek were noted.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

The OU1 and OU2 remedies appear to be functioning as intended. An objective of the OU1 and OU2 remedies was to prevent direct human exposure to contaminated media above risk-based criteria. An additional objective of the OU2 remedy was to prevent ecological receptors from exposure to contaminated soils and sediment above ecologically-protective values. The OU1 cleanup successfully removed lead contamination from residential properties. The OU2 remedy removed soil and sediment contamination at the Site. Institutional controls are in place and additional institutional controls will be implemented to ensure the remedies remain protective in the future.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M is adequate at this time.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None at this time.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

None at this time.

APPENDIX H – SITE INSPECTION PHOTOS

View across Main Parcel of OU2 looking toward Warehouse Parcel

View across Main Parcel of OU2 looking at the Parking Lot Parcel

Kaercher Creek in OU2

Kaercher Creek running through OU2, sheet pile wall to left

Monitoring wells MW-3 and BW-3

Monitoring well MW-2

Fence along Broom Works Parcel, OU1 in background (Update: Fence repaired December 2019)

Signage on OU2 fence

Warehouse Parcel

APPENDIX I – REVIEW OF LEAD SOIL CLEANUP GOALS

This FYR evaluated lead-in-soil cleanup levels to determine if they remain valid in light of updated risk assessment methodology. EPA established the residential soil cleanup level in the 2009 Interim ROD using the IEUBK model with site-specific assumptions. Since 2009, EPA has updated the MatPb for use in the IEUBK model in 2017. In addition, EPA updated two additional parameters used in the ALM to include the background blood lead concentration parameter in U.S. in women of child-bearing age (PbBo), as well as the geometric standard deviation parameter (GSDi). The PbBo and GSDi were based on the updated National Health and Nutrition Examination Survey (NHANES).[7]

Using the 2017 updated MatPB in the IEUBK model along with the site-specific assumptions (Table I-1) used in the 2009 Interim ROD, the residential cleanup goal increased only slightly to 578 mg/kg versus the Interim ROD cleanup level of 572 mg/kg; therefore, the residential cleanup goal for lead remains valid.

Table I-1: Assumptions Used in the IEUBK Model Based on EPA 2017 Guidance

Description	Units	Model Input Values
Maternal blood lead concentrations	µg/dL	0.6[a]
Contribution of soil lead to indoor dust	Percent	0.318[b]
Concentration in air	micrograms per cubic meter	0.1[c]
Geometric standard deviation of blood lead	unitless	1.6[c]
Dietary lead intake	µg/day	
0-11 months		3.16[d]
12-23 months		2.60[d]
24-35 months		2.87[d]
36-47 months		2.74[d]
48-59 months		2.61[d]
60-71 months		2.74[d]
72-84 months		2.99[d]
Concentration in water	µg/L	1[c]
Bioavailability	Percent	30[c]
Risk-based concentration	mg/kg	578[e]

Notes:
a) Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. Office of Land and Emergency Management Directive 9285, 6-56. May 2017.
b) Value obtained from Table 3-5 from 2005 HHRA.
c) Value obtained from Table 4-2 of the 2005 HHRA.
d) Value obtained from Table 3-3 of 2005 HHRA.
e) EPA 2017 guidance recommends using 12-71 month age range.

The cleanup goals for the office worker and construction worker were entered into 2017 ALM using the most current GSDi, PbBo, target blood lead level of 10 µg/dL and site-specific exposure assumptions for ingestion rate and exposure frequency as listed in the 2011 Baseline Human Health Risk Assessment for Exide-Owned Properties, prepared by Gradient (2011 HHRA). The calculated lead cleanup goal for the office worker equates to 2,517 mg/kg (Table I-2), which is slightly higher than the 2015 ROD cleanup goal of 2,240 mg/kg. Similarly, the calculated lead cleanup goal for the construction worker is 1,057 mg/kg (Table I-3), which is also slightly higher

[7] Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. Office of Land and Emergency Management Directive 9285,6-56. May 17, 2017.

than the 2015 ROD cleanup goal of 941 mg/kg. However, these results demonstrate the lead cleanup goals remain valid based on the cleanup goals' results within EPA's threshold of a 5% probability that a fetus' blood lead level will not exceed a 10 µg/dL blood lead level. It should also be noted that the acceptable blood lead level of 10 µg/dL is currently under review by EPA and it may be lowered to the level recommended by the Centers for Disease Control of 5 µg/dL or lower. If EPA lowers the acceptable target blood lead level below 10 µg/dl, EPA will reassess the protectiveness of the calculated site-specific lead cleanup level in accordance with any updated guidance, as appropriate.

Table I-2: Calculation of Lead Cleanup Goals for Office Workers Using the 2017 ALM Model

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of National Health and Nutrition Examination Survey (NHANES) 2009-2014
$PbB_{fetal,\ 0.95}$	Target PbB in fetus	µg/dL	10[a]
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	µg/dL	0.6
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050[a]
$AF_{S,\ D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,\ D}$	Exposure frequency (same for soil and dust)	days/yr	219[a]
$AT_{S,\ D}$	Averaging time (same for soil and dust)	days/yr	365[a]
Preliminary Remediation Goal in Soil for no more than 5% probability that fetal PbB exceeds target PbB		**ppm**	**2,517**

Notes:
a) Values obtained from Table Appendix E of the 2011 HHRA prepared by Gradient.
g/day = grams per day
days/yr = days per year
ppm = parts per million (equivalent to mg/kg)

Table I-3: Calculation of Lead Cleanup Goals for Construction Workers Using the 2017 ALM Model

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 2009-2014
$PbB_{fetal,\ 0.95}$	Target PbB in fetus	µg/dL	10[a]
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	µg/dL	0.6
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100[a]
$AF_{S,\ D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,\ D}$	Exposure frequency (same for soil and dust)	days/yr	100[a]
$AT_{S,\ D}$	Averaging time (same for soil and dust)	days/yr	140[a]
Preliminary Remediation Goal in Soil for no more than 5% probability that fetal PbB exceeds target PbB		**ppm**	**1,057**

Notes:
a) Values obtained from Table Appendix E of the 2011 HHRA prepared by Gradient.

APPENDIX J – REVIEW OF SEDIMENT CLEANUP GOALS

Table J-1: Comparison of OU2 Sediment Cleanup Levels to Current Ecological-based Benchmarks

Sediment COC	OU2 Sediment Cleanup Level[a] (mg/kg)	2020 Freshwater Sediment NOAA Screening Benchmarks[b] (mg/kg)	2020 EPA BTAG Freshwater Sediment Screening Benchmarks[c] (mg/kg)	Notes
Lead	35.8	35.8	35.8	No changes
Arsenic	9.79	9.79	9.8	No changes
Antimony	3.0	3	2	EPA BTAG benchmark is more stringent than cleanup level

Notes:

a) Source is Table 10 of the 2015 ROD.

b) NOAA Screening Quick Reference Tables (SQuiRTs) available at https://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf, accessed 2/12/2020.

c) BTAG sediment screening benchmarks available at: https://www.epa.gov/risk/freshwater-sediment-screening-benchmarks, accessed 2/12/2020.

Table J-2: Sediment Cleanup Goal Screening-level Health-based Risk Evaluation

Sediment COC	OU2 Sediment Cleanup Level (mg/kg)	Residential Soil RSL[a]		Screening-level Risk Evaluation	
		Risk	HQ (hazard quotient)	Risk[b]	HQ[c]
Lead	35.8	400[d]		--	--
Arsenic	9.79	0.68	35	1×10^{-5}	0.3
Antimony	3.0	--	31	--	0.1

Notes:

a) EPA's soil RSLs, dated November 2019, available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables, accessed 02/12/2020.

b) Carcinogenic risk calculated using the following equation: Risk = cleanup goal / cancer-based RSL x 10^{-6}.

c) Noncancer HQ calculated using the following equation: HQ = cleanup goal / noncancer-based RSL.

d) EPA has not calculated carcinogenic or noncarcinogenic screening levels for lead. A screening level for soil lead at residential sites of 400 mg/kg is based on a recent analysis of the combined phases of the National Health and Nutrition Examination Survey that choose a cleanup goal protective for all subpopulations.

-- = EPA has not finalized toxicity values for this compound.