1239303

RECORD OF DECISION

FOR

FLAT CREEK/IMM SUPERFUND SITE

OPERABLE UNIT 1

MINERAL COUNTY, MONTANA

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RECORD OF DECISION
FOR
FLAT CREEK/IMM SUPERFUND SITE
OPERABLE UNIT 1
MINERAL COUNTY, MONTANA

Part 1

Declaration

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Declaration

Site Name and Location

The Flat Creek Iron Mountain Mine (FC IMM) Superfund Site (the site) is located in northwestern Montana, at latitude 47.192 and longitude -114.892. It includes the Town of Superior and the Clark Fork River and Flat Creek within its boundaries. The site is approximately 58 miles west of Missoula, Montana, and 47 miles east of the Idaho/Montana border. U.S. Interstate 90 and the Clark Fork River run east-west through the site. The U. S. Environmental Protection Agency's (EPA's) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number for the site is MT0012694970.

The site includes three operable units (OUs), the first of which (OU1) is the focus of this document. OU1 encompasses mining contaminated soils from the IMM transported into Superior and placed within the residential and non-residential properties. It does not include other media (e.g., surface water or groundwater). These other media will be addressed in a future record of decision for the Flat Creek watershed (OU2).

Statement of Basis and Purpose

This document represents the record of decision (ROD) for the remedial action to clean up mining contaminated soils of OU1. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The decision is based on the administrative record file for OU1 of the site.

This document is issued by EPA Region 8, the lead agency, and the Montana Department of Environment Quality (DEQ), a supporting agency. The US Forest Service (USFS) is also a supporting agency. Both EPA and DEQ concur on the selected remedy presented herein.

Assessment of Site

The response action selected in this ROD is necessary to protect the public health and welfare and the environment from actual or threatened releases of hazardous substances into the environment. It will achieve this by breaking the exposure pathways associated with contaminants in mining contaminated soils.

Description of Selected Remedy

The contaminants of concern (COC) at this OU are antimony, arsenic, and lead in mining contaminated soils (mine tailings). These soils were brought into town from the Iron Mountain Mine and placed at various properties in areas where the property owner wished to discourage vegetation growth (such as driveways, borders, etc.). The selected remedy uses a remedial strategy that emphasizes excavation and disposal of contaminated soils in an on-site repository in Wood Gulch (OU3), constructed by EPA in 2011, to reduce exposure to hazardous substances. The soils will come from contaminated areas of individual properties that were screened in the Town of Superior in the 2009 and 2010 field seasons. Excavation of mining contaminated soils will be performed in a manner that protects human health and meets Remedial Action Levels, which are shown in Exhibit 8-1. Where mining contaminated soils are found, EPA will remove them both vertically and horizontally to the extent practicable, unless infrastructure (buildings or utilities) prevents their removal. The contaminated soils from previous time-critical removal actions (TCRAs) that were disposed of at the airport repository will also be excavated and relocated to the Wood Gulch repository to facilitate future development plans at the airport. Land use controls and institutional controls will be employed to address any mining contaminated soils left in place, which will be minimal.

The Wood Gulch repository is located on State of Montana land, within the Flat Creek watershed (OU2). The repository will be used primarily by EPA, the USFS, and DEQ to store contaminated soils removed from OU1 and OU2. These three agencies are developing a Memorandum of Understanding that will address the use and long term operation and maintenance of the repository. A separate and future record of decision for the Flat Creek watershed (OU2) will incorporate final decisions regarding the Wood Gulch repository, the remedy for mining contamination in the watershed, and will address ecological risks associated with OU1.

Statutory Determinations

The selected remedy meets the mandates of CERCLA §121 and, to the extent practicable, the NCP. It is protective of human health and the environment, complies with all federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. It was determined that the source materials present in OU1 do not represent a principal threat, thus eliminating the expectation for treatment of these source materials. Although they are present in large volumes, the source materials within OU1 are low in toxicity, can be reliably contained, and present a relatively low risk in the event of exposure.

Because this remedy will potentially result in hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action, and at a minimum every five years thereafter, to ensure that the remedy is or will be protective of human health and the environment. The 5-year reviews will focus on areas where waste may need to be left in place either because of an inability to obtain access, or because the waste removal would have jeopardized infrastructure.

ROD Data Certification Checklist

The following information is included in the decision summary section of this ROD. Additional information can be found in the administrative record file for this site.

1. Contaminants of concern and their respective concentrations (Section 5)
2. Baseline risks represented by the contaminants of concern (Section 7)
3. Cleanup levels established for contaminants of concern and the basis for these levels (Section 8)
4. Discussion of principal threat wastes (Section 11)
5. Current and reasonably anticipated future land use assumptions used in the baseline risk assessment (Section 6)
6. Potential land use that will be available as a result of the selected remedy (Section 12)
7. Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 12)
8. Key factors that led to selecting the remedy (Sections 10, 11, and 12)

Authorizing Signatures

Martin Hestmark (Acting)
Assistant Regional Administrator
Office of Ecosystem Protection and Remediation

7/3/12
Date

Richard Opper, Director
Montana Department of Environmental Quality

5/31/12
Date

RECORD OF DECISION
FOR
FLAT CREEK/IMM SUPERFUND SITE
OPERABLE UNIT 1
MINERAL COUNTY, MONTANA

Part 2

Decision Summary

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Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
ASARCO	American Smelting and Refining Company
ATSDR	Agency for Toxic Substances Disease Registry
bgs	below ground surface
BMP	best management practice
CDM Smith	CDM Federal Programs Corporation
CEP	community engagement plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COC	contaminant of concern
COPC	contaminants of potential concern
CSM	conceptual site model
CTE	central tendency exposure
cy	cubic yards
DEQ	Montana Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentrations
FC	Flat Creek
FS	feasibility study
GM	geometric mean
gpm	gallons per minute
GSD	geometric standard deviation
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IC	institutional control
IEUBK	Integrated Exposure Uptake Biokinetic model
IRIS	Integrated Risk Information System
IMM	Iron Mountain Mine
IVBA	in vitro bioaccessability assay
LOAEL	lowest-observed-adverse-effect level
LUC	land use control
MCL	maximum contaminant level
MDSL	Montana Department of State Lands
mg/kg	milligrams per kilogram (equivalent to ppm)
mg/L	milligrams per liter
µg/dL	microgram per deciliter
µg/L	micrograms per liter
µg/m^3	microgram per cubic meter
MPDES	Montana Pollutant Discharge Elimination System
MSL	mean sea level
NCP	National Oil and Hazardous Substances Pollution & Contingency Plan
NOAEL	no-observed-adverse-effect level

NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
P10	probability of a blood lead value exceeding 10 micrograms per deciliter
PA	preliminary assessment
PbB	lead in blood
ppm	parts per million
PV	present value
PVC	polyvinyl chloride
PWS	public water supply
RAL	remedial action limit
RAO	remedial action objective
RBA	relative bioavailability
RfC	reference concentration
RfD	reference dose
RAL	remedial action level
RI	remedial investigation
RME	reasonable maximum exposure
ROD	record of decision
RPM	Remedial Project Manager
SF	slope factor
SI	site inspection
site	Flat Creek/IMM Superfund Site
TBC	to be considered
TCRA	time-critical removal action
TSP	triple super phosphate
UOS	URS Operating Systems
USFS	U.S. Forest Service
WOE	weight of evidence
XRF	x-ray fluorescence

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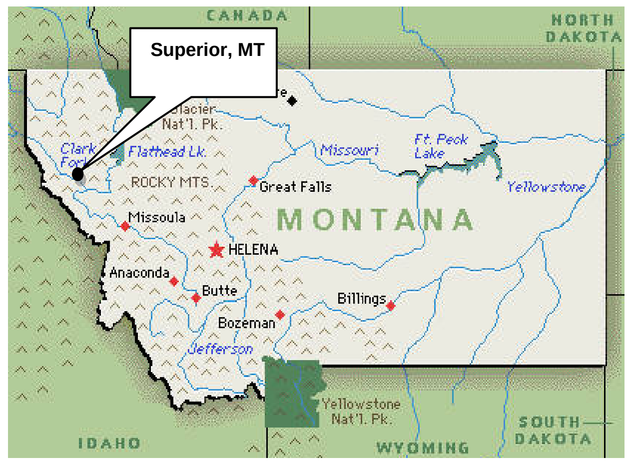
Section 1
Site Name, Location, and Description

1.1 Site Name and Location

The Flat Creek Iron Mountain Mine (FC IMM) Superfund Site (the site) is located in Mineral County, Montana, in and around the small community of Superior. The site's CERCLIS identification number is #MT0012694970. The site is approximately 47 miles east of the Idaho border (Exhibit 1-1) at latitude 47.192 and longitude -114.892. It includes the Clark Fork River and Flat Creek within its boundaries. The nearest other community is St. Regis, which is 14 miles to the west, and the nearest city is Missoula, which is 58 miles to the east. Superior is located at exit 47 of U.S. Interstate 90 and has an area of 1.18 square miles. Most of Superior lies north and west of U.S. Interstate 90 and south and east of the Clark Fork River. Before being listed on EPA's National Priorities List (NPL) in 2009, the site was known as the Superior Waste Rock site.

