# Explanation of Significant Differences to the 2006 Butte Priority Soils Operable Unit Record of Decision

July 2011

# Section 1

# Introduction

## 1.1 Site Name and Location

This document presents an Explanation of Significant Differences (ESD) from the 2006 Record of Decision (ROD) for the Butte Priority Soils Operable Unit (BPSOU) of the Silver Bow Creek/Butte Area National Priorities List (NPL) site (Site).

The Site, which includes the Butte Priority Soils Operable Unit (BPSOU), is one of four contiguous Superfund sites in the upper Clark Fork River Basin that extend 140 miles from the headwaters of Silver Bow Creek north of Butte to the former Milltown Reservoir near Missoula, Montana (Figure 1-1). The Site lies immediately west of the Continental Divide in southwestern Montana, at the easternmost extent of the upper Clark Fork River drainage. The Site encompasses approximately 85 square miles, including the entire length of Silver Bow Creek and associated land contamination from Butte westward approximately 25 miles to the Warm Springs Ponds near Anaconda. The Site incorporates several square miles of land area within the City of Butte, Montana.

The BPSOU consists of a 5 square mile area encompassing the Town of Walkerville and a large portion of the City of Butte, as shown in Figure 1-2, as well as associated alluvial aquifer contamination. The operable unit (OU) is centered on Butte Hill, which is the location of the historic Butte Mining District. Silver Bow Creek flows along the base of Butte Hill. The OU is situated in a predominately urban setting and includes residential neighborhoods, schools and parks, and commercial and industrial areas.

The ROD for the BPSOU was signed by the U.S. Environmental Protection Agency (EPA), with partial concurrence from Montana Department of Environmental Quality (DEQ) in September 2006 (EPA 2006). The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number is MTD 980502777.

## 1.2 Statement of Purpose

Following the signing of the ROD in September 2006, information generated during remedial design prompted reassessment of portions of the Selected Remedy for solid media (mine waste, soil, and residential soil and dust) and alluvial groundwater. Even though the changes are significant, they do not involve fundamental change with respect to the scope, performance, and/or cost of the Selected Remedy described in the BPSOU ROD.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, provides for the public disclosure of the reasons for significant differences through this document. The pertinent section of CERCLA, Section 117(c), requires the lead agency to address post-ROD significant changes in the following instances:

> *After adoption of a final remedial action plan (1) if any remedial action is taken [under section 104 or 120]; (2) if any enforcement action under section 106 is taken; or (3) if any settlement or consent decree under section 106 or section 122 is entered into, and if such action, settlement or decree differs in any significant respects from the final plan [the ROD] the [lead agency] shall publish an explanation of significant differences and the reasons such changes were made.*

Section 435(c)(2) of the National Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) §300.435(c)(2), states the same criteria and direction. EPA's remedy selection guidance entitled "A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents", Office of Solid Waste and Emergency Response Dir. No. 9200.1-23P (EPA 1999), further explains the nature of significant differences and states that considering the change in the remedy's scope, cost, and performance is a site-specific determination. According to the guidance, significant differences generally involve a change to a component of a remedy that does not fundamentally alter the overall cleanup approach.

In this case, the changes identified below are significant differences that do not change the fundamental overall cleanup approach. Some of the changes may be considered minor modifications to the BPSOU ROD, but EPA has included them in this document to provide full public disclosure and consistency with the NCP. Details of these changes, including the basis for these decisions, are provided in Section 3.

**Selected Remedy for Solid Media: Residential Metals Abatement Program (RMAP)**

1. The modification of the residential assessment and sampling time period from 8 to 10 years, and the modification of the remediation time frame for residential areas found to exceed action levels from 15 to 20 years (Pages 12-2, 12-15, and 12-16 of the ROD). Yearly goals and yearly reporting for achieving yearly goals are also identified.

2. The modification of the soil sampling depth for residential areas from the original 0 to 2 inches to depths of 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches (Page 12-20 of the ROD).

3. The modification of the contaminated soil removal and replacement depth from yard areas from 18 inches to a minimum of 12 inches (Page 12-20 of the ROD).

**Selected Remedy for Solid Media: Non-Residential Contamination**

4. The elimination of the need for reclamation of the small waste area at the Wake-Up Jim site 1615 because the site is now protected under the Granite Mountain Memorial historic site and its fencing and institutional control requirements (Page 12-24 of the ROD).

**Selected Remedy for Groundwater: Groundwater Monitoring**

5. The elimination of the need for tracer dye monitoring of the Metro Storm Drain (MSD) Sub-Drain system and replacement with augmented flow monitoring (Page 12-39 of the ROD).

## 1.3 Document Availability

The ESD and all documents that support the changes are part of the administrative record for the BPSOU as required by NCP Section 300.825(a)(2) and are also located in local information repositories in Butte, Montana.

The full administrative record is housed at the following address:

U.S. EPA
Montana Office
10 W. 15th St, Suite 3200
Helena, Montana 59626
Hours: Monday through Friday 8:00 am to 4:30 pm, except holidays.

Local information repositories include Citizen's Technical Environmental Committee (CTEC) and the Montana Tech Library. Their address and business hours are as follows:

CTEC
27 W Park St
Butte, Montana 59701
Hours: Monday through Thursday from 10:00 am to 3:00 pm.

Montana Tech Library
1301 W Park
Butte, Montana 59701
Summer Session Hours: Monday through Friday 7:30 am to 4 pm.
All other session Hours: Monday through Friday 7:30 am to 10:00 pm
Sunday 1:00 pm to 9:00 pm
Saturday Noon to 5:00 pm

# Section 2
# Site History, Contamination, and Selected Remedy

A complete description of the BPSOU, its history, the contamination and its threat to human health and the environment, as well as the Selected Remedy provided for in the 2006 BPSOU ROD, can be found in the *Record of Decision Butte Priority Soils Operable Unit Silver Bow Creek/Butte Area NPL Site, September 2006* (EPA 2006), Declaration and Decision Section, Parts 1 and 2.

## 2.1 Silver Bow Creek/Butte NPL Site

The following presents important Site events and relevant dates for the Site. The identified events are illustrative, not comprehensive.

- 1864 – First placer gold claims in the Butte area were staked and worked. However, silver and copper ore also drew attention of early miners.

- 1870 – Dozens of silver and copper claims had been located and developed, prompting construction of mills and smelters capable of refining arsenic-laden copper ores.

- 1881 – Copper baron Marcus Daly marked a significant turning point for Butte by rapidly acquiring surrounding mining properties on the Butte Hill. At about this time, there were over 300 operating copper mines, at least 10 silver mines, 5 smelters, and over 4,000 posted claims. Many mining companies operated in the Butte area from the 1860s through the 1920s.

- 1890 – In response to poor air quality for many years, the city of Butte passed ordinance 186, which made it illegal to roast ore with the city limits.

- 1910 – Butte had become the largest producer of copper in North America and large quantities of mine waste and tailings were disposed of in ponds or dumped in Silver Bow Creek. A series of consolidations and mergers resulted in almost all facilities in Butte being operated and owned by the Anaconda Copper Mining Company.

- 1920s – Milling and smelting continued in Butte; however, as the copper smelting capacity at Anaconda grew, Butte became primarily a mining center. Butte's smelters and mills produced air emissions that contaminated yards and attics throughout the BPSOU, as well as large quantities of waste such as tailings and slag. Butte's mines also produced waste and overburden piles throughout Walkerville and Butte.

- 1955 – Open pit mining began in Butte with the formation of the Berkeley Pit. Previously, all mining in Butte was completed entirely underground.

- 1964 – The completion of the Weed Concentrator (now known as the Montana Resources Concentrator) reduced the amount of ore sent to Anaconda; however, the concentrator also led to production of large quantities of waste in the active mining area and discharged large volumes of contaminated water to the Metro Storm Drain area.

- 1977 –ARCO merged with Anaconda Copper Mining Company (ACMC). Open pit mining operations were conducted in the Berkeley Pit until 1982 and in the Continental Pit until 1983 when all mining operations were suspended by ARCO, the successor to ACMC.

- 1984 - ARCO closed the Anaconda Smelter. Later, ARCO, now known as the Atlantic Richfield Company, became a wholly owned subsidiary of the BP collection of companies.

***Regulatory Enforcement:***

- 1983 – EPA designated the original Silver Bow Creek as a Superfund site in September 1983.

- 1987 – Recognizing the importance of Butte as a source of contamination to Silver Bow Creek, EPA concluded that Butte and Silver Bow Creek should be treated as one site under CERCLA. EPA subsequently modified the existing Silver Bow Creek site to include the Butte area and the formal name changed to the "Silver Bow Creek/Butte Area NPL Site." The BPSOU was one of four remedial OUs formed in the Butte Area.

- 1989 – EPA separated the BPSOU into Phase I and Phase II. Phase I activities focused on high-priority human health risks and resulted in the implementation of numerous time-critical removal actions (TCRAs) and emergency response actions (ERAs) (summarized in the section below). Phase II activities included conducting the full remedial investigation (RI)/feasibility study (FS) for the entire OU.

- 1991 – EPA developed the statement of work (SOW) for the Phase II RI/FS. The SOW served as the substantive basis for the Phase II RI/FS work plan. A consent order to conduct a RI/FS at the BPSOU was executed by EPA and signed by ARCO and other BPSOU potential responsible party's (PRPs) in June 1992.

## 2.2 Butte Priority Soils Operable Unit

The RI/FS for the BPSOU was conducted by the BPSOU Potential Responsible Party Group. The final RI report was issued in April 2002 (PRP Group 2002) and the final FS was issued in April 2004. EPA released the proposed plan in December 2004 (PRP Group 2004) and the ROD was completed in September 2006 (EPA 2006).

During the course of the RI/FS, EPA implemented several response actions to address high priority human health risks and reduce the severity of contaminant loading to Silver Bow Creek and to protect downstream remedies at other OUs (i.e., Stream Side Tailings Operable Unit [SSTOU] and Warm Springs Ponds Operable Units [WSPOUs]). Response actions done to date have addressed over 8 million cubic yards of waste within the BPSOU using removal, capping, and/or land reclamation. Over 400 acres of mine-impacted land on the Butte Hill have been reclaimed. Also, approximately 1.2 million cubic yards of tailings that were previously in contact with groundwater and surface water have been removed from the Silver Bow Creek floodplain, and stormwater controls, including conveyance channels, diversions, and detention basins have been constructed to reduce contaminant loading carried from the Butte Hill via stormwater runoff.

Despite the past response actions completed at the BPSOU, remedial goals have yet to be achieved and significant risks still threaten human and environmental receptors. The potential exposure to lead and arsenic in residential soil and interior dust continues to pose a significant human health risk. Arsenic and metal contaminants in surface water and alluvial groundwater exceed applicable water quality standards and continue to affect aquatic life in Silver Bow Creek.

The list below provides a brief summary of the removal actions performed at the BPSOU.

***Removal Actions:***

- 1988 - Walkerville (north of Butte): Stabilization of 300,000 cubic yards of lead-contaminated soil from mine waste dumps. Four earthen basements and 23 residential yards were cleaned up.
- 1989 - Timber Butte: Some 40,000 cubic yards of contaminated soil were moved to a temporary onsite repository in 1989. Two residential yards were cleaned up.
- 1990-1991 - Priority Soils: Waste dumps containing about 100,000 cubic yards of soil were either capped or removed. A railroad bed and seven residential yards were also reclaimed.
- 1991 - Colorado Smelter: Approximately 40,000 cubic yards were moved to an onsite disposal area.
- 1992 - Anselmo Mine Yard/Late Acquisition Silver Hill: contaminated soils were removed.
- 1994 - Walkerville: Several waste dumps were either removed or capped.
- 1994 - Residential/source areas: Residential yards and waste rock dumps located throughout Butte and Walkerville have been/are being addressed.
- 1996 - Stormwater: Construction of cement channels and sedimentation ponds throughout the Butte hill to address stormwater contamination.
- 1999 - Railroad: Removal of contaminated soil on numerous railroad beds and rail yards throughout the Butte hills.
- 2000/2001 - Walkerville residential area: This action addressed 46 residential properties throughout Walkerville, Montana.

## 2.3 Selected Remedy

The Selected Remedy for the BPSOU includes components to address contaminated solid media (mine waste, soil, and residential soil and dust), specific land use areas such as the Granite Mountain Memorial Interpretive Area and the Syndicate Pit, surface water (base flow and stormwater runoff), and alluvial groundwater. A short description of the Selected Remedy, as originally presented in the *Record of Decision Butte Priority Soil Operable Unit Silver Bow Creek/Butte Area NPL Site, September 2006 (EPA 2006),* is presented in the subsections below for solid media, groundwater, and surface water. A detailed description is also provided in section 12 of the BPSOU ROD.

### 2.3.1 Residential Contamination

EPA's action levels for residential, commercial/ industrial, and recreational soils and dust are:

**Table 2-1**
**Soil, Dust, and Vapor Action Levels in Residential Areas**

| Contaminant of Concern (COC) | Exposure Scenario | Concentration |
|---|---|---|
| Lead | Residential | 1,200 milligrams per kilogram (mg/kg) |
| | Non-residential | 2,300 mg/kg |
| Arsenic | Residential | 250 mg/kg |
| | Commercial | 500 mg/kg |
| | Recreational | 1,000 mg/kg |
| Mercury | Residential | 147 mg/kg |
| | Residential (vapor) | 0.43 micrograms per cubic meter ($\mu g/m^3$) |

The Selected Remedy requires yards, residential areas, recreational areas, and industrial/business areas above these action levels (as well as indoor dust and attic dust in living spaces if a pathway of exposure of exposure exists), to be remediated.

Certain residential areas above these levels have been addressed previously under prior removal actions, but many homes and residences have not. The yard/recreational/business location and indoor dust cleanup apply throughout the BPSOU, and the attic dust portion applies throughout the BPSOU and to an area adjacent to the BPSOU (See Appendix A BPSOU and Butte Site Map).

The Selected Remedy calls for the continuation and expansion of the BSB Lead Intervention and Abatement Program to achieve these requirements. The expansion of this program in the Selected Remedy requires that all residential properties within the BPSOU must be sampled, assessed, and abated if action levels are exceeded, within a reasonable time frame, for arsenic, lead, and mercury. Abatement includes cleaning up yard soils, indoor dust, and attic dust as described below. Abatement can be done through the existing program, and can be integrated with the comprehensive abatement components of the existing program, which are already established.

If the Superfund remedial requirements are incorporated into the existing and expanded comprehensive program, complete indoor and outdoor assessment (i.e., residential yard soil, indoor and outdoor dust, non-living space dust, lead-based paint, drinking water, and mercury vapor) of all residential properties that are known to be occupied or expected to be occupied must be completed within 8 years of the initiation of the expanded program. During this 8-year period, the cleanup of residential properties that exceed the action levels will occur in concert with the assessment program. The Selected Remedy requires the assessment and abatement activities be completed in no later than 15 years. This program will be a point of focus during the 5-year review process to determine if changes need to be made to improve the program.

Contaminated dust in portions of homes that are seldom visited (non-living space areas), such as attics or crawl spaces, will be abated if an exposure pathway is identified during sampling

and evaluation of the home. If elevated concentrations of heavy metals are found in the attic dust, and there is no avenue for the dust to migrate into the living space, the attic dust will not be removed. Homes where remodeling is planned that would create an exposure pathway to attic dust will be abated. If sampling of living space identifies a pathway of exposure created in other ways, then these homes will also be abated.

Properties that are not addressed or abated because the owner would not allow access for sampling, properties with contaminated attics that are not abated because there is no current exposure pathway, and properties that are not currently occupied will be flagged and tracked in a database for future action. These properties will be tracked for at least 99 years.

Community awareness and educational programs in conjunction with a medical monitoring program are also required.

### 2.3.2 Non-Residential Solid Media and the Butte Reclamation Evaluation System

Contaminated solid media in non-residential areas at the BPSOU include waste rock piles, smelter wastes, milling wastes, and contaminated soils. Solid media in non-residential areas including commercial areas, open areas, and non-active mining areas may exceed action levels. These areas may also pose a threat to the environment from stormwater runoff. For example, runoff from these areas is a source of copper and zinc loading to receiving waters. Contaminated solid media shall be addressed through a combination of source removal, capping, and land reclamation.

All contaminated solid media within the BPSOU containing concentrations of arsenic, lead, or mercury above the respective action levels shall be addressed. Also, source areas that do not exceed action levels shall be addressed if diagnostic monitoring performed as part of the surface water management and best management practices (BMPs) program indicates that the source area contributes contaminant loads to receiving surface waters during wet weather runoff conditions.

The Butte Reclamation Evaluation System (BRES) (see 2006 BPSOU ROD Appendix E) establishes the vegetation, weed, and erosion performance standard for all completed solid media response actions under the Selected Remedy. The system is specifically designed for use in the upland environment of Butte. To accommodate the diverse land types and end land uses within the BPSOU, the BRES is designed to address reclaimed uplands in residential, recreational, and commercial/industrial land settings, excluding: residential yards, and playgrounds. The system also has components that allow it to be applied to areas reclaimed as open space within this urban setting. Reclaimed areas, including cover soil caps, must achieve the performance standards described by EPA in the BRES document. This system is a tool created for the BPSOU to evaluate the site-specific stability, integrity, and degree of human and environmental protectiveness afforded by response actions initiated on lands impacted by mining within the Butte site, as well as a tool to create and implement corrective action work plans for each area on a periodic basis.

The BRES is an evaluation tool for reclaimed and revegetated land, relying on routine inspections to assess the following:

- Condition and diversity of vegetative cover
- Presence of erosion

- Condition of site edges
- Presence of exposed waste material
- Presence of bulk soil failure or mass instability
- Presence of barren areas or gullies

The system also sets corrective action "triggers", coordinated with the conditions listed above. Based on the periodic monitoring and evaluation of response action sites, the triggers noted in the BRES require corrective action in a timely and appropriate manner in accordance with the scheduling requirements of the BRES. Vegetated cover soil caps must support a diverse plant community including native species to the extent that the constituents of the vegetation cover are not incompatible with the Selected Remedy.

### 2.3.3 Groundwater

The ground water component of the Selected Remedy requires the continued use of the Hydraulic Control Channel (HCC) and the Metro Storm Drain capture and interception system (MSD) to capture and pump contaminated ground water (and some surface water) into the Butte Treatment Lagoon facility for treatment prior to discharge. Both the HCC and the MSD are to be thoroughly evaluated and improved as needed. Waste left in place will not be excavated. Additional ground water control measures, such as infiltration barriers, ground water diversion, or other measures, may also be needed and are to be evaluated. The ground water aquifer must be further evaluated and characterized to ensure the effectiveness of the interception and pumping systems. Ground water monitoring and data reporting is required. The wetlands demonstration area near Kaw Avenue and George Street will be used for the construction of an emergency over flow pond (this is a minor modification to the 2006 ROD which listed the area as a possible catch basin area). A five year shakedown period for operation of the MSD interception and pumping facility is required. Institutional controls to prevent domestic use of the alluvial aquifer are required.

The Selected Remedy requires the capture and treatment of contaminated groundwater. The 2006 BPSOU ROD contained a waiver of ARAR standards for the alluvial ground water within the defined TI Waiver Area described in the 2006 BPSOU ROD. The Selected Remedy will not and is not intended to clean up groundwater to meet groundwater performance standards within the boundary of the waived standards. Therefore, there are no performance standards for groundwater in the area of the BPSOU alluvial aquifer that is covered by the TI waiver boundary. The TI boundary is shown in Figure 12-6 of the 2006 BPSOU ROD. Based on the data collected during the groundwater monitoring program, additional points of compliance may be determined necessary by EPA in consultation with DEQ in future remedial design (e.g., southern edge of the MSD).

Since the Selected Remedy requires that contaminated plumes be prevented from migrating outside the established TI zone, the boundary for the TI zone represents the point of compliance boundary for groundwater, and groundwater performance standards must be met at these points of compliance and beyond, as further defined in the Revised Interim Ground Water Monitoring Plan (EPA 2011). Groundwater quality standards (Appendix B, Table 2) will apply to groundwater at and beyond the edge of this boundary.

Groundwater contamination outside of the boundary of the TI zone in excess of groundwater performance standards identified in Appendix B, Table 2 shall constitute a violation.

Design of a groundwater treatment system at the Butte Treatment Lagoons facility and a sludge disposal plan must be approved by EPA, in consultation with DEQ, and the construction, operation, and maintenance of the facility will be monitored by EPA and DEQ in accordance with approved plans. The facility will be designed so that any discharge from the facility must meet water quality ARARs described in Appendix B and in the ARARs established in the 2006 BPSOU ROD. Design, construction, maintenance, operation, and monitoring of the facility will be conducted according to the engineering standards established during remedial design and ARARs, and must be approved by EPA in consultation with the State. Treated water discharged to Silver Bow Creek shall meet all discharge requirements set forth in the ARARs (Appendix B and the ARARs established in the 2006 BPSOU ROD). This discharge to surface water is discussed in greater detail in the following section.

### 2.3.4 Surface Water

In addition to the robust implementation of the ground water remedial component described above to prevent contamination from ground water and certain captured surface water from contributing to exceedances of surface water Performance Standards, the 2006 BPSOU ROD requires the removal of in-stream sediments and near stream contamination in the reach of Silver Bow Creek and certain areas of Blacktail Creek which were not addressed in the prior Lower Area One non-time critical removal action. It also requires that the discharge from the Butte Treatment Lagoons facility meet Performance Standards for discharges in a permanent manner.

For wet weather conditions, the Selected Remedy requires the remediation of several specifically identified sites which are known to contribute to contaminated storm water runoff (these actions are described in the 2006 BPSOU ROD as part of the solid media component of the Remedy). The evaluation and implementation of BMPs on a yearly basis to control wet weather run-off under a variety of scenarios and flows such that surface water Performance Standards are met is also required. If BMPs do not meet surface water Performance Standards within a fifteen year time period, the 2006 BPSOU ROD provides for contingency measures such as the construction of a collection and treatment plant system for stormwater and/or flow augmentation in Silver Bow Creek.

The overall remedial goal for the ROD as applied to Silver Bow Creek is to achieve and maintain the in-stream concentration of site-specific COCs (aluminum, arsenic, cadmium, copper, iron, lead, mercury, silver and zinc) below the numeric surface water quality standards identified in the ARARs, ROD Appendix B Table 3, for all flow conditions throughout the length of Blacktail Creek, Grove Gulch Creek, and Silver Bow Creek within and directly downstream of the BPSOU.

The Selected Remedy requires an EPA-approved comprehensive, long-term surface water monitoring program that will include collection of compliance and diagnostic flow and chemistry data for normal flow and wet weather conditions in receiving surface waters and within intermittent storm water conveyances at the BPSOU.

### 2.3.5 Groundwater Treatment Facility

As previously described, the Butte Treatment Lagoon facility shall be evaluated and designed to ensure that contaminated groundwater captured from MSD and Lower Area One (LAO) (and certain captured surface water that is transported to the lagoon treatment facility) is

treated to ARAR standards, the plant can be operated efficiently and effectively in a variety of conditions, and sludge disposal can occur in accordance with the 2006 ROD and ARARs. The treatment plant will meet "end of pipe" discharge standards defined as the lesser of the chronic or human health surface water quality standards presented in Appendix B, Table 3.

Paired total recoverable and dissolved samples shall be collected and analyzed for COCs. Hardness-based standards will be calculated using the hardness of the sample collected from the treatment plant discharge, as directed by Circular DEQ-7. Two, 24-hour composite samples will be collected each week on random days to monitor compliance (for example, sampling will not be limited to Mondays and Thursdays).

Other analytes that shall be monitored include: dissolved calcium and magnesium (for hardness calculations), total alkalinity, total dissolved solids, total suspended solids, and sulfate. Temperature and pH will be monitored daily. Additional required field parameters will be determined based on the operational needs of the facility.

### 2.3.6 Surface Water Monitoring and Compliance Requirements

Comprehensive surface water monitoring is required. Sampling provides information to determine sources of continuing wet weather contamination among other things, and routine monitoring and annual data report and analysis is required. Compliance with in-stream ARAR standards in baseflow and wet weather conditions is required over time.

### 2.3.7 Other Remedial Components – Syndicate Pit, Granite Mountain Memorial Interpretative Area, and Butte Mine Waste Repository

The Syndicate Pit within the BPSOU shall be reclaimed, to the extent practicable, for use as a mine training center if feasible. Shallow to moderate slopes will be reclaimed using soils caps, rock caps, and gravel parking areas. Steep slopes will not be reclaimed. The pit base will continue to be used as a sediment basin. The Granite Mountain Memorial Interpretive Area shall be subject to various reclamation and enhancements in keeping with its historical character. These include reclaiming source areas in publicly used areas, restricting access to certain areas of historic mining landscape, installing picnic areas and walking trails, enhancing existing vegetation, and diverting storm water runoff to the Berkeley Pit. These actions shall be consistent with the preservation requirements and other standards and the county's historical park plan. A Butte Mine Waste Repository was previously established and shall be used for the disposal of removed waste and contamination associated with BPSOU response actions. When the existing structure is full, it shall be closed in compliance with ARARs. A new repository will be sited next to the existing repository if that capacity is needed. It, too, would be closed using the same methods.

### 2.3.8 Institutional Controls

The 2006 BPSOU ROD requires the development, implementation, funding and enforcement and implementation of the following institutional controls (ICs): A. a controlled ground water area for the alluvial aquifer Technicality Impracticability zone to prevent domestic use of the contaminated ground water there as well as other controls for ground water use; B. Butte Silver Bow enacted zoning and ordinance/permit requirements for storm water controls, protection of capped and waste in place areas, removal and disposal of contaminated dirt, as well as other possible requirements: C. Deed notices under Montana state law for capped and waste in place areas; and D. fencing and signs where appropriate.

### 2.3.9 Operations and Maintenance

There are several short-term O&M plans in existence for various actions within the BPSOU. The Selected Remedy requires the development of long-term and integrated comprehensive monitoring and O&M plans for all aspects of the Selected Remedy.

# Section 3
# Description of Significant Differences and Basis for Decision

Table 3-1 summarizes the significant differences between Section 2 (Selected Remedy) of the BPSOU ROD and this ESD. The following sections discuss each of the five differences.

## 3.1 Residential Metals Abatement Program

### 3.1.1 Residential Assessment and Remediation Timeframe

The ROD stated that the assessment of all residential properties within the BPSOU will occur in 8 years and all contaminated residential properties within the BPSOU would be remediated in 15 years.

**Change to ROD Language**

The change made by this ESD is as follows: Assessments of all residential properties within the BPSOU shall occur in 10 years and all contaminated residential properties within the BPSOU shall be remediated in 20 years. To accomplish these requirements, yearly goals for sampling and remediation contained in the *Final Multi-Pathway Residential Metals Abatement Program Plan* (RMAP) (April 2010 by Butte Silver Bow County and Atlantic Richfield Company) page 11 must be confirmed through yearly reporting, as provided in RMAP section 15, or revised appropriately. The 10 and 20 year time frames for completion of these activities began in 2009 as reflected in the RMAP. Other requirements specified in the ROD regarding residential area cleanup are not changed except as specifically provided in this ESD.

**Explanation of Change**

During the implementation of Remedial Design and the development of the RMAP, the plan which will implement the residential contamination component of the Selected Remedy, the time frames described above were requested by the implementing Responsible Parties to address both mining and non-mining related lead, arsenic, and mercury contamination at all residential properties that exceed action levels within the BPSOU and attic dust in the defined Adjacent Area. By including the non-mining related contamination in the RMAP, more time was needed due to the expansion of the program. Accordingly, the time frames for completion of the assessments and remediation were increased by 2 and 5 years, respectfully. EPA, in consultation with DEQ, determined that such changes were reasonable, added to the overall protection of human health through implementation of the Multi-Pathway Program, and met basic requirements for cleanup of mining related contaminants above actions levels in yard soils and indoor dust.

### 3.1.2 Depth of Soil Sampling

The ROD called for soil sampling in residential areas from 0 to 2 inches.

**Change in ROD Language**

The change made by this ESD is as follows: Samples will be collected in residential areas at depths of 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches, and reported accordingly.

**Explanation of Change**

The change in soil depth sampling will better define the presence of contamination for the constituents of concern at three increments instead of the original one sample that was collected. The three sampling depths will determine if the contamination is present only at the surface or is at depth. For residential property, if the contamination is only surficial and removed, then ICs would not be necessary for the property. If contamination is at depth and not removed, ICs may be needed.

### 3.1.3 Depth of Soil Removal and Replacement

The ROD called for decision units exceeding the action levels to be subject to soil removal and replacement to a minimum depth of 18 inches.

**Change in ROD Language**

The change made by this ESD is as follows: Contaminated soil which exceeds action levels shall be removed from residential areas to a minimum depth of 12 inches or to the soil bedrock interface (if bedrock is encountered before the 12-inch depth).

**Explanation of Change**

This change is consistent with national EPA guidance as defined in the Superfund Lead Contaminated Residential Sites Handbook, August 2003 (EPA 2003). The rationale for establishing a minimum cover thickness of 12 inches is that the top 12 inches of soil in a residential yard can be considered to be available for direct human contact. With the exception of gardening, the typical activities of children and adults in residential properties do not extend below 12-inch depth. Removal to a depth of 24 inches in vegetable garden areas will not be changed.

## 3.2 Non-Residential Contamination

### 3.2.1 Wake-Up Jim Site 1615

The ROD called for reclamation of the Wake-Up Jim site 1615.

**Change in ROD Language**

The change made by this ESD is as follows: EPA, in consultation with DEQ, has determined that the Wake-Up Jim site 1615 will not be reclaimed.

**Explanation of Change**

Wake-Up Jim site 1615 is a small area of mine waste located outside of the residential area of the BPSOU. There is no public access at this site as it is located within a fenced area of the Historic Mining Landscape of the Granite Mountain Memorial Interpretation Area (which has appropriate access and institutional land use controls) resulting in no potential for direct human contact (See Figure 3-1). Furthermore, the EPA found that the stormwater from the site flows to the Berkeley Pit. Accordingly, reclamation is not necessary for the Wake-Up Jim site. Management of the Wake-Up Jim site shall be included in the O&M plan for the Granite Mountain Memorial Interpretation Area.

# 3.3 Groundwater Monitoring

## 3.3.1 Dye Tracer Monitoring at MSD Sub-Drain

The ROD called for groundwater loads entering the MSD sub-drain to be monitored annually in the fall (base flow) using dye tracer methods to determine flow and standard sampling to measure metals and arsenic concentrations.

**Change in ROD Language**

The change made by this ESD is as follows: Additional dye tracer studies will not be completed in the vicinity of the MSD sub-drain. Load monitoring will be conducted using dedicated flumes and sampling via manholes as described below.

**Explanation of Change**

Load monitoring using tracer dye methodology as described in the 2006 ROD was completed once in 2009 for the MSD Subdrain. It was anticipated that the results of the dye tracer study (PTS 2010) would provide information into loading and mass balance of the groundwater in the vicinity of the MSD. This information could be used to provide insight into the contribution of different sources of groundwater along the length of the MSD subdrain, and to determine reaches of the subdrain that have highest influx of contaminants. Multiple methods of flow determination were utilized in the study, and consistent results between the methods were not attained. This investigation concluded that alternative methods of measuring flows and loading would be equally effective and easier to implement than dye tracer methodology. The EPA and DEQ agree that the initial dye tracer study did not provide the anticipated data and results, and thus additional dye tracer studies will not be performed.
Therefore, the utilization of a flume or other simple method for monitoring flows within the MSD will be implemented as follows.

The groundwater loads entering the MSD sub-drain will be monitored twice yearly – during high flow (June – July) and low flow (October - November using flumes installed within manholes in the MSD Subdrain. The flow monitoring shall also include use of a mass balance analysis to determine that the pumping rate is matching the groundwater collection rate, and that the subdrain is not adding contaminated groundwater back into the aquifer in the vicinity of the pump vault.

A load monitoring plan shall be developed as a part of overall Operation and Maintenance plan for the MSD. The load monitoring plan shall provide data, information, and analysis to determine whether the subdrain continues to operate as is necessary to ensure adequate capture

of incoming loads and is not fouling or clogging. Reporting shall be yearly under the plan. At a minimum, the load monitoring plan shall address the following elements:

- Determine a pumping level in the vault that ensures that the subdrain is not adding contaminated water back into the aquifer in the vicinity of the pump vault;
- Establish flumes or weirs and totalizers within the subdrain to continuously monitor flow;
- Identify monitoring wells adjacent to the subdrain to be monitored that will signify when subdrain cleanouts are needed;
- Contain and overall description of flow measurement and monitoring procedures;
- Contain location and description of monitoring points;
- Contain a description of flow measurement techniques;
- Describe the development of a Standard Operating Procedure (SOP) for the flow measurement and water sampling within the subdrain; and
- Contain a clear monitoring and reporting schedule based on two monitoring events per year to be conducted at high water table conditions (approximately June or July) and low water table conditions (approximately October or November) of each year.
- An annual data summary report shall be prepared no later than June 30 of the year following data collection that includes: all measurements, analytical results and field notes for monitoring events; all flow rate and pumping rate data for the year; water level data from pertinent monitoring wells for the year; all analytical data pertinent to the subdrain collected between monitoring events; calculation of loads and mass balance to determine if the pumping rate is matching the subdrain collection rates and to assure that the subdrain is not adding contaminated water back into the aquifer near the pump vault; recommendations for operations changes, if needed: and other elements typical of a data summary report.

EPA notes that other groundwater tests and data reports, including the February 2010 pump test and other reports, will continue to add to the understanding of the alluvial aquifer and the requirements for the final implementation of the groundwater component of the Selected Remedy as that component is described in the ROD.

# Section 4
# Support Agency Comments

### 4.1 DEQ Comments on the ESD.

DEQ reviewed this ESD prior to issuance. Comments from DEQ have been addressed in the document by inclusion except as noted here.

BRES. DEQ believes there are significant problems with the BRES procedure made evident by the 2007 – 2010 BRES inspections and evaluations. DEQ believes the ESD should acknowledge the scope and level of effort necessary for BRES implementation at the over 200 sites which make up the BRES system. DEQ also believes that the ESD should require a report which sets forth criteria, based on the 2007 – 2010 BRES inspections and evaluations, for reanalyzing certain sites where the BRES procedure seems inappropriate. DEQ believes that for the significant majority of the BRES sites, this step is not necessary, but for those where it is needed, more than maintenance is required.

Dye Tracer Monitoring. DEQ agrees with the use of weirs or flumes in place of the dye tracing monitoring at the MSD Sub-Drain, but believes the flume monitoring as presented in the ESD does not adequately meet the ROD purposes and requirements without the inclusion of a new manhole between Casey Street and Harrison Avenue and the inclusions of flow barriers to direct flow out of the gravel pack and through the weir flume.

Metro Storm Drain Wastes. DEQ believes the most substantial data generated since the signing of the ROD that should prompt reassessment of portions of the selected remedy is the February 2010 pumping test data. DEQ believes that this pumping test, performed pursuant to Section 12.3.2.3(6) of the BPSOU ROD, invalidated the assumptions and basis for the ROD's remedy determination for the MSD groundwater and related TI waiver. DEQ believes that the ESD needs to recognize the February 2010 pumping test results and note how the study and monitoring will assist in meeting the requirements of the ROD.

**4.2 EPA's response to DEQ comments**

BRES. EPA did not include DEQ's remedy change relating to the non-application of BRES procedures to certain of the capped sites in the BPSOU. The BRES system, properly implemented, already provides for the full upgrade of all capped sites to ROD-required standards, through corrective action, in a consistent manner, along with maintenance. EPA is committed to ensuring that the BRES system is fully implemented in a timely manner and is taking enforcement steps to ensure that happens. EPA believes that treating all capped sites under a uniform and consistent system like BRES remains the appropriate response action to ensure the long term and permanent maintenance of the capped areas. EPA can provide level of effort estimates if needed during enforcement proceedings.

Dye Tracer Monitoring. EPA will continue to evaluate the need for additional manhole(s) and flow barriers as part of the final design for the MSD pump vault area, in consultation with DEQ. EPA did not include flow barriers (and related manholes) at this time because experience at the MSD pump vault area indicates that such barriers tend to restrict flow and impair function of the collection system, and may lead to liner dislocation in the area.

Metro Storm Drain Wastes. In response to the DEQ's concerns, EPA did include language in this ESD, at the end of section 3.3.1, that expresses its commitment to continue to use all available data, including the February 2010 pumping test data, in conducting remedial design for purposes of designing a final, protective interception and pumping system and other ground water control measures in the Metro Storm Drain area in accordance with the BPSOU ROD. EPA does not believe that the February 2010 pumping test data, which is one report among

many data reports and analysis conducted as part of remedial design, invalidated the assumptions and basis for the ROD's remedy determination for the MSD groundwater and related TI waiver. Although the aquifer test results did increase our understanding of flow rates in the middle part of the alluvial aquifer and do vary from the flow rate assumptions in the 2006 BPSOU alluvial aquifer TI Evaluation document and similar documents, that change alone does not "invalidate" the assumptions and basis for the ROD's remedy determination for the MSD groundwater and related TI waiver. The BPSOU alluvial ground water TI evaluation used a weight of evidence approach using such information as the wide distribution of mine waste and contaminated aquifer materials acting as primary and secondary sources and the heterogeneity of the aquifer limiting the kinetics of desorption that would extend the time to attain groundwater ARARs. EPA believes this analysis remains valid based on current data on the contaminated groundwater plume. EPA is committed to protecting Silver Bow Creek through the vigorous implementation of the MSD interception and pumping facility requirements and other ground water control measures as part of the existing ROD.

# Section 5
# Public Participation Compliance

In accordance with NCP Section 300.435(c)(2)(i),to issue an ESD, the lead agency shall:

> *(A) Make the explanation of significant differences and supporting information available to the public in the administrative record established under NCP § 300.815 and the information repository; and*
>
> *(B) Publish a notice that briefly summarizes the explanation of significant differences . . . in a major local newspaper of general circulation;*

The lead agency, EPA, will publish a public notice in the *Montana Standard* that briefly summarizes the changes presented in the ESD. This is a local newspaper of general circulation, in accordance with NCP Section 300.435(c)(2)(i)(B). Additionally, a copy of this ESD and supporting information will be placed in the BPSOU Administrative Record and in two local information repositories as described in Section 1 of this ESD.

# Section 6
# Statutory Determinations

Considering the new information presented in this ESD and the changes that have been made to the Selected Remedy, EPA believes that the Selected Remedy, as modified by this ESD, remains protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to this operable unit or involves appropriate waivers of these requirements, and is cost effective.

**APPROVAL**

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection
And Remediation

7/18/11
Date

# Figures

# Figures

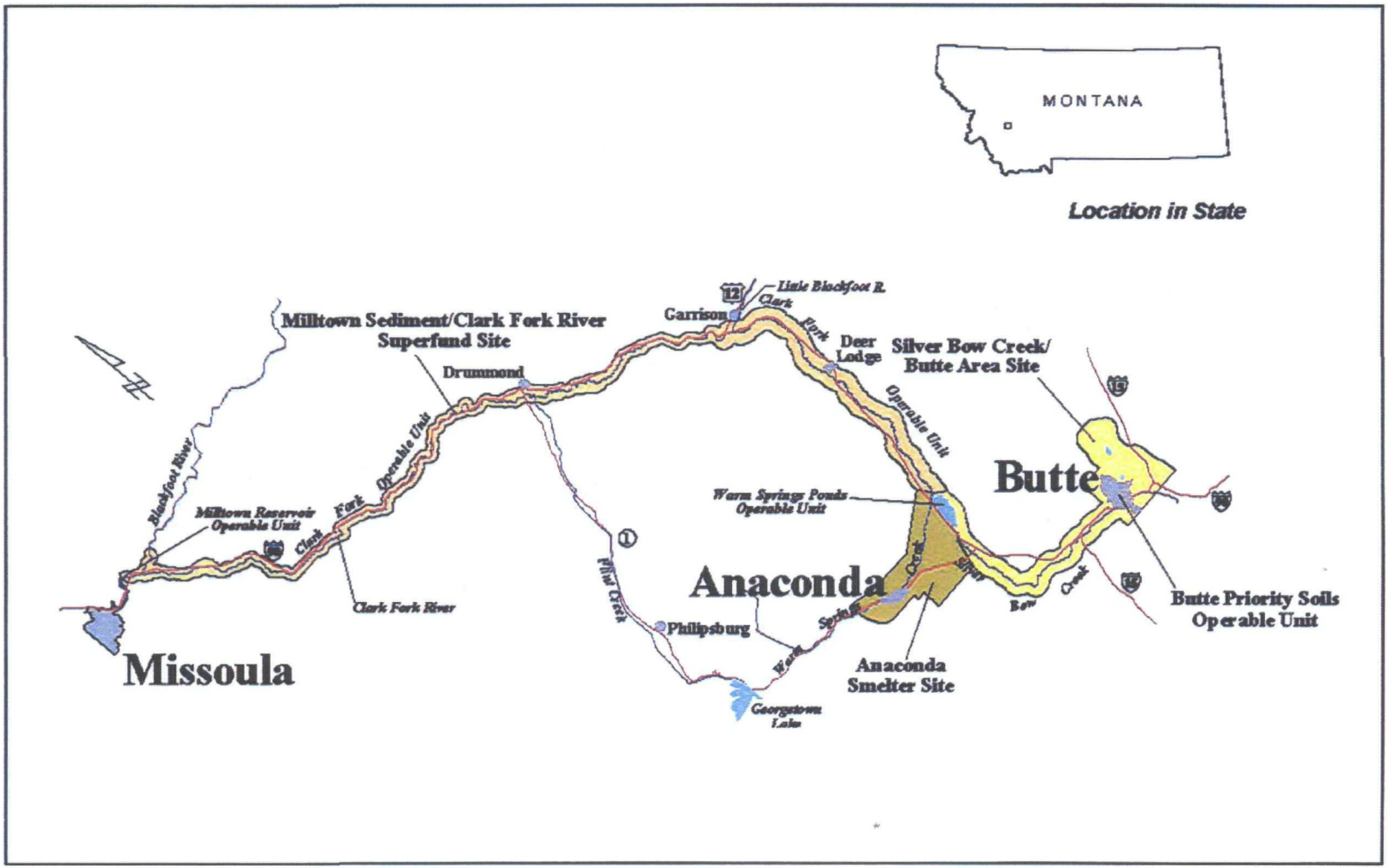



**Figure 1-1**
**Site Location**

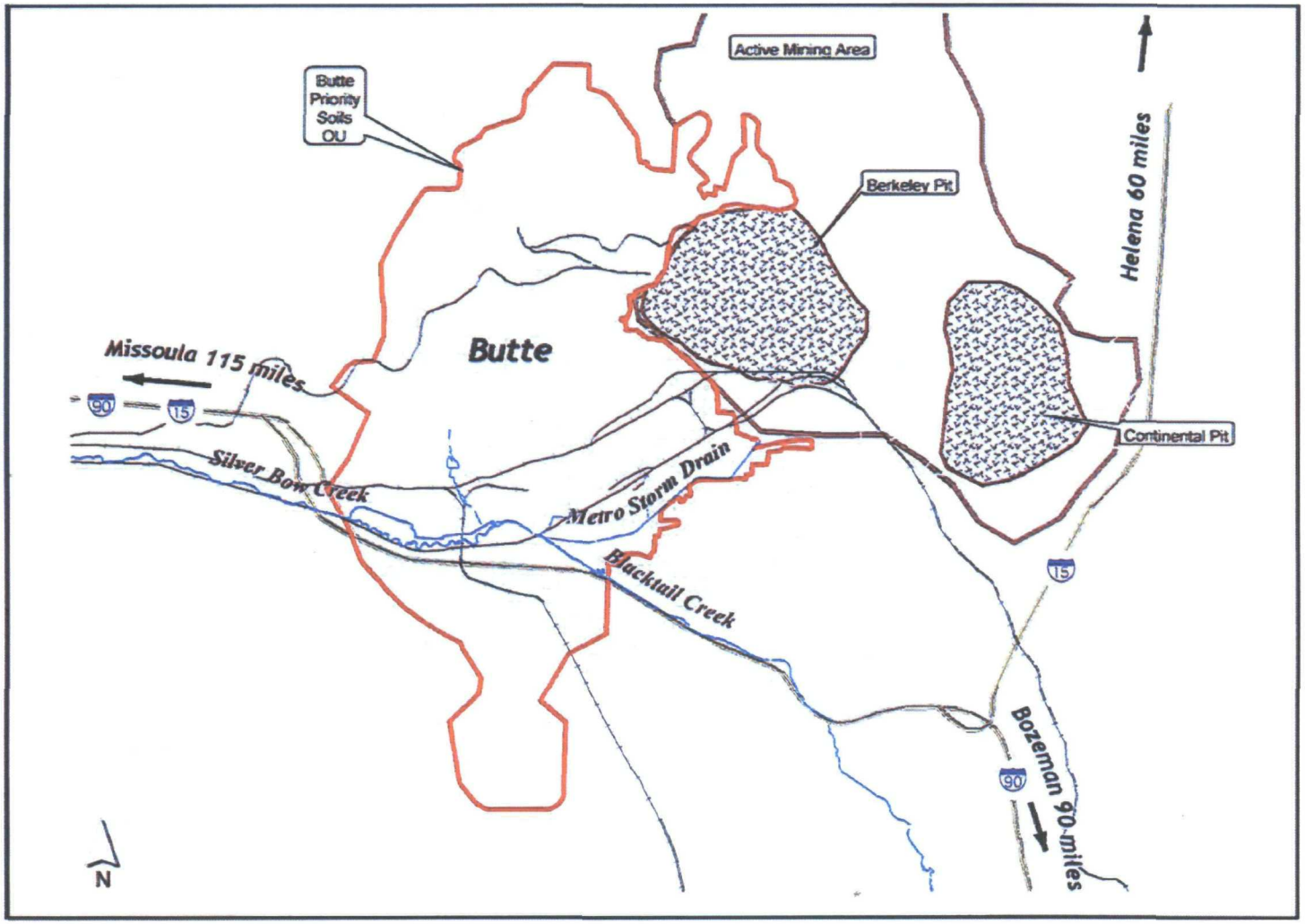



**Figure 1-2**
**Butte Priority Soils OU Site Map**


**Figure 3-1**
**Wake-Up Jim Site Location**

# Tables

# Table 3-1

**Table 3-1**

**Significant Differences between BPSOU Selected Remedy and Explanation of Significant Differences**

| Difference | ROD Section and page | 2006 BPSOU Record of Decision Text | Revised Explanation of Significant Differences Text (strike-out text is deleted; underlined text is added) | Basis for Difference |
|---|---|---|---|---|
| Residential Metals Abatement Program Timeframes | 12.1.1 page 12-2 | If the Superfund remedial requirements are incorporated into the existing and expanded comprehensive program, complete indoor and outdoor assessment (i.e., residential yard soil, indoor and outdoor dust, non-living space dust, lead-based paint, drinking water, and mercury vapor) of all residential properties that are known to be occupied or expected to be occupied must be completed within 8 years of the initiation of the expanded program. During this 8-year period, the cleanup of residential properties that exceed the actions levels will occur in concert with the assessment program. The Selected Remedy requires the assessment and abatement activities be completed in no later than 15 years. | If the Superfund remedial requirements are incorporated into the existing and expanded comprehensive program, complete indoor and outdoor assessment (i.e., residential yard soil, indoor and outdoor dust, non-living space dust, lead-based paint, drinking water, and mercury vapor) of all residential properties that are known to be occupied or expected to be occupied must be completed within ~~8~~10 years of the initiation of the expanded program. During this ~~8~~10-year period, the cleanup of residential properties that exceed the actions levels will occur in concert with the assessment program. The Selected Remedy requires the assessment and abatement activities be completed in no later than ~~15~~20 years. | RD was implemented to include both mining and non-mining related contamination at residential properties. The addition of non-mining related contamination required extension of the RA time frame. |
| | 12.3.1.1 pages 12-15 to 12-16 | The Selected Remedy requires that all residential properties be sampled, assessed, and abated within 15 years. A complete indoor and outdoor assessment (i.e., residential yard soil, indoor and outdoor dust, non-living space dust, lead-based paint, drinking water, and mercury vapor) of all residential properties that are known to be occupied or expected to | The Selected Remedy requires that all residential properties be sampled, assessed, and abated within ~~15~~20 years. A complete indoor and outdoor assessment (i.e., residential yard soil, indoor and outdoor dust, non-living space dust, lead-based paint, drinking water, and mercury vapor) of all residential properties that are known to be occupied or expected to be occupied must be completed within the first ~~8~~10 years of the initiation of the expanded program. | |

| Difference | ROD Section and page | 2006 BPSOU Record of Decision Text | Revised Explanation of Significant Differences Text (strike-out text is deleted; underlined text is added) | Basis for Difference |
|---|---|---|---|---|
| | | be occupied must be completed within the first 8 years of the initiation of the expanded program. During this 8-year period, the clean-up of residential properties that exceed the action levels will occur in concert with the assessment program. | During this ~~8~~10-year period, the clean-up of residential properties that exceed the action levels will occur in concert with the assessment program. | |
| | 12.3.1.1 page 12-16 | This ROD requires that all residential properties be assessed within 8 years. | This ROD requires that all residential properties be assessed within ~~8~~10 years. | |
| | 12.3.1.1 page 12-16 | At least 94 properties per year will need to be addressed to complete the remediation of all residential properties within the required 15 years.<br><br>According to BSB, 59 percent of properties that have required residential soil abatements have also needed house abatements, resulting in an estimated 831 homes that may require remediation. Using this estimate, about 56 house abatements will need to be conducted per year to complete remediation within the required 15 years. | All ~~At least 94~~ properties ~~per year~~ will need to be addressed to complete the remediation of all residential properties within the required ~~15~~20 years. Yearly goals for completion of all properties for assessment and abatement established in remedial design plans shall be achieved or adjusted and yearly reporting is required.<br><br>~~According to BSB, 59 percent of properties that have required residential soil abatements have also needed house abatements, resulting in an estimated 831 homes that may require remediation. Using this estimate, about 56 house abatements will need to be conducted per year to complete remediation within the required 15 years.~~ | |
| Residential Metals Abatement Program Soil | 12.3.1.1 page 12-20 | At a minimum, soil will be sampled from the 0 to 2-inch depth interval within decision units (e.g., front yard, back | At a minimum, soil will be sampled from the 0 to 2-inch, 2 to 6 inch, and 6 to 12 inch depth intervals within decision units (e.g., front yard, back yard, play | The additional sampling allows determination if the contamination is |

| Difference | ROD Section and page | 2006 BPSOU Record of Decision Text | Revised Explanation of Significant Differences Text (strike-out text is deleted; underlined text is added) | Basis for Difference |
|---|---|---|---|---|
| Sampling Depths | | yard, play area, driveway, etc.)… | area, driveway, etc.)… | surficial or is at depth. |
| Residential Metals Abatement Program Soil Removal and Replacement Depths | 12.3.1.1 page 12-20 | …and those decision units exceeding the action levels will be subject to soil removal and replacement to a minimum depth of 18 inches. | …and those decision units exceeding the action levels will be subject to soil removal and replacement to a minimum depth of ~~18~~12 inches. | The change was made to be consistent with the Superfund Lead Contaminated Sites Handbook |
| Non-Residential Contamination Wake-Up Jim Site Change | 12.3.1.2 page 12-24 | ▪ Wake Up Jim Site 1615 | ~~▪ Wake Up Jim Site 1615~~ | The Wake-up Jim Site is incorporated into a fenced area where no public access is allowed. Additionally, runoff flows into the Berkeley Pit. |
| Ground Water Monitoring: Dye Tracer change | 12.3.2.3 page 12-39 | The groundwater loads entering the MSD sub-drain will be monitored annually in the fall (base flow) using dye tracer methods to determine flow and standard sampling to measure metals and arsenic concentrations. | ▪ The groundwater loads entering the MSD sub-drain will be monitored ~~annually in the fall (base flow)~~ using ~~dye tracer methods to determine flow and standard sampling to measure metals and arsenic concentrations.~~ flumes installed within manholes in the MSD Subdrain. Additionally, a load monitoring plan shall be developed as a part of overall Operation and Maintenance plan for the MSD. The load monitoring plan shall provide data, information, and analysis to determine whether the subdrain continues to operate as is necessary to ensure adequate capture of incoming | Load monitoring as described in the 2006 was completed once in 2009 ROD for the MSD Subdrain. This investigation concluded that alternative methods of measuring flows and loading would |

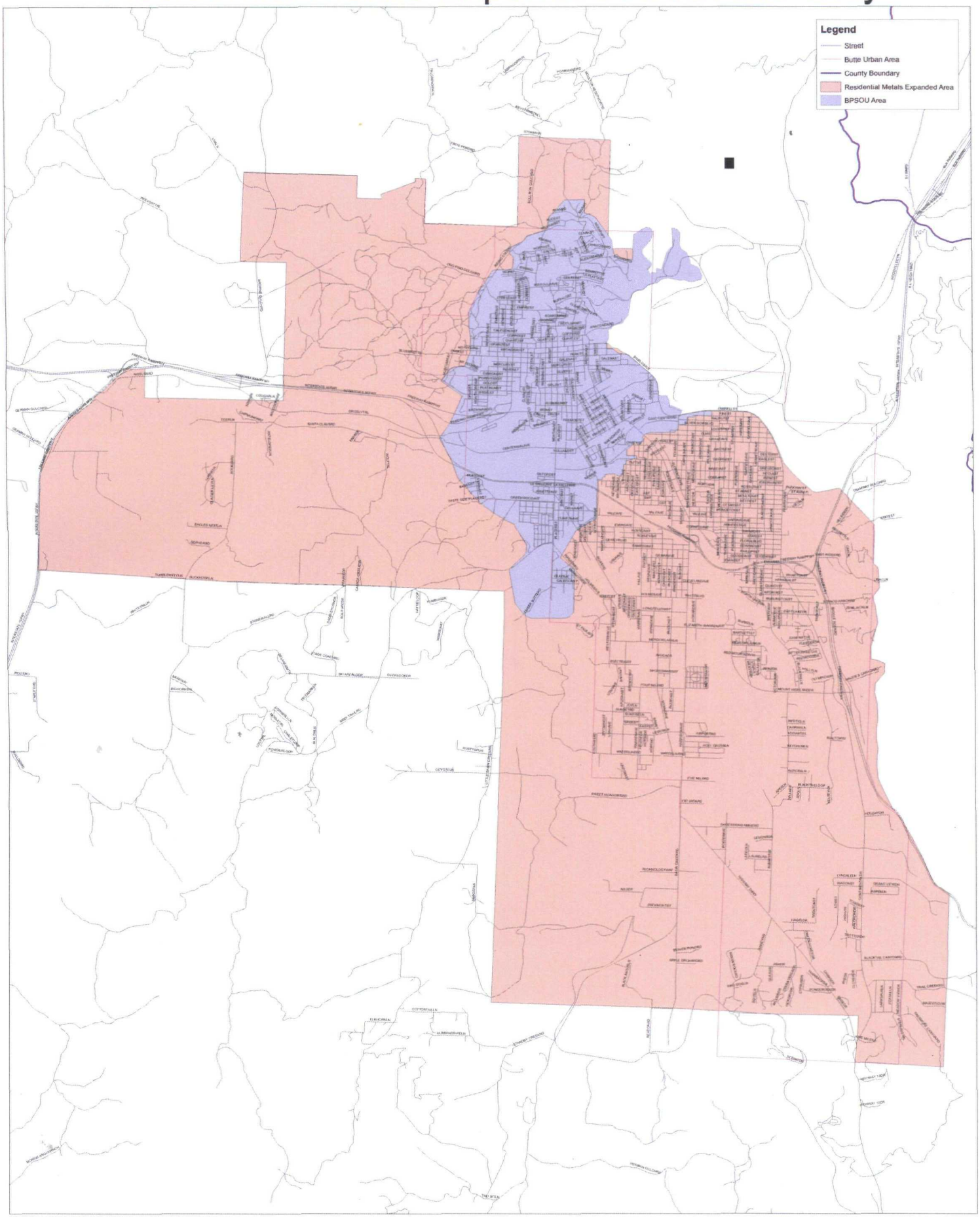
| Difference | ROD Section and page | 2006 BPSOU Record of Decision Text | Revised Explanation of Significant Differences Text (strike-out text is deleted; underlined text is added) | Basis for Difference |
|---|---|---|---|---|
| | | | loads and is not fouling or clogging. At a minimum, the load monitoring plan shall address the following elements:<br>• Determine a pumping level in the vault that ensures that the subdrain is not adding contaminated water back into the aquifer in the vicinity of the pump vault;<br>• Establish flumes or weirs and totalizers within the subdrain to continuously monitor flow;<br>• Identify monitoring wells adjacent to the subdrain to be monitored that will signify when subdrain cleanouts are needed;<br>• Contain and overall description of flow measurement and monitoring procedures;<br>• Contain location and description of monitoring points;<br>• Contain a description of flow measurement techniques;<br>• Describe the development of an SOP for the flow measurement and water sampling within the subdrain; and<br>■ Contain a clear monitoring and reporting schedule based on two monitoring events per year to be conducted at high water table conditions (approximately June or July) and low water table | be equally effective and easier to implement than dye tracer methodology. |

| Difference | ROD Section and page | 2006 BPSOU Record of Decision Text | Revised Explanation of Significant Differences Text (strike-out text is deleted; underlined text is added) | Basis for Difference |
|---|---|---|---|---|
| | | | conditions (approximately October or November) of each year.<br><br>■ An annual data summary report shall be prepared no later than June 30 of the year following data collection that includes: all measurements, analytical results and field notes for monitoring events; all flow rate and pumping rate data for the year; water level data from pertinent monitoring wells for the year; all analytical data pertinent to the subdrain collected between monitoring events; calculation of loads and mass balance to determine if the pumping rate is matching the subdrain collection rates and to assure that the subdrain is not adding contaminated water back into the aquifer near the pump vault; recommendations for operations changes, if needed: and other elements typical of a data summary report. | |

# Appendices

# Appendix A

# Residential Metals Expanded Area Attic Only



# Appendix B

**Table 2**
**Standards for Ground Water**

| COC | Standard (Dissolved)[1] |
|---|---|
| Arsenic | 10 µg/L |
| Cadmium | 5 µg/L |
| Copper | 1,300 µg/L |
| Lead | 15 µg/L |
| Mercury | 2 µg/L |
| Zinc | 2,000 µg/L |

1 As presented in the BPRSOU ROD, these are equal to the DEQ-7 standards published in February 2006.

**Table 3**
**Numeric Water Quality Standards**

| Contaminant | Human Health Standard (µg/L) | Chronic Aquatic Standard (µg/L) | Acute Aquatic Standard (µg/L) | Notes |
|---|---|---|---|---|
| Aluminum | -- | 87 | 750 | Dissolved fraction |
| Arsenic | 10 | 150 | 340 | |
| Cadmium | 5 | 0.097 | 0.52 | Hardness-dependent |
| Copper | 1,300 | 2.85 | 3.79 | Hardness-dependent |
| Iron | -- | 1,000 | -- | |
| Lead | 15 | 0.545 | 13.98 | Hardness-dependent |
| Mercury | 0.05 | 0.91 | 1.7 | |
| Silver | 100 | -- | 0.374 | Hardness-dependent |
| Zinc | 2,000 | 37 | 37 | Hardness-dependent |

Note: All standards are based on total recoverable analysis except for aluminum.
µg/L = micrograms per liter