

**First 5-Year Review
of the Non-Populated Area Operable Unit
Bunker Hill Mining and Metallurgical Complex
Shoshone County, Idaho**

Approved by:

Date:

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Executive Summary

Introduction

This report summarizes the initial 5-year review of remedial actions implemented by the Environmental Protection Agency (EPA) Region 10 and the State of Idaho at the Non-Populated Areas operable unit of the Bunker Hill Superfund Site (Site) located in Shoshone County, Northern Idaho. This 5-year review of remedial actions has been prepared to meet the federal statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

At the time of this initial 5-year review, full implementation of the site remedy had not yet been completed. The purpose of this 5-year review is to document the remedial action work conducted to date, and based on information at this time, to assess whether the remedy at the Bunker Hill Superfund site, once completed, will be protective of human health and the environment. Since the time from completion of the implemented remedial actions ranges from months to a couple of years, adequate time has not passed to fully judge the effectiveness of the specific remedial actions. Therefore, this initial 5-year review is not expected to provide final definitive judgements on the effectiveness of the remedies completed at the Site; but rather to be a starting point for ongoing monitoring and evaluation of the overall site remedy.

EPA documents that define the selected remedy for the Non-Populated Areas of the Site include:

- Record of Decision, Bunker Hill Mining and Metallurgical Complex, Shoshone County, Idaho, September 1992.
- Amendment to the Record of Decision for the Bunker Hill Mining and Metallurgical Complex (Non-Populated Areas) Superfund Site, September 3, 1996.
- Explanation of Significant Differences (ESDs) for Revised Remedial Actions at the Bunker Hill Superfund Site, Shoshone County, Idaho: two separate ESDs, January 1996, April 1998.

Brief Site History and Chronology

Commercial mining for lead, zinc, silver, and other metals began at the Site in 1883. Mineral processing and smelting began in the early 1900's and continued until 1981. Over the following decades, the Silver Valley became one of the most important centers of metals mining and processing in the United States. Milling of ore resulted in by-products (tailings) that were routinely disposed in surface waters. In 1910, a plank and pile dam was constructed along the South Fork of the Coeur d'Alene River (SFCDR) at the Pinehurst Narrows to retain the tailings. This retention dam deposited tailings throughout the floodplain of the SFCDR in an area referred to as Smeltermville Flats. The dam failed in 1933 resulting in some portion of the tailings spreading downstream. A second tailings repository, the Central Impoundment Area (CIA) was initially constructed in 1928. This

tailings impoundment was expanded several times throughout its life as necessary to receive more tailings and other waste materials (eventually to approximately 200 acres in surface area).

Environmental contamination of surface water, groundwater, soil and sediment occurred throughout the valley as a result of the mining, milling, and smelting processes. Vegetation of the surrounding hillsides was gradually denuded from logging, deposition of air-borne metals contamination, and acidification by sulfur compounds. Air-borne emissions affected areas near the Smelter and Zinc Plant as well as the surrounding communities. Over time, blood lead levels of children in the valley reached concentrations well above those considered to be toxic.

In 1983, the federal government listed the site on its National Priorities List. Shortly thereafter, EPA presented various orders to the companies held responsible for the contamination (the Potentially Responsible Parties, PRPs) in an effort to begin remediation of the environmental problems existing on the Site. PRP-supported investigation and cleanup efforts ensued for about 10 years. Their efforts included conducting a Remedial Investigation and Feasibility Study, initial cleanup of the smelter complex, terracing of the denuded hillsides, and some re-vegetation work. EPA issued a Record of Decision (ROD) in 1992 describing the required remedy for the Non-Populated Areas of the Site (which had been delineated as an approximate 21 square mile area).

In 1992 and 1994, two PRPs went bankrupt resulting in EPA and the State of Idaho assuming responsibility for the majority of the Non-Populated Areas cleanup. Five remaining PRPs signed Consent Decrees with EPA and committed to implementing those remedial actions in the Non-Populated Areas of the Site that they agreed to perform. A detailed chronology of site actions and remediations is included in Section 2 of this report.

Responsibilities for Remedy Implementation and Long-Term Operations and Maintenance

In 1994, EPA and the State of Idaho entered into a cost-sharing agreement (as documented in the State Superfund Contract) specific to those areas of the Site that EPA and the State were performing remedial actions. These areas include:

- Hillsides,
- Gulches (Grouse, Government, Magnet, and Deadwood),
- Smelerville Flats, north and south of Interstate 90,
- Central Impoundment Area,
- Industrial Complex (Lead Smelter, Zinc Plant, Phosphoric Acid Plant),
- Boulevard Area and Railroad Gulch,
- Mine Operations Area,
- Central Treatment Plant,
- Bunker Creek, and
- Milo Creek and Reed Landing.

For these same areas, based on the requirements of CERCLA, the State of Idaho will be responsible for 100-percent of long-term operations and maintenance (O&M).

The five remaining PRPs (Union Pacific Railroad (UPRR), Stauffer Chemical, Hecla, Sunshine Mining, and ASARCO) signed Consent Decrees with EPA and committed to implementing and conducting long-term O&M for those Non-Populated Areas' remedial actions that they agreed to perform. PRP-implemented remedial actions include:

- Remediation of UPRR right-of-way through the Site – UPRR,
- Closure of A-4 Gypsum Pond – Stauffer Chemical, and
- Page Pond remediation – Hecla, Sunshine, and ASARCO.

For the portion of the site which EPA and the State are performing the cleanup actions, a two-phased implementation strategy was agreed upon as documented in the State Superfund Contract. Phase I work (reviewed in this initial 5-year review document) includes source removals aimed at removing and consolidating extensive contamination from various site areas, demolition of structures, development and implementation of an Institutional Controls Program (ICP), future land use development, and public health response actions. Phase I work also includes support studies for long-term water quality improvement. Phase I was expected to last approximately 8 years (1995 through 2002).

Phase II will be implemented following completion of source control and removal activities and evaluation of the effectiveness of these activities in meeting water quality improvement objectives. This phase will consider any shortcomings encountered in implementing Phase I and will specifically address long-term water quality, ecological, and environmental management issues.

ROD Requirements

The selected remedy documented in the 1992 Non-Populated Areas ROD addresses both human health and ecological aspects of the Non-Populated Areas of the Bunker Hill site through the following general objectives:

- Minimize direct human contact with contaminants.
- Reduce erosion of the hillsides.
- Minimize windblown dust from contaminated areas.
- Reduce suspended sediment and contaminant loading in surface water runoff to the SFCDR.
- Minimize migration of contaminants to groundwater.
- Consolidate contaminated material removed during remedial actions in on-site repositories and close these areas with engineered covers to reduce infiltration.

In addition to these general objectives, the remedy selected in the ROD is required to comply with federal and state standards that are applicable or relevant and appropriate requirements (ARARs). As part of this initial 5-year review, the ARARs identified in the 1992 Non-Populated Areas ROD were reviewed and any changes or newly promulgated standards were identified and summarized (Appendix A). Section 5.1 of this report

summarizes revisions to existing ARARs or to be considered (TBC) documents initially identified in the ROD, and newly identified regulations of TBCs.

Remedy Description

The selected remedy was designed to achieve the ROD objectives through a series of source removals, surface capping, reconstruction of surface water creeks, demolition of abandoned milling and processing facilities, engineered closures for waste consolidated on-site, and re-vegetation efforts.

A brief description of each remedial action that is part of the overall site remedy is summarized in Table ES-1. More detailed descriptions of the various remedial actions and the specific ROD requirements that apply to each action are presented in Section 4 of this report.

Table ES-1	
Summary of Remedial Action Descriptions	
Remedial Action	General Description of Remedial Action
Implemented by EPA and State of Idaho	
Hillsides	Reduce erosion, increase infiltration, and minimize direct contact by contouring, terracing, and re-vegetating hillsides areas that are essentially denuded. Provide surface armor or soil cover on mine waste rock dumps and remove solid waste landfills to on-site consolidation areas.
Gulches (Grouse, Government, Upper Magnet, and Deadwood)	Reduce erosion, minimize direct contact, and minimize migration of contaminants to surface and groundwater by constructing erosion control structures and sediment basins, removing contaminated soils above cleanup levels, relocating the A-1 Gypsum Pond from Magnet Gulch to the CIA, reconstructing Government and Magnet Creeks, and installing surface barriers consistent with future land use.
Smeltonville Flats (north and south of Interstate 90)	Minimize direct contact, surface water erosion, and migration of contaminants to surface and groundwater by conducting extensive tailings removals throughout the floodplain, depositing removed tailings on the CIA, reconstructing portions of the SFCDR, providing soil barriers and re-vegetation as necessary. Construct storm drain/swale conveyance system for surface water generated south of I-90 highway.

Table ES-1	
Summary of Remedial Action Descriptions	
Remedial Action	General Description of Remedial Action
Implemented by EPA and State of Idaho	
Central Impoundment Area	Minimize dust dispersion, direct contact, and infiltration through underlying contaminated materials by closing the impoundment with an engineered cover of permeability 1×10^{-7} cm/sec or less. Minimize seepage to the SFCDR by intercepting the CIA seeps located on the north side of the CIA.
Industrial Complex (Lead Smelter, Zinc Plant, Phosphoric Acid Plant)	Minimize dust dispersion, direct contact, and potential for migration to surface and groundwater; remove safety hazards of abandoned facilities by recycling or consolidating principal threat materials in a fully lined and covered monocell, removing PCB transformers and PCB-contaminated soils, removing asbestos material, demolishing structures and consolidating debris in Smelter Closure area, consolidating contaminated soil and slag from site removals in Smelter Closure area, demolishing 4 stacks in Smelter and Zinc Plant, and constructing an engineered cover over the closure area with a permeability of 1×10^{-7} cm/sec or less.
Mine Operations and Boulevard Area, Railroad Gulch	Minimize direct contact, infiltration through contaminated material, and erosion by demolishing structures, removing contaminated soils to cleanup levels and disposing in the Smelter Closure area, removing principal threat materials and recycling or disposing in the Smelter Closure, capping and re-vegetating disturbed areas, and reconstructing Railroad Gulch Creek to increase surface water flow capacity.
Central Treatment Plant	Treat acid mine drainage and contaminated site surface waters to current NPDES discharge standards and dispose of resulting sludge on top of the CIA. These actions are considered interim measures. EPA and the State are presently evaluating acid mine drainage issues and long-term treatment issues for the Site. A separate ROD documenting the evaluations and remedy selection process is anticipated to be issued in 2001.
Bunker Creek	Minimize infiltration through contaminated soil, contaminated sediment releases to surface water, and direct contact by channelizing and reconstructing Bunker Creek, removing contaminated surface soil to cleanup levels, and capping and re-vegetating disturbed areas.

Table ES-1	
Summary of Remedial Action Descriptions	
Remedial Action	General Description of Remedial Action
Implemented by EPA and State of Idaho	
Milo Creek and Reed Landing	Minimize sediment transport into Milo Creek from adjacent tailings and waste rock dumps and surface water infiltration into the underlying Bunker Hill mine workings by lining the creek (pipe the flow) and removing contaminated sources adjacent to the Creek as practicable.
Implemented by PRPs	
Page Pond	Minimize fugitive dust, direct contact and contaminant releases to surface and groundwater by removing tailings from the West Page Swamp, regrading, capping, and re-vegetating the Page Pond impoundment and dikes, diverting/modifying surface water channels into the swamp areas, providing hydraulic controls to enhance wetlands, and inundating remaining tailings.
Union Pacific Railroad Rights-of-Way	Minimize fugitive dust and direct contact by "hot spot" removals, soil/rock barriers, and re-vegetation.
A-4 Gypsum Pond Closure	Minimize dust dispersion and seepage from the impoundment by placing a soil barrier, regrading, and re-vegetating the surface of the Pond and providing a stable channel for Magnet Creek flow across or through the A-4 Pond to Bunker Creek.

Monitoring Programs

The ROD requires periodic monitoring of soil, water and air at the Bunker Hill Superfund site to provide information about the changing nature and extent of contamination of various media. ROD-stated objectives of monitoring are:

- To evaluate compliance with ARARs in surface water and groundwater,
- To assess the status of environmental receptors (i.e., biological monitoring),
- To evaluate the performance of specific remedial actions and their respective O&M programs,
- To evaluate success in meeting public health protection goals (i.e., continuation of blood lead screening program),
- To evaluate the adequacy of control measures instituted during the implementation of remedial actions, and

- To evaluate the success of remedial actions in protecting human health and the environment and determine the adequacy of remedial actions selected in the ROD.

Monitoring is also used in conjunction with design to meet the objectives of the ROD. Surface water, groundwater, and air monitoring at the Bunker Hill Superfund Site is being performed in three different programs:

- The Site-Wide Surface Water, Groundwater and Air Monitoring Program
- The Hillside Monitoring Program
- The Smelter Observational Approach Monitoring Program

These programs are described in Section 4 of this report.

The three monitoring programs will continue to be conducted, with annual reports prepared to document trends observed. The site-wide monitoring program was initially developed during the remedial investigation phase of the project (late 1980's) and was initially planned to evaluate the general nature and extent of contamination throughout the site. This site-wide monitoring program has been modified over the years for the purposes of tracking site-wide trends as well as gathering needed remedial design data. Now that the remedial designs and remedial actions are nearly complete, the site-wide monitoring program (primarily surface and groundwater) will be re-evaluated and modified as necessary to ensure that appropriate data are gathered to address remedial actions that have been designed and implemented across the Site.

Biological monitoring of wildlife is currently being planned under an inter-agency agreement between EPA and the U.S. Fish and Wildlife Service. This monitoring is expected to begin in 2001. A description of the biological monitoring program and any results obtained from this program will be addressed in a future 5-year review report.

Assessment of Remedial Actions

Table ES-2 provides a summary of this initial 5-year assessment for the Non-Populated Areas of the Site. Included in the table are dates during which particular activities or remedial actions were conducted, work that is remaining to complete the remedial action, a general assessment of the performance or protectiveness of the remedy, and any deficiencies noted during this 5-year review. This same table is repeated in the text of this 5-year report in Section 5 as Table 5-1.

**Table ES-2
Summary of Initial 5-Year Assessment**

Activity or Remedial Action (RA)	Dates of Activity or RA	Work Remaining	Assessment	Deficiency of the Activity or Remedial Action
Activity				
ICP Program within Non-Populated Areas	1994 - present	As part of individual RAs, placement of ICP barriers and fences at various Site locations	As has been conducted to date, EPA, IDEQ, and USACE will continue to provide oversight of ICP-related work in the Non-Populated Area of the Site	None noted.
Health and Safety During Remediations	1994 - present	Ongoing	Successful implementation of safety programs as evidenced by no lost time or injuries reported for prime contractor	None noted.
Operations and Maintenance of Remedies	1994 - present	Day-to-day O&M currently provided by subcontractors to USACE.	O&M being performed adequately.	None noted.
	1999 - 2000	IDEQ in process of preparing Site-Wide O&M Plans	Not applicable (NA)	NA
Site-Wide Monitoring	1987 - 1993 1996-present	Ongoing monthly and quarterly programs, data reports, and trend analysis prior to next 5-year review.	Insufficient data exists at this time to establish trends between data and effectiveness of remedies.	None noted.

**Table ES-2
Summary of Initial 5-Year Assessment**

Activity or Remedial Action (RA)	Dates of Activity or RA	Work Remaining	Assessment	Deficiency of the Activity or Remedial Action
Hillsides Monitoring Program	1999 - present	Ongoing monitoring, annual reports and workshops to discuss data modifications to RA approach, if necessary	Adaptive management approach working adequately.	None noted.
Smelter Closure Observational Approach	1997 - present	Ongoing monthly sampling, yearly trend analysis reports	As expected, insufficient amount of post-remediation data to conclusively determine trends at this time.	None noted.
Remedial Action				
Hillsides RA	1990 – 1994 (PRPs)	NA	Terracing was effective. Planting was marginally effective.	None noted.
	1996 – present (Fund-lead)	Re-vegetation programs planned through 2001, adaptive management afterwards. Upper Industrial Landfill yet to be removed.	Adaptive management approach working adequately. Raveling hillslopes above Smeltonville and Wardner residential areas may need additional monitoring and/or cleanout to reduce potential for recontamination.	None noted.

**Table ES-2
Summary of Initial 5-Year Assessment**

Activity or Remedial Action (RA)	Dates of Activity or RA	Work Remaining	Assessment	Deficiency of the Activity or Remedial Action
Central Impoundment RA	1995 – present	Final closure to be completed in 2000. Ongoing monitoring of CIA seeps.	No assessment at this time; remedy is only partially complete	None at this time.
Page Pond RA	1997 - present	Majority of RA yet to be completed: Tailings removal, placement of clean fill, modifications to South and North Channels, construction of outlet and discharge structures to SFCDR, construction of internal berms in West Swamp.	No assessment at this time; remedy is only partially complete	Program for baseline and routine groundwater and surface water monitoring was reviewed by EPA and the State and found to have possible deficiencies. Revisions to the monitoring program are being considered.
Industrial Complex RA	1995 – 1998 Construction season 2000	Borrow Area/ICP Landfill construction. Ongoing monthly monitoring of groundwater wells as part of observational approach.	Remedy is performing adequately.	None noted.
Mine Operations Area RA	1994	None noted.	Remedy is performing adequately.	None noted.
Boulevard RA	1997	None noted.	Remedy is performing adequately.	None noted.

**Table ES-2
Summary of Initial 5-Year Assessment**

Activity or Remedial Action (RA)	Dates of Activity or RA	Work Remaining	Assessment	Deficiency of the Activity or Remedial Action
Railroad Gulch RA	1997	None noted.	Remedy is performing adequately.	None noted.
Central Treatment Plant RA	1994 - present	Ongoing O&M	Remedy is performing adequately.	None noted.
Bunker Creek	1996 - 1997	ICP capping on west end of Bunker Creek project area. Emergency overflow channel to Gov't Creek.	Remedy is performing adequately. Protectiveness from direct contact is not yet achieved until all areas receive ICP cap.	None noted.
UP Railroad RA	1995 - 1999	A portion of the UPRR right-of-way used as a haul road remains to be remediated by EPA.	Remedy is performing adequately; verification sampling indicated that none of the sampled areas exceeded 1,000-mg/kg lead. 1999 Sampling Report did indicate that 7 areas sampled did not have the required thickness of ICP barrier.	Increasing barrier thickness in some locations is warranted as indicated by 1999 sampling.
Milo Creek and Reed Landing RA	1995 - 2000	None noted.	Remedy appears to be performing adequately, however, much of the remedy has been constructed in last 2 years and will require more time to determine effectiveness and protectiveness.	None noted.

Recommendations and Required Actions

As part of this 5-year review, recommendations and required actions were identified to improve remedy performance or protectiveness in alignment with the Remedial Action Objectives and performance standards of the Site. Section 5, Table 5-2 of this 5-year review summarizes the specific recommendations and required actions that have been identified for the various monitoring activities and remedial actions. Also identified in Table 5-2 are parties responsible for implementation and oversight, proposed completion milestone dates, and the potential to affect protectiveness of the remedy.

Recommendations and required actions resulting from this initial 5-year review include:

- Evaluate the need for additional efforts to encourage vegetative growth at the Page Mine Waste Rock Dump.
- Evaluate the need for an Explanation of Significant Differences or ROD Amendment to address groundwater control and collection systems and creek lining in Government Gulch.
- Evaluate the site-wide monitoring program to confirm that appropriate data is being gathered to assess remedy performance across the Site.
- Evaluate the need for an Explanation of Significant Differences or ROD Amendment to address the adaptive management approach adopted for the hillsides remedial action.
- Inspect catchment walls at the base of Smeltonville and Wardner hillsides to determine if additional action is necessary to prevent recontamination.
- Assess the need for additional access controls to hillsides and gulches.
- Develop and implement operations and maintenance procedures for all remedial actions, including measures to address recontamination potential.
- Conduct yearly surveys of gulch remedial actions to evaluate channel and surface barrier stability, success of vegetation, and surface water and groundwater quality.
- Develop and implement a biological monitoring program for the Site.
- Clean out sediment from the bottom of the Lined Pond.
- Evaluate the areas of the Union Pacific Railroad right-of-way that were identified as having insufficient barrier thickness to determine the scope of work necessary to reestablish the prescribed thickness.
- Evaluate the need to cover mine waste and tailings disposed in the Milo Creek Guy Caves area with clean material.
- Evaluate the need for an Explanation of Significant Differences or ROD Amendment to address increased tailings removal on the Flats and the decision to defer construction of the groundwater and surface water wetland treatment systems.

- Evaluate the need for an Explanation of Significant Differences or ROD Amendment to address the deferment of construction of a seep collection system at the Central Impoundment Area.
- Conduct an evaluation of new groundwater and surface water quality criteria or standards and the recently issued TMDL to determine their status as ARARs or TBCs.

Statement of Protectiveness

Overall, the remedy being implemented in the Non-Populated Area operable unit of the Bunker Hill Superfund Site is expected to be protective of human health and the environment upon completion, provided that the recommendations identified above are implemented. Although the remedy hasn't been fully implemented, immediate threats to human health and the environment have been addressed by source removal efforts, capping activities, erosion control measures, ongoing treatment of mine water, and institutional controls. The site requires ongoing reviews.

Next 5-Year Review

Statutory requirements of CERCLA require ongoing 5-year reviews for Superfund sites once remediations have been initiated. The next review will be conducted within 5 years of the completion date of this 5-year review report. The completion date is the date of the signature shown on the cover of this report. This subsequent review will cover all remedial work, monitoring, and O&M activities conducted at the Site. This subsequent 5-year report is expected to summarize more detailed information on protectiveness of the remedy since five additional years of monitoring data and annual remedy inspection reports will then be available to judge remedy performance.