Exhibit 1-1. Site Location Map



Superfund-related contamination at the site is the result of importation of mine waste from the nearby IMM over several decades. The waste was used for construction and as fill material by local government and private citizens. Importation of the mine waste has resulted in documented contamination of soils within the community. Impacts to other media are not known at this time, but will be investigated as part of the Flat Creek watershed operable unit (OU2).

EPA is the lead agency for the site and the Montana Department of Environmental Quality (DEQ) and the U.S. Forest Service (USFS) are the support agencies. There are no specific site boundaries associated with this site; rather the site consists of any areas where mining waste exists. To better evaluate risks posed by contamination and prioritize response actions to address contamination, EPA has organized the work at the site into three OUs (Exhibit 1-2).

- OU1 – Town of Superior. This OU is limited to mining contaminated soils brought into town and placed at residential and other properties in Superior. OU1 was given top priority to address the risks to the community from these soils.
- OU2 – Flat Creek Watershed. OU2 includes the IMM and mill site where the contamination originated, contamination deposited along the stream corridor downgradient of the mine, and the overall site-wide groundwater and surface water issues.
- OU3 – Wood Gulch Mine Waste Repository. This OU is the joint mine waste repository that EPA constructed in 2011 specifically to accept wastes from OU1 and OU2.

This document represents the EPA's ROD for cleanup (or remedial action) for OU1. OU1 encompasses contaminated soils within the residential and other properties in Superior. It does not include other media (e.g., surface water or groundwater). Those media will be addressed as part of OU2.

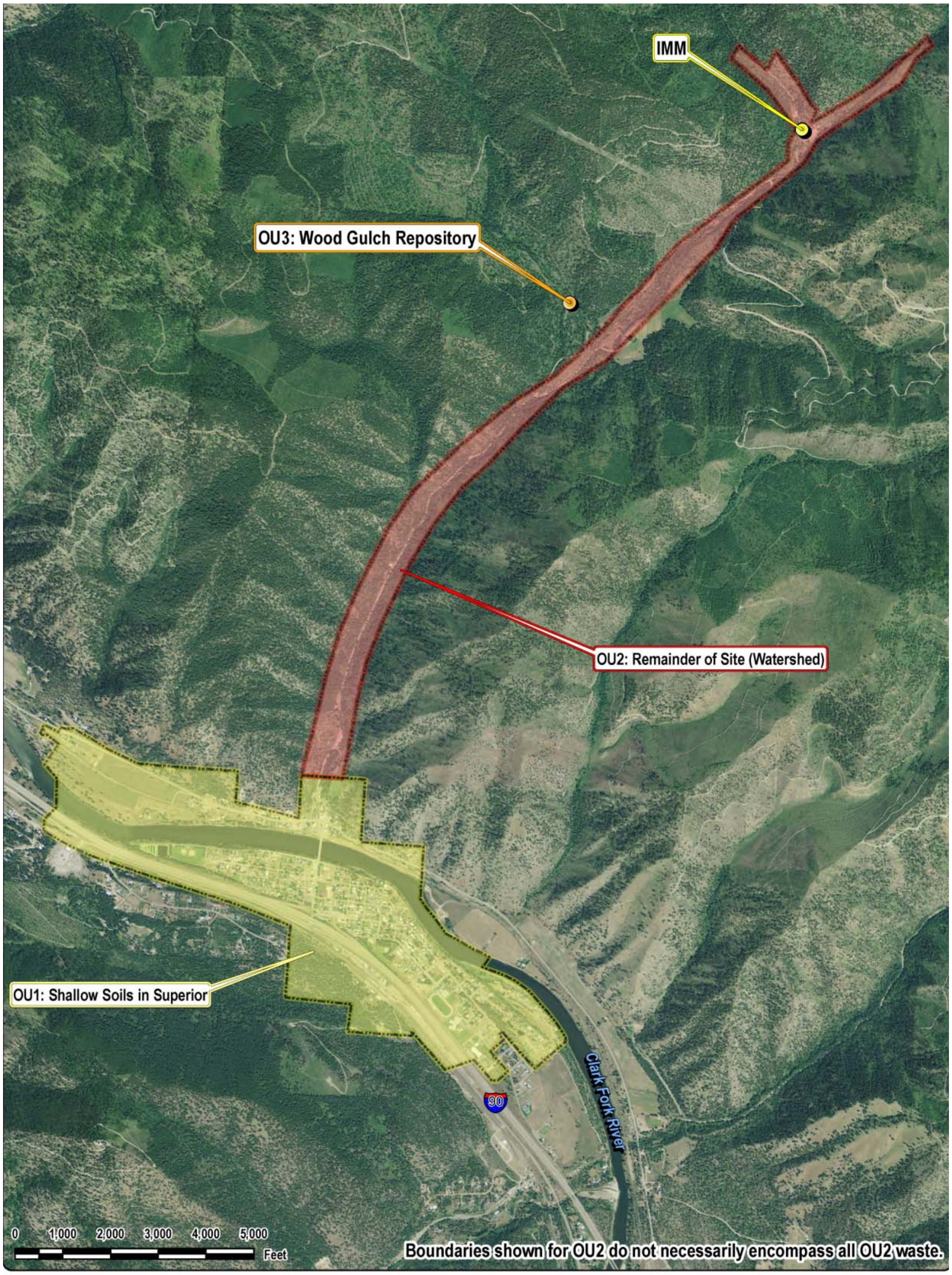


Exhibit 1-2. Locations of OUs at Site

Section 2
Site History and Enforcement Activities

2.1 Site Background and History

The IMM is the primary source for contamination at the site. It operated from 1909 to 1930 and again from 1947 to 1953, producing silver, gold, lead, copper, and zinc ores. The now abandoned property includes tunnels, tailings, and the remnants of a mill and other mine buildings. The tailings from the mine contain elevated concentrations of metals and the metalloid, arsenic (hereafter collectively referred to as "metals"). While the mine was in operation, tailings were disposed of along Flat Creek using gravity drainage. Those tailings have been distributed along Flat Creek as far as its confluence with the Clark Fork River.

The IMM covers approximately 3 acres of property and consisted of a 200-ton mill and approximately 500 feet of tunnel. Tunnels were developed at the 200-foot, 400-foot, 700-foot, and 1,600-foot levels, with the main haulage level at 1,600 feet. The mill also accepted ore from the Dillon Mill and the Belle of the Hills, which were located upgradient of the IMM in Hall Gulch. The IMM reportedly used flotation methods to separate the metals. Although waste rock and tailings piles still exist on site, most of the tailings were washed down onto the Flat Creek floodplain.

Tailings have also been imported into Superior by the local government and various individuals for use as fill material in yards, roadways, and other locations (e.g., the school track). Various investigations have noted that it was a common practice in the 1950s and 1960s for tailings from the IMM to be hauled into town for use as roadbeds, driveways, and fill material for low-lying areas. The tailings were reportedly used along the edges of some properties to suppress weed growth. These tailings were readily available near and below the mill, as well as along Flat Creek. The tailings were sought-after because they were well sorted with no rocks or boulders, and they compacted and drained well. Local residents reported that they saw the tailings being used by town government for road projects and for the high school track, and that they felt that there were no problems associated with their use.

2.2 Regulatory Activities

Regulatory and government activities at the site began with the State of Montana in the early 1990s (Exhibit 2-1). A forest fire in August of 2000 caused significant deforestation, which resulted in a large runoff event that caused the release of significant volumes of contaminated tailings and other mine wastes to Flat Creek. This event, along with the knowledge that mine wastes had been used for fill at various properties in Superior, and a 1993 abandoned mines investigation, resulted in the State requesting EPA involvement.

The following briefly lists the regulatory and other associated activities that have occurred at the site:

- 1993 – Abandoned Mines Investigation. The Montana Department of State Lands (MDSL) conducted an abandoned mine investigation to determine the potential health risks associated with the IMM site. Concentrations of many metals were found at levels significantly above background.

- 1998 – Initial Reclamation Activities. The IMM's owner removed some tailings from Flat Creek and placed them in an impoundment that was then covered and revegetated. Additional tailings along the creek were revegetated in place.

- 1997 – Drinking Water Testing. The town government became concerned about the potential public health effects from the IMM after a water sample from the town's well 2 miles downstream of the mine tested at 31 micrograms per liter (µg/L) for antimony, above EPA's maximum contaminant level (MCL) for antimony of 6.0 µg/L.

- August/September 2000 – Documented Release and Request from DEQ. A lightning storm ignited wildfires that burned more than 9,000 acres in the drainage. A subsequent high rainfall event resulted in a debris flow (including tailings) that swept into and down Flat Creek. Because of concern that tailings would be mobilized, DEQ requested that EPA conduct a preliminary assessment (PA), and site inspection (SI) at IMM, Flat Creek, and Superior.

- September 2001to April 2002 - PA/SI. EPA conducted a focused SI at the mine and in portions of Superior where importation of tailings was suspected. Elevated concentrations in soils were detected for lead, arsenic, antimony, cadmium, and manganese (URS Operating Systems [UOS] 2001). Soil samples were collected from the high school track and residential properties in Superior. Samples from the track were elevated for various metals, including lead and arsenic, as were samples from a residential property and a right of way in a residential neighborhood.

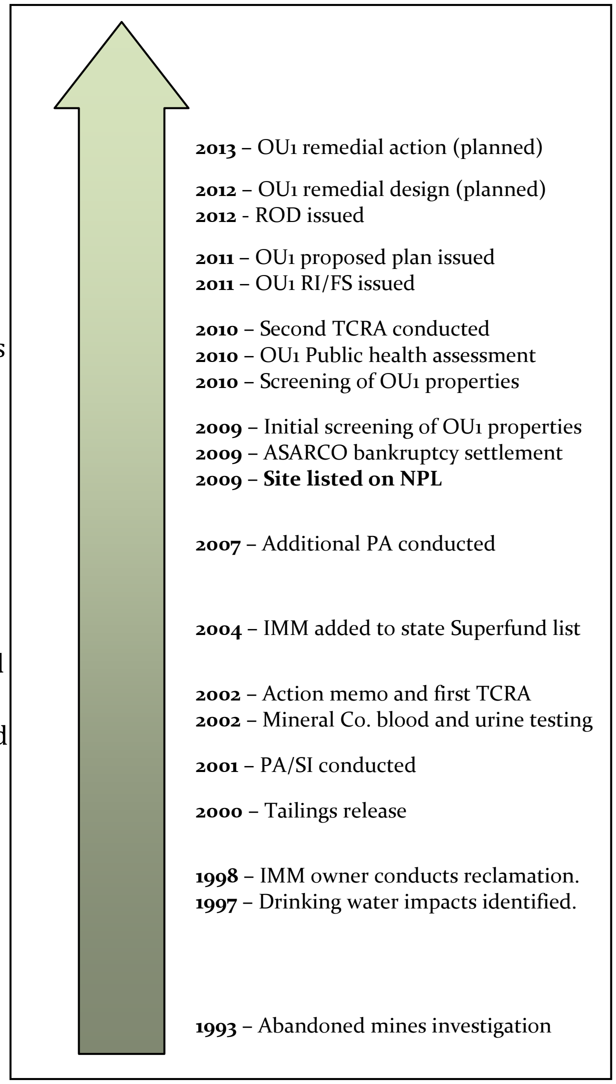


Exhibit 2-1. Timeline of Regulatory Activities at Site

- February 2002 – Blood and Urine Testing. Mineral County collected blood lead and urine samples from individuals living in Superior to evaluate exposure to arsenic. No effects of exposure were found.

- January to July 2002 – Removal Assessment. As a result of elevated concentrations of target analytes in soil, additional sampling was conducted in 2002 by EPA's Removal Branch. Soil samples were collected from 64 residential properties, 20 rights of way, and 10 city/county and open space properties within and around Superior (UOS 2002).

- August 2002 – General Notice Letter and Action Memorandum. EPA issued general notice letters to several potentially responsible parties on August 21, 2002. EPA also drafted an action memorandum to support removal of the tailings used as fill in Superior because of possible health and environmental problems. EPA established health-based preliminary goals of 3,000 parts per million (ppm) for lead and 400 ppm for arsenic for TCRA. The TCRA began in August 2002 and concluded in June 2003.

- 2004 DEQ – Montana State Superfund List. In 2004, DEQ added the IMM site to its State Superfund List.
- May 2007 - PA. An additional PA was prepared to update the 2001 PA using data generated in the TCRA and observations made during an April 2007 visit to determine if there were still targets associated with soil exposure.
- December 24, 2008 – NPL Request Letter. Mineral County requested that Montana support the addition of the site to EPA's NPL.
- January 2009 – NPL Request Letter. In a letter to EPA, Montana Governor Schweitzer wrote that he supported NPL listing. In response, EPA indicated the proposal for listing would proceed.
- April 2009 – NPL Proposal. The site was proposed for addition to the NPL in April 2009. A 60-day comment period ended in June 2009.
- June 2009 – Remedial investigation (RI). EPA began an RI of OU1 in June 2009. This entailed an environmental screening of shallow soils in residential and other properties.
- September 23, 2009 – NPL Listing. The site was officially added to the NPL.
- December 2009 – American Smelting and Refining Company (ASARCO) Bankruptcy. The bankruptcy settlement of the IMM was completed.
- January 2010 – Public Health Assessment Completed. The Agency for Toxic Substances Disease Registry (ATSDR) finalized its public health assessment.
- July and August 2010 - RI. EPA completed a second field season, which included sampling of most of the remaining residential and other properties in town, as well as alleys, and began the second TCRA. The second TCRA was concluded in November 2011.
- April 2011 – Human Health Risk Assessment (HHRA). EPA completed an HHRA for OU1 in support of the RI.
- May and June 2011 –RI and feasibility study (FS) reports were completed. The draft RI characterized the nature and extent of shallow soil contamination in the OU and the draft FS report evaluated alternative remedial actions for the cleanup.
- August through October 2011 – EPA constructed the Wood Gulch Repository.
- September 2011 – The RI (CDM Smith 2011a) and FS reports (CDM Smith 2011b) were finalized, incorporating comment from DEQ and the Superior Technical Assistance Committee.
- October 3, 2011 – EPA issued its proposed plan for cleanup. A public hearing was held in Superior on October 12, 2011. The 30-day public comment period ended on November 3, 2011.
- May 2012 – EPA finalized the ROD for OU1.

Upcoming activities include remedial design of the properties to be cleaned up and a remedial action to implement the cleanup.

2.3 Enforcement Actions and Documented Releases

As described in Section 2.2, DEQ documented a major release of contamination at the site in 2000. An August lightning storm ignited wildfires that burned more than 9,000 acres in the drainage. Shortly thereafter, a high rainfall event resulted in a debris flow (including tailings) that swept into and down Flat Creek. This release was what initiated the PA/SI for the site.

Two TCRAs have been undertaken at the site by EPA. The first occurred in August through November of 2002. Based on the 2001 and 2002 sampling events, EPA's Removal Branch conducted this TCRA to remove soils exceeding preliminary risk based goals of 3,000 ppm of lead or 400 ppm of arsenic from four driveways, three right-of-ways, much of the high school track, one residential fence line, and a portion of the Mineral County fairgrounds. These soils were placed at the airport repository. The second began in July of 2010. Based on the 2009 and 2010 sampling results, EPA's Removal Branch conducted this TCRA to remove soils exceeding preliminary risk based goals of 3,000 ppm of lead or 400 ppm of arsenic from an additional 30 residential properties. Soils from this removal action were placed in the Wood Gulch repository. Three additional properties identified during the second field season of the RI in 2010 were cleaned up in 2011.

In July, 2006, EPA entered into an Administrative Order on Consent with the Town of Superior, Mineral County, and the Mineral County School Board (Respondents), to settle EPA's claims for costs incurred in performing the 2002 TCRA which addressed contamination at several yards in Superior and at the high school track. Settlement was based on the Respondents' "ability-to-pay," and, while Respondents were not required to pay for the costs of EPA's removal action, they did agree to implement institutional controls at the site, provide a repository for waste, and grant EPA access to that repository.

In 2008 and 2009, the USFS and DEQ entered into two separate settlement agreements with ASARCO. Both settlements provided funds to address contamination at the Site, but not for contamination within the Town of Superior. The 2009 settlement arose from a global settlement of the ASARCO bankruptcy and created the Montana Custodial Trust, which now owns property formerly owned by ASARCO, and which has primary responsibility for addressing contamination at that property.

Section 3
Highlights of Community Participation

EPA has satisfied public involvement requirements outlined in CERCLA and the NCP throughout the remedy selection process. In addition to required activities, EPA conducted community involvement and outreach activities from the time shortly before the site was added to the NPL in September 2009 until the release of the proposed plan in October 2011. The components of EPA's community engagement activities are outlined below.

3.1 Fact Sheets

Several fact sheets were prepared in support of EPA's activities while RI and FS activities were being conducted. These fact sheets were mailed to every residence (780 addresses) in the Superior, Montana zip code (59872). The fact sheets were also posted on EPA's website, and have been entered into the Administrative Record.

The fact sheets titles and dates are:

- Project Kickoff, June 2009
- Results of 2009 Sampling, May 2010
- 2010 Field Update, October 2011
- 2010 Site Update, April 2011

3.2 Door-to-Door Canvassing

To obtain access to as many properties as possible, EPA, its contractors, and DEQ went door-to-door throughout the community at the start of the 2009 field season to request permission to collect samples as part of the RI. Permission to collect samples from individual properties was granted voluntarily and depended upon obtaining signed consent for access from property owners. As a result of the door-to-door canvassing, public meetings, advertisements, and fact sheets, EPA received access to sample a total of 644 properties in 2009 and 2010.

3.3 Community Engagement Plan

EPA issued a community engagement plan (CEP) for the site in May 2010 to describe how it would ensure that the public was informed and engaged throughout the Superfund process. The plan was based in large part on information gathered from individual interviews with members of the public in the summer of 2009. The plan is available on the EPA website and at the information repository.

3.4 Public Meetings

EPA held three public meetings at the site to present a project update and details of upcoming events. All three meetings were advertised in advance in the local newspaper, the Mineral Independent.

The meetings and their topics were:

- July 8, 2009. EPA and other agency personnel discussed comments received and next steps on the proposed NPL listing, the public health assessment prepared by the ATSDR, EPA's CEP, and the upcoming field season. The meeting was held from 7 to 9 p.m. in the Superior High School Multipurpose Room.
- May 12, 2010. EPA held a public meeting and open house to discuss the work done as of that date, results of the first year of sampling, and a planned additional field season. The open house was held from 5 to 6:30 p.m. followed by the public meeting from 7 to 9 p.m. The location for both was the Superior High School Multipurpose Room.
- July 20, 2011. EPA and DEQ presented information about the work planned for summer 2011, the Wood Gulch Repository, an overview of site reports, the RI and FS, next steps, and the project schedule. The meeting was held from 7:00 to 9:00 pm in the Superior High School Multipurpose Room.

3.5 Presentations to Local Government

EPA's Remedial Project Managers (RPMs) made regular presentations to the Town of Superior Commission at their regularly scheduled commission meetings. At those meetings, the RPMs presented project updates and answered questions.

3.6 Release of the Proposed Plan

The proposed plan (Appendix A) was released to the public on October 3, 2011. It presented an overview of the site remedial alternatives and presented the preferred alternative for remediation. It also discussed the comment period, how to provide comment, and notice of the time and place of public meetings regarding the proposed plan. As with the fact sheets, a copy of the plan was mailed to every residence in the Superior, Montana zip code.

3.7 Display Advertisements

Display advertisements were regularly placed in the Mineral Independent (the local weekly newspaper) before meetings. An ad was also run in July 2010 in an effort to encourage the participation of any residents who might not yet have granted EPA access to sample their yards. EPA estimates that access was obtained to almost all properties by the end of the 2010 field season. The properties EPA was not able to access are limited to a few vacant lots or unoccupied properties.

A display advertisement was prepared and placed after the release of the proposed plan. The ad announced the release of the plan and upcoming public hearing (Appendix A). The ad ran in the Mineral Independent on October 5, 2011, and again on October 12, 2011 – the day of the public meeting.

3.8 Public Comment Period

The 30-day public comment period for the proposed plan ran from October 3 to November 3, 2011. There were no requests to extend the comment period.

3.9 Public Hearing

A public hearing was held in Superior, Montana, on October 12, 2011, from 6:30 to 8:30 p.m., at the Ambulance Barn (1202 5th Avenue East). The EPA RPM, Leslie Sims, presented an overview of the proposed plan to the attendees and answered informal questions. The remainder of the hearing focused on accepting formal oral comments from the public. A stenographer recorded the hearing and was available to record any oral comments. The hearing transcript is in the administrative record.

3.10 EPA Web Sites

The fact sheets, RI and FS reports, proposed plan, and public hearing date were published on EPA's web page for this site before the scheduled public hearing (www.epa.gov/region8/superfund/sites/mt).

3.11 Available Supporting Documents

The administrative record, including the RI and FS, was available for public review during the proposed plan public comment period, and is currently available for public review in EPA's Denver and Helena offices.

3.12 Responsiveness Summary

A responsiveness summary is included as Part 3 of this ROD. EPA received a few oral comments during the public hearing, but did not receive any written public comment during the 30-day public comment period. Comments were received from DEQ, which have been addressed in the responsiveness summary, along with the oral comment received during the public hearing.

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Section 4
Scope and Role of Operable Unit

At sites with multiple OUs that are addressed separately, it is important to convey the scope and role of the OU within the overall site management plan. This section discusses how OU1 fits into the overall site cleanup strategy. The conceptual sequence of events for the site is shown in Exhibit 4-1.

OU1 focuses on contaminated soils at residential and other properties in Superior. It was designated as a separate OU to allow EPA to address the most significant risks to the community before addressing the remaining site risks. The OU1 remedial action will build on TCRAs already implemented at the site which addressed short-term risks posed by the most contaminated soils (removal of soils with concentrations greater than 3000 parts per million (ppm) lead or 400 ppm arsenic). The selected remedy for OU1 addresses the remaining contaminated soils that present an unacceptable long-term risk to the community. In general, these soils have moderate levels of contamination and do not pose a short-term (i.e., immediate) risk. The OU1 remedy focuses on preventing direct exposure to elevated concentrations of COCs in soil, such as arsenic, lead and antimony. Contaminated soils will be excavated, consolidated with soils previously excavated as part of the TCRAs and disposed at the joint mine waste repository (OU3) in Wood Gulch. The excavated areas will be backfilled and revegetated or otherwise returned to pre-excavation uses (e.g., gravel driveway).

The Wood Gulch Repository OU3 will be operated and maintained in accordance with a final plan for this repository that is currently being negotiated between the State, EPA, and the USFS. The joint repository will contain mining wastes from both OU1 and 0U2.

The OU1 remedial action addresses source materials from the IMM that were brought in as fill material by local residents and government. The remedy for OU1 will eventually be integrated into the remedy for OU2, the final site remedy. The OU2 remedy will address the remaining media in OU1 (i.e., groundwater and surface water) and site-wide ecological risk.

The selected remedy for OU1 is essentially a simple excavation, consolidation and disposal remedy. Implementation of the remedy will reduce human health risks to acceptable levels. At the same time, it will reduce environmental risks in OU1. Although the risks to the environment will be quantified in an ecological risk assessment for OU2, such risks are not expected to be significant for OU1, particularly after the remedial action is completed. The selected remedy for OU1 should lessen impacts from runoff of contaminated surface soils to surface water, as well as the potential for COCs to migrate from soils to groundwater. The remedial action for OU1 will be implemented before or concurrent with the RI for OU2. If a remedial action is found to be necessary for OU2, it is expected to be the final remedial action for the site. Both OU1 and OU2 are being addressed under Superfund authority, with EPA as the lead agency and DEQ and the USFS as the support agencies.

The mine waste joint repository at Wood Gulch (OU3) was constructed in 2011 by EPA's Removal Branch on property owned by the State of Montana. Future use of the repository will be shared between EPA and other stakeholders, including DEQ and the USFS, and possibly Mineral County. Wastes from the second TCRA were deposited there shortly after construction was finished.

Designation of the repository as OU3 was an administrative tool, and details regarding the operation and maintenance of the Wood Gulch repository will be documented in the ROD for OU2.

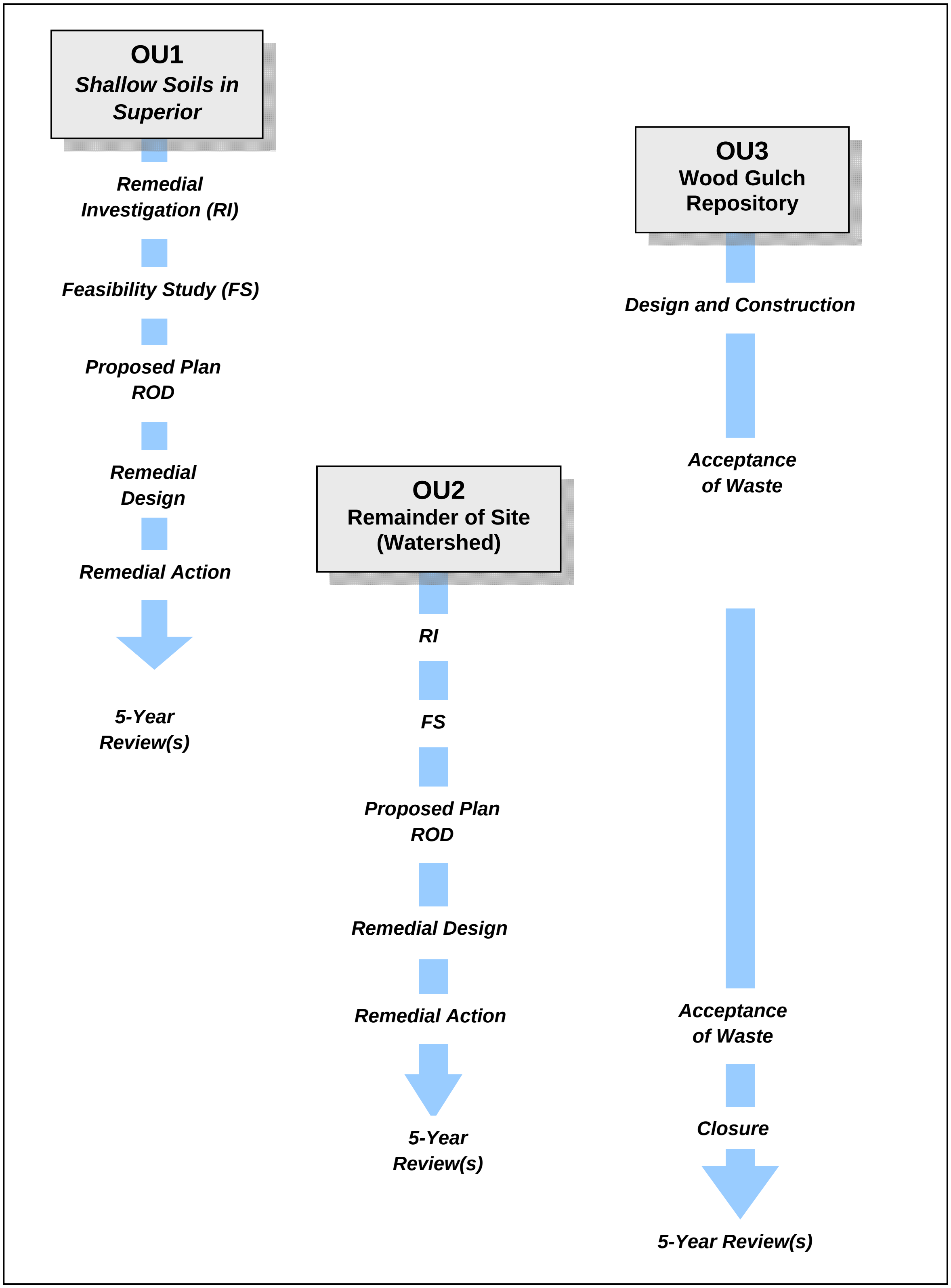

Exhibit 4-1. Conceptual Sequence of Events for Site OUs

Section 5
Summary of Site Characteristics

This section contains a general discussion of site features and setting and provides a mechanism for contaminants to migrate off site. The conceptual site model (CSM) based on the results of the RI are included.

5.1 Conceptual Site Model

The CSM (Exhibit 5-1) incorporates the primary mechanisms that lead to release of contaminants from source materials, migration routes of contaminants in the environment, and exposure pathways and human receptors. The conceptual model was used in guiding the HHRA, a summary of which is provided in Section 7.

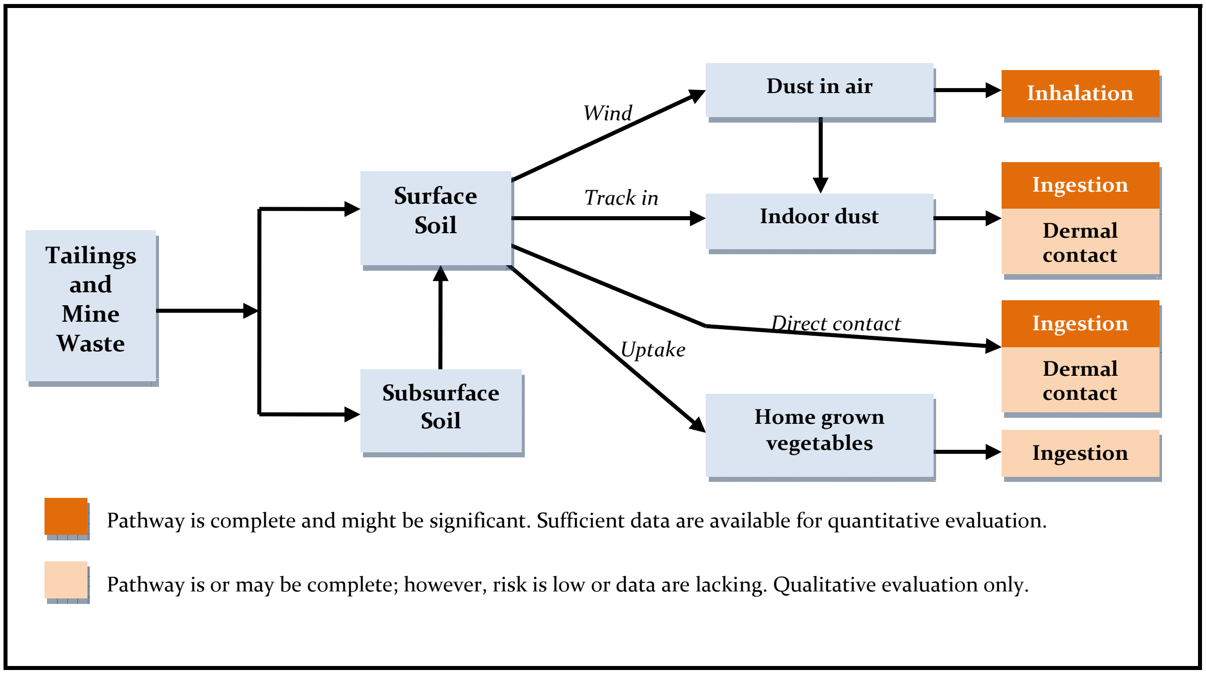

Exhibit 5-1. Conceptual Site Model

Because there are no zoning restrictions in the Town of Superior, any property could be used for residential purposes. For that reason, the human health risk assessment (HHRA) for OU1 focused on human exposure to contaminants of concern in soil under a current residential land use scenario. The HHRA refers to these people as "residential receptors." Other types of receptors (e.g. populations) are present in Superior and have access to these properties (e.g., commercial workers, visitors, and recreational users). However, a consideration of potential risk pose to residential receptors is the most conservative approach and would be protective of any other populations that could be exposed to contamination.

The CSM summarizes how area residents may be exposed to contaminated soils in their yards or driveways. Exposure pathways that were initially considered but not further evaluated in the HHRA are dermal (skin) contact with soil and consumption of homegrown vegetables. Residents may have dermal exposure to contaminated soil while working or playing outdoors. However, this pathway is minor in comparison to the exposure that occurs by the oral route. Most metals tend to bind to soils, thus reducing the likelihood that they would cross to the skin. Thus, recognizing that current methods and data are limited for attempting to quantify dermal absorption of chemicals from soil, this pathway was not evaluated quantitatively in the HHRA. Likewise, consumption of homegrown vegetables was not evaluated in the HHRA. When grown in contaminated soil, vegetables may take up contaminants which may then be ingested by area residents. However, there are no site-specific data on uptake of metals into vegetables, and studies at other sites suggest that this pathway is usually quite minor, especially if the vegetables are washed before ingestion.

The pathways that were evaluated in the HHRA are:

- Incidental ingestion of outdoor soil. Residents (especially children) may ingest small amounts of soil that adhere to hands during outdoor work or play. Generally, contact is primarily with surface soil, and exposure to subsurface soil does not occur unless excavation activity brings the subsurface soil to the surface. Quantification of possible future exposure to subsurface soil is very difficult and is expected to be lower than exposure to surface soil. Therefore the HHRA focuses on surface soil (generally 0 to 2 inches) which residents may be exposed to every day.

- Ingestion of indoor dust. Outdoor soil may be tracked into homes by people or pets, or may enter homes by deposition of dust. It then mixes into indoor dust, which may be ingested by hand-to-mouth contact. Most people spend a majority of time indoors, so this pathway can be significant.

- Inhalation of airborne soil particulates. When contaminated surface soil is exposed, particles may become suspended in air by wind or mechanical disturbance, and particles can be inhaled. The amount of dust inhaled is usually minor compared to the amount ingested, but some metals are carcinogenic when inhaled but not when ingested.

5.2 Overview of the Site

5.2.1 Size

OU1 roughly encompasses the Town of Superior and includes any area where mining contaminated soils were placed. Samples have been taken at properties outside of town at the request of individual property owners who were concerned about the potential for contamination on their property. The area within the established town boundary is 1.2 square miles (approximately 768 acres).

5.2.2 Site Setting

The Town of Superior, Montana, (OU1) is located adjacent to exit 47 on U.S. Interstate 90. Figure 5-1 shows the overall layout of Superior, including the locations of the airport repository and the Wood Gulch repository (OU3).

The elevation of Superior is 2,762 feet above mean sea level (MSL). There are over 88 mountain summits and peaks in Mineral County, and Superior is surrounded by the mountains of the Bitterroot Range. Within a mile of town, there are mountains with elevations of over 4,400 feet above MSL. Within four miles, elevations are as high as 6,400 feet above MSL. The Clark Fork River runs through the community in a northwesterly direction. The Clark Fork is part of the Columbia River Basin watershed and ultimately drains to Lake Pend Oreille in northern Idaho. Flat Creek, a tributary to the

Clark Fork River, drains the watershed north of Superior. Its confluence with the Clark Fork River is near River Street in Superior.

The IMM is the source for the tailings and waste rock found in Superior, but is not included in the ROD for OU1. It will be addressed in a future ROD for OU2. The IMM is located approximately 3.5 miles north of Superior at the confluence of Hall Gulch and Flat Creek at latitude 47°14'25" north and longitude 114°51'10" west. It covers an area of approximately 3 acres, and is at approximately 3,400 feet above MSL. The mine is surrounded by the Lolo National Forest. Vegetation generally consists of cedar, spruce, fir, and willow trees.

5.2.3 Climate

Climate data from the Western Regional Climate Center for the Superior, Montana station (# 248043) indicate the weather at the site is typical of the climate in western Montana. The area has a relatively cool and dry continental climate. Because of its lower elevation, temperatures in Superior are warmer year-round than in many parts of western Montana. The lowest average minimum temperature is in January (17.7 degrees Fahrenheit) and the highest average maximum temperature is in July (87 degrees Fahrenheit). The regional temperature is marked by wide seasonal and diurnal variations. In winter, temperatures often drop below 0 degrees Fahrenheit with extended periods of sub-freezing temperatures. In summer, highs often exceed 90 degrees Fahrenheit. There is a greater than 50 percent probability of first frost by September 20 and last frost by May 19.

The average annual snowfall for the area is 36.4 inches. Local mountains are generally blanketed in snow from November through March. Average annual precipitation is 16.77 inches and is delivered relatively evenly throughout the year. Average precipitation is highest in June (1.96 inches) and lowest in July (0.87 inches). Summer thunderstorms frequently produce high winds, intense rainfall, and occasional hail.

5.2.4 Geology and Major Fracture Zones

The general geology of the Superior region is characterized by Proterozoic age bedrock of the Belt Supergroup, with Quaternary age alluvial sediments within the Clark Fork River basin. Quaternary age deposits are also intermittently present within area stream and drainage channels.

The Osburn fault trends from northwest to southeast across the IMM area. Bedrock to the northeast of the fault consists of the Helena Formation and the Revett formation, which generally consist of quartzite with thin beds of siltite and argillite. An anticline runs through these formations approximately parallel to the fault strike. To the southwest of the Osburn fault are the younger rocks of the Wallace Formation. The Wallace Formation consists of dolomitic quartzite and siltite with discontinuous interbeds of argillite. Quaternary-age, undivided alluvium and colluvium is present within the confluence of Hall Gulch and Flat Creek. The sediments may include mixtures of gravel, sand, and silt with talus and slope wash.

5.2.5 Hydrogeology/Hydrology

Water bearing units in the area include the alluvial sediments within the Clark Fork River basin and fractured bedrock. Groundwater yields from the fractured bedrock are highly variable. Yields for wells within the fractured bedrock average approximately 10 gallons per minute (gpm). Well yields within the alluvial basin are approximately three times this amount. Wells are uncommon within the bedrock aquifer in the direct vicinity of the IMM. Wells in the alluvial valley near Superior may number as high as 11 to 30 wells per section in some areas (Warren 2007). Water levels in wells within both the bedrock aquifer and the alluvial aquifer typically range between 2,650 and 2,700 feet above MSL in the Superior area. Groundwater flow is typically toward the Clark Fork River within the alluvial basin. Groundwater flow within bedrock is dominated by fracture networks and is variable. Background concentrations of nitrates are typically less than 2.0 milligrams per liter (mg/L) and arsenic concentrations less than 5.0 mg/L in both the bedrock and alluvial aquifers. Water quality is good with respect to total dissolved solids, with concentrations typically less than 500 mg/L throughout the region. Available data on groundwater quality in the area are not sufficient to characterize background conditions for other COCs at the site. Groundwater will be investigated as part of OU2.

5.2.6 Community Characteristics

Superior was established in 1869, and the economy was driven by gold mining and then logging. Superior is the county seat of Mineral County. The governing body for the county is the three-member Board of Commissioners. There are no local media outlets that originate on or near the site. The newspaper closest to the site is the Mineral Independent published in Plains, Montana. Mineral County had a population of 4,223 and is ranked 39th in population of 53 Montana counties. Superior has a population of 812. Based on the 2010 census there were 410 housing units in Superior, and there were 239 children over the age of 3 years enrolled in school. A total of 61 percent of workers worked for private industry, 27 percent worked for government, and 11 percent were self-employed. The most commonly cited employers are: educational, health, and social services (25 percent); agriculture, forestry, fishing and hunting, and mining (14 percent); arts, entertainment, recreation, accommodation, and food services (11 percent); and retail trade (9 percent). There are no known areas of archeological or historical importance within the contaminated soils in OU1.

5.3 Overview of Site Contamination

5.3.1 Affected Media

OU1 addresses only the mining contaminated soils brought into town from OU2, and placed in driveways, yards and other areas as fill material. Generally, these areas of contamination are less than two feet thick. All other media in OU1 and the rest of the site will be addressed in OU2. Soil has been (and continues to be) contaminated by airborne transport of contaminated dust, runoff of contaminated surface water, or mechanical transportation of source materials (e.g., mine waste).

5.3.2 Source Materials

From a site-wide perspective, source materials are mine waste originating from the IMM that poses a risk through direct contact or that may continually be migrating to other portions of the site through runoff of surface water or air transport. In the case of OU1, the mine waste was imported by local residents and government for use as fill materials on private properties and in roadways.

Contamination from the now abandoned IMM includes tailings that contain elevated concentrations of metals. While the mine was in operation, tailings were disposed of along Flat Creek, which is a tributary to the Clark Fork River and runs through the town of Superior. Tailings have also been imported by individuals into Superior for use as fill material in yards, roadways, and other locations (e.g., the school track).

The Flat Creek tailings are mill tailings that were deposited into the creek by flooding or facility processes (MDSL 1993). In 1993, there were eight tailings piles containing approximately 370 cubic yards (cy) extending along a 1.2 mile length of Flat Creek (UOS 2001) from the IMM. In 2001, EPA reported that most of the tailings in the Flat Creek floodplain were poorly vegetated, and varied in depth between 4 inches and 7 feet (UOS 2002). At that time, the largest continuous section of tailings was sampled and was estimated to cover an area exceeding 61,000 square feet with depths of up to 7 feet (UOS 2002). Tailings were noted to vary in depth and distribution along the creek bed between sample locations IM-SO-06 and IM-SO-07 (Schultz Ranch location), but to be continuous and visually consistent. Six samples were collected from tailings piles in and near the creek. Four of the samples were from sizeable piles: IM-SO-04, IM-SO-05, IM-SO-06, and IM-SO-07 (UOS 2001). Concentrations for hazardous substances found in these samples are summarized in Exhibit 5-2. These substances were all present in concentrations more than three times expected background. The background levels are shown in parenthesis in Exhibit 5-2.

Instances of a reddish color have been reported to be associated with the tailings, along with a lack of vegetation in the contaminated areas. However, EPA noted that there did not appear to be a reliable visual marker for contaminated versus uncontaminated soils at the low levels anticipated for remedial decision making.

Investigations have noted that it was a common practice in the 1950s and 1960s for tailings from the IMM site to be hauled into town for use as roadbed, driveways, and fill material for low-lying areas. The tailings were also reportedly sometimes used along the edges of properties to suppress weed growth. These tailings were readily available near and below the mill, as well as along Flat Creek (EPA 2009). The tailings were sought-after, because they were well sorted, had no rocks or boulders, and compacted and drained well. Local residents reported that they saw the tailings used by town government for road projects and for the high school track, and that they felt that there were no problems associated with their use.

Exhibit 5-2. Hazardous Substances Associated with Tailings

Parameter	Sample No.	Concentra-tion (ppm)	Parameter	Sample No.	Concentra-tion (ppm)
Antimony (<10 ppm)	IM-SO-04	4,500	Lead (<15 ppm)	IM-SO-04	24,000
	IM-SO-05	1,280		IM-SO-05	7,800
	IM-SO-06	1,520		IM-SO-06	9,990
	IM-SO-07	3,000		IM-SO-07	55,600
Arsenic (<100 ppm)	IM-SO-04	24,800	Manganese (<500 ppm)	IM-SO-04	4,270
	IM-SO-05	9,350		IM-SO-05	2,210
	IM-SO-06	2,320		IM-SO-06	4,200
	IM-SO-07	3,530		IM-SO-07	5,530
Cadmium (no data)	IM-SO-04	75	Zinc (<45 ppm)	IM-SO-04	9,590
	IM-SO-05	5.9		IM-SO-05	1,200
	IM-SO-06	34.7		IM-SO-06	5,930
	IM-SO-07	161		IM-SO-07	25,200

Based on table in UOS 2009
(ppm) = background concentration from Shacklette, 1984

The 2001 focused SI found elevated concentrations of metals in soil, including lead, arsenic, antimony, cadmium, and manganese (UOS 2001). Sampling was limited, but contamination was found at the high school track, a residential property, and a residential right of way in Superior. During the 2009 community interviews that were conducted for preparation of the CEP, people were asked if they could suggest areas where waste might be located, to assist EPA in focusing the investigation. Their suggestions included driveways, the uptown section north of the river, the rodeo grounds and high school track, River Street, and Diamond Road. Individual properties in these areas were included in the RI.

The sources of contamination for the residential receptors in OU1 are the contaminated fill materials – primarily in driveways, but also in some other limited areas of the OU where the material was used as fill. EPA's Removal Branch performed TCRAs at the areas with the highest levels of contamination (e.g., the school track and the fairgrounds). The Removal Branch anticipated a more stringent remedial action level, and thus addressed the full extent of contamination above the Remedial Action Levels specified in this ROD to the extent practicable, both vertically and horizontally. Therefore, those areas will not need to be revisited during remedial design.

5.3.3 Nature and Extent of Contamination

The RI included screening by visual observation and x-ray fluorescence (XRF) of all 588 properties for which access was granted and for which there was at least a reasonable expectation that material might have been imported (Figure 5-2). Large, open fields that appeared to be unaltered were not sampled. EPA estimates that approximately 95 percent of all properties in town were screened. This is more than sufficient to characterize nature and extent of contamination in local soils. Most alleys were also screened to provide information on locations that had the potential to generate dust.

The screening was carried out using the following protocol:

- For the typical residential property, four sampling areas were usually established. Some properties (e.g., a smaller property that lacked a side yard) required fewer sampling areas, and other properties (e.g., municipal properties such as the high school or hospital) were much larger and had more sampling areas.
- Sampling areas were identified with a letter (generally A, B, C, or D) appended to the property ID. For each sampling area, five aliquot locations were determined. For an average yard (with 4 sampling areas), there were a total of 20 aliquot locations.
- One surface (0 to 2 inches) composite and two subsurface (2 to 6 inches and 6 to 12 inches) composite samples were made for each sampling area using the individual aliquot samples from within that sampling area. Sampling pits for each aliquot were excavated using hand tools and actual sampling was conducted using precleaned disposable plastic trowels.
- Provisions were made to allow the collection of grab samples, as needed, from locations that appeared suspicious in the field. It was anticipated that those samples might come from areas which the field team identified as potential fill areas or areas that appeared to contain mine waste based on color or other visual cues.

Samples collected during screening were analyzed for lead and arsenic by XRF. Samples with concentrations greater than 250 ppm of lead were sent for laboratory analysis of a list of contaminants typical of mining sites – the Target Analyte List (Exhibit 5-3). At least 5 percent of all samples that did not exceed the 250 ppm screening level were submitted to the laboratory for quality assurance purposes. Samples were also sent to the laboratory, as needed, to account for special requests or to address issues at a property.

A total of 7,209 samples from 588 properties were screened by XRF. Most (500) of those properties were residential. The screening included 6,197 residential samples and 1,174 non-residential samples. A total of 1,012 samples from 345 properties were submitted to the laboratory. This represents 14 percent of all samples collected and 59 percent of all properties screened. Only 279 (4 percent of all samples collected or 27 percent of the samples sent to the laboratory) of those samples were submitted because of lead concentrations above the 250 ppm screening level. The rest were submitted for quality assurance purposes or to address concerns about a sampling area identified in the field.

The results of the RI confirm the original understanding of the CSM for OU1. Mine waste tailings were transported to town on an individual basis by land owners or local government for use as fill material. Because of this random process of importing waste, there is no obvious spatial pattern to the horizontal or vertical distribution of contamination in the upper 12 inches of soils in OU1. However, clusters of contamination are seen in properties adjacent to where the material was brought in for use in construction of Mullan and River Roads. This random distribution is why EPA sampled the upper 12 inches of soil at almost every property in town. Approximately 95 percent of the properties located in town were sampled during the RI. This provided enough data to confirm the CSM and to select a protective remedy. The remaining 5 percent of properties were not readily accessible, and EPA intends to sample them during implementation of the remedy.

Exhibit 5-3. Target Analyte List – Inorganic Parameters

Analyte			
Aluminum	Calcium	Magnesium	Silver
Antimony	Chromium	Manganese	Sodium
Arsenic	Cobalt	Mercury	Thallium
Barium	Copper	Nickel	Vanadium
Beryllium	Iron	Potassium	Zinc
Cadmium	Lead	Selenium	

Mine waste material from the IMM was free, easy to obtain, and had physical properties that made it desirable for use in driveways, road beds, and as fill for building pads. These same physical characteristics made it undesirable for areas such as gardens or children's play areas (e.g., sand boxes). As a result, it was generally not seen in those areas during the RI field sampling events. It was also reportedly used along the sides of properties to keep down the growth of weeds, and it was sometimes evident along the edges of some properties.

Key findings resulting from the analysis of the data gathered for the RI include:

- The COCs in soils from OU1 are lead, arsenic, and antimony.
- Most properties (88 percent) in Superior are in the low concentration category (less than 400 ppm of lead, 100 ppm of arsenic, or 130 ppm of antimony). In fact, concentrations of antimony, arsenic, and lead were below the limits of detection by XRF (30 ppm, 6 ppm, and 7 ppm, respectively) in a large percentage of the samples (97 percent, 79 percent, and 34 percent, respectively).
- Only 5 percent (29 properties) of the properties screened had moderate concentrations of arsenic (100 to 400 ppm) or lead (400 to 1,200 ppm) in one or more of the three depth intervals sampled.
- Only 7 percent (42 properties) had concentrations in the high category for arsenic (greater than 400 ppm) or lead (greater than 1,200 ppm) in one or more of the three depth intervals.
- Elevated antimony concentrations generally ranged from 130 to 3,490 ppm. Properties that had elevated concentrations of antimony also had elevated concentrations of arsenic and/or lead.
- Contamination is scattered, rather than clustered in specific areas, confirming reports that waste was imported on a yard-by-yard basis as fill in driveways or other small areas. Mine

waste was also used in municipal road construction and on municipal properties such as the school track and the fairgrounds.

- TCRAs were conducted at 33 properties and significantly reduced the overall concentrations of contaminants at the site. However, moderate to high concentrations remain in certain areas of 38 properties that were not addressed by the TCRAs. These concentrations do not present an immediate unacceptable risk, but will be removed under this ROD, or controlled through LUCs if removal is not practical (i.e., infrastructure such as buildings or utilities prevents removal), to mitigate potential future risk.

5.3.4 Migration Routes

OU1 is limited to areas in Superior containing imported mining contaminated soils. Expected potential migration routes for contamination from these soils are: migration in soil, wind erosion, migration in surface water, and migration in groundwater. Surface water and groundwater will be addressed in the ROD for OU2.

5.3.4.1 Migration Potential in Soil

Substances such as metals in mine waste will normally remain at or near the soil surface. The extent of movement of substances in the soil system is related to the physical and chemical properties of the soil as well as the substances in the waste materials. Based on experience at other mining-impacted sites, it is unlikely that the contaminants at OU1are migrating through the soil profile and accumulating at depth.

5.3.4.2 Migration Potential by Wind Erosion

The potential for release of COCs to the air is limited to wind erosion of source materials and suspension of particulates in the form of fugitive dust. The potential for wind erosion increases as the particle size decreases. Wind is expected to be a transport mechanism when waste material is dry and exposed. The ground in this area of the country is frozen, wet, or covered with snow during about six months of the year. Thus, airborne transport is a mechanism of concern for only part of the year, and only for areas that are not vegetated.

A few small areas of exposed, scattered mine waste (remnants of road building or weed suppression) are present in vacant lots or bare areas near roads. Some of this material is currently exposed, and could be entrained by wind. In other cases, overlying vegetation protects contamination from erosion. For locations where mine waste was brought in as fill for driveways, although this material is exposed to the wind, it appears to be well packed and large enough in particle size so that the likelihood of wind erosion is not expected to be significant.

5.3.4.3 Migration Potential in Surface Water

Releases of contaminants to surface water can occur when waste material or contaminated soil is exposed. If uncontrolled, contaminants can erode into the stormwater system, perennial tributaries, and potentially the Clark Fork River. Investigation of surface water was outside the scope of the RI for OU1 and it is unknown if COCs have migrated significantly via the surface water transport mechanism. No visual evidence of runoff was noted in the field. This migration pathway will be investigated as part of the RI for OU2.

5.3.4.4 Migration Potential in Groundwater

Investigation of groundwater was not included in the RI for OU1 and the migration potential for contaminants to groundwater will be characterized as part of the RI for OU2. However, it should be noted that the mine waste materials imported into the community were primarily for shallow use, with the exception being materials used for road base. The road base materials are essentially capped by the overlying asphalt which would limit infiltration of precipitation through the contaminated material. Driveways constructed of mine waste are uncapped and infiltration is possible, but those driveways are scattered and do not present a concentrated source area for contamination of groundwater.

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Section 6
Current and Potential Future Land and Resource Uses

6.1 Land Use

Understanding current and reasonably anticipated potential future land and resource use is important to EPA's decision making process because it helps ensure that the selected remedy is protective of human health and the environment, can be implemented and maintained successfully, and is accepted by the community. A remedy designed for an industrial use area will not be appropriate for a residential use area. EPA's decision-making process takes a conservative approach, in order to ensure protectiveness. Thus, if an area is not currently used as residential but has the reasonably anticipated potential for residential use in the future, remedy decisions will be based on the residential use designation.

6.1.1 Current Land Use

Within OU1, land ownership is primarily privately-owned, residential parcels (85 percent) versus non-residential parcels (15 percent). Non-residential properties include municipal, state, and federal land that is used for open space, roadways, or buildings (e.g. schools). A small percentage of privately-owned properties are used for commercial purposes (e.g., gas stations and shops). There are no zoning regulations in Superior, and land use is generally unrestricted.

Outside of OU1 is a mix of private land (mostly residential) and public land that is used for recreation (hiking, hunting, and all-terrain vehicle operation) and industry (logging and forest management activities). The site is located on a main transportation corridor (U.S. Interstate 90). Land surrounding the site is primarily rural. Private land use is generally residential, with a few small ranches and businesses in the area. The site is surrounded by large tracts of land administered by the USFS. The USFS lands are used for recreation (e.g., camping, hunting, and hiking) and timber production. The Clark Fork River, which runs through the site, is a major recreational attraction for rafting, boating, and fishing.

6.1.2 Reasonable Anticipated Future Land Uses

Within OU1, EPA anticipates land use will remain a mix of residential and commercial properties. Industrial land use has not been a factor in the area and is not anticipated. Because of the lack of zoning regulations, the potential exists for any currently non-residential property to be used for residential purposes in the future.

6.2 Groundwater and Surface Water Use

OU1 does not address groundwater or surface water contamination issues at the site. These issues will be addressed in a future ROD for OU2. Information on groundwater and surface water use is provided below to give a more complete picture of the site.

6.2.1 Current Use

In OU1, residents and businesses obtain their drinking water from municipal sources. That water is provided via three large wells that draw water from a confined aquifer. Groundwater is relatively shallow and is influenced by the nearby Clark Fork River. Some residents are known to have shallow groundwater wells that are used for irrigation. Current surface water resources include the Clark Fork River and Flat Creek. Because the scope of OU1 is limited to mining contaminated soils, no specific investigations have been conducted to evaluate current groundwater or surface water use within or near OU1. These investigations of groundwater and surface water will be addressed as part of OU2.

Since the early 1900s, the majority of town residents have been connected to the public water supply (PWS). Previously, the PWS source for the town of Superior was a spring adjacent to Flat Creek. However, the Mountain Water Company (former PWS owner) discontinued use of Flat Creek Spring in 1997 when antimony was detected at concentrations above the MCL. This source was subsequently upgraded with a polyvinyl chloride (PVC) sleeve and a disinfection system. When it was retested in 2001 by DEQ, the antimony concentration was below the limit of detection and the MCL. Currently, the spring is not in use, but it is maintained as an emergency drinking water source (UOS 2001). Although named "Flat Creek Spring," the spring surfaces at a higher elevation than Flat Creek. As a "gravity flow spring," it arises from area groundwater.

Ownership of the PWS was transferred from the Mountain Water Company to the town of Superior in October 2000. The current PWS has a total of 430 connections. There are three production wells for this system (Figure 6-1): Wells 1, 2, and 3. The wells are located within the city limits of Superior and are drilled into the confined aquifer at depths of 105.5 feet below ground surface (bgs) (Well 1), 118 feet bgs (Well 2), and 214 feet bgs (Well 3). Well water is treated, and the town of Superior tests these wells for water quality in accordance with federal standards.

Most residents living in the town of Superior receive drinking water from the PWS, but a few homes on the north side of town obtain water from private wells. In general, these private wells draw water from the deep aquifer (more than 85 feet bgs), which is believed to be confined. However, several homes do have wells that draw water from less than 85 feet bgs. It is not known whether these wells are currently used as a drinking water source; this will be addressed in the OU2 RI.

There is also one residence located north of the town limits that is not served by the PWS. This family draws drinking water from two distinct sources—a private groundwater-fed well and a diversion from Flat Creek, approximately 2 miles south of the IMM site (EPA 2002a). EPA will address these sources during the RI for OU2.

6.2.2 Potential Future Use

As noted above, groundwater and surface water quality will be investigated during the RI for OU2, and there are currently no restrictions on groundwater use at the site. If groundwater is found to be contaminated, future groundwater use within the site boundaries may be restricted based on the area that groundwater contamination is found. Institutional controls would be implemented to prevent the unacceptable uses of groundwater that pose human or ecological risks. Future surface water use is expected to be similar to the current uses designated by Montana Surface Water Quality Regulations.

Section 7
Summary of Site Risks

This section provides a brief summary of the relevant portions of the HHRA that provide the basis for taking the remedial action at OU1. The focus of this action is to address site risks associated with residential exposure to contaminated soils in OU1. Ecological risk will be addressed site-wide under OU2.

EPA conducted a HHRA in 2011 to provide an evaluation of the nature and magnitude of health risks posed to residents in Superior because of exposures to site-related contaminants in mining contaminated soils, assuming no additional steps are taken to remediate or reduce human contact with these soils. The results are intended to inform risk managers and the public about potential risks to residents from contaminated soil and to help determine if there is a need for further action.

7.1 Identification of COCs

Contaminants of potential concern (COPCs) are chemicals which exist in the environment at concentration levels that might be of potential health concern to humans and which are or might be derived, at least in part, from site-related sources. Soils were sampled and analyzed for 22 inorganics typically associated with mining activities. The COCs were then selected by comparing the site-wide maximum detected concentration of each contaminant to a conservative risk based screening level and a detection frequency of greater than 5 percent as shown in Exhibit 7.1. Antimony, arsenic, and lead were identified as the COCs for soil for further evaluation in the human health risk assessment. The data used by the risk assessors to derive these COCs came from the 0- to 2-inch interval of 518 properties currently classified as residential that had not already been targeted for TCRAs. The data used in the HHRA were collected during the RI and were validated, evaluated, and determined to be usable.

Exhibit 7.1 Summary of COC Statistics

Exposure Point Media	Contam-inant of Concern	Concentration		Frequency of Detection (percent)	Cmax> RBC?
		Cmax	RBC		
Soil	Antimony	1,100	130	100	Yes
	Arsenic	790	0.5	100	Yes
	Lead	720	400	100	Yes

Cmax = maximum detected concentration
RBC = risk-based concentration (HHRA 2010)
All concentrations in parts per million (milligrams per kilogram)

7.2 Exposure Assessment

The exposure assessment identified scenarios through which individuals could come into contact with COCs in site media and estimated the possible extent of exposure. The CSM presented in Section 5 illustrates sources, potentially contaminated media, exposure routes, and exposed populations at the site that were evaluated in the HHRA. The primary medium of human health concern was found to be imported mining contaminated soils. The highlights of the exposure assessment from the HHRA are:

- Exposure points or areas. An exposure point, or exposure area, is an area where a receptor may be exposed to one or more environmental media. The HHRA focused on soils in residential yards and driveways. The HHRA calculated a yard-wide exposure point concentration for each property. Other media (e.g., surface water and groundwater) will be evaluated under OU2.

- Potential receptors. Because the lack of zoning restrictions in Superior allows any property to potentially be used for residential purposes, the HHRA evaluated exposures to current and future residents. This is the most conservative approach to estimating risk at the OU. Children living at the site constitute a sensitive subpopulation in regards to their exposure to lead.

- Exposure routes. The pathways evaluated in the HHRA are; incidental ingestion of outdoor soil, ingestion of indoor dust, and inhalation of airborne soil particulates. Routes evaluated qualitatively but not retained for future evaluation are residential individuals who could be exposed by dermal contact with soil and by consuming homegrown vegetables. Additional detail on exposure routes is provided in Section 5.1.

7.3 Toxicity Assessment

The toxicity assessment identifies what adverse health effects a chemical causes and how the appearance of these effects depends on exposure level. Toxic effects frequently depend on the route (oral, inhalation, or dermal) and the duration of exposure (subchronic, chronic, or lifetime). The assessment process is usually divided into two parts: the first characterizes and quantifies the non-cancer effects of the chemical, while the second addresses the cancer effects of the chemical.

7.3.1 Non-Cancer Effects

All chemicals can cause adverse health effects at a high enough dose. However, when the dose is sufficiently low, typically no adverse effect is observed for non-cancer effects. Thus, in characterizing non-cancer effects, the key parameter is the threshold dose at which an adverse effect first becomes evident. Doses below this threshold are considered safe, while doses above the threshold are likely to have an effect.

Threshold dose is typically estimated from toxicological data by finding the highest dose that does not produce an observable adverse effect and the lowest dose that produces an effect. These are referred to as the no-observed-adverse-effect level (NOAEL) and the lowest-observed-adverse-effect level (LOAEL), respectively. The threshold lies in the interval between the two. To be conservative, non-cancer risk evaluations are not based directly on the threshold exposure level, but on a value referred to as the reference dose (RfD) for oral exposures or reference concentration (RfC) for inhalation exposures. The RfD and RfC are estimates (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population that is likely to be without an appreciable risk of adverse effects during a lifetime.

RfD and RfC values are derived from a NOAEL divided by an uncertainty factor. If the data from studies are considered to be reliable, the uncertainty factor may be as small as 1.0. However, it is normally at least 10, and can be much higher if data are limited. The uncertainty factor ensures there is always a margin of safety built into an RfD and RfC values. Doses higher than the RfD or RfC may carry some risk, but because of the margin of safety, a dose above the RfD or RfC does not mean that an effect will necessarily occur.

7.3.2 Cancer Effects

The toxicity assessment process has two components for cancer effects. The first is a qualitative evaluation of the weight of evidence (WOE) that the chemical does or does not cause cancer in humans. The WOE categorization used in the HHRA is shown in Exhibit 7-2.

Exhibit 7-2. Qualitative Evaluation of Weight of Evidence

WOE	Meaning	Description
A	Known human carcinogen	Sufficient evidence of cancer in humans
B1	Probable human carcinogen	Suggestive evidence of cancer incidence in humans
B2		Sufficient evidence of cancer in animals, but lack of data or insufficient data in humans
C	Possible human carcinogen	Suggestive evidence of carcinogenicity in animals
D	Cannot be evaluated	No evidence or inadequate evidence of cancer in animals or humans
E	Not carcinogenic to humans	Strong evidence that it does not cause cancer in humans

WOE = weight of evidence

For chemicals which are classified in Group A, B1, B2, or C, the second part of the toxicity assessment is to describe the carcinogenic potency of the chemical. This is done by quantifying how the number of cancers observed in exposed animals or humans increases as the dose increases. Typically, it is assumed that the dose response curve for cancer has no threshold, arising from the origin and increasing linearly until high doses are reached. Thus, the most convenient descriptor of cancer potency is the slope of the dose-response curve at low doses (where the slope is still linear). This is referred to as the slope factor (SF), which has dimensions of risk of cancer per unit dose.

Estimating the cancer SF is often complicated by the fact that observable increases in cancer incidence usually occur only at relatively high doses. Thus, it is necessary to use mathematical models to extrapolate from the observed high dose data to the desired (but unmeasurable) slope at low dose. To account for the uncertainty in this extrapolation process, EPA typically chooses to employ the upper 95th confidence limit of the slope as the SF. That is, there is a 95 percent probability that the true cancer potency is lower than the value chosen for the SF. This approach ensures that there is a margin of safety in cancer as well as non-cancer risk estimates.

For inhalation exposures, EPA uses a unit risk value to describe cancer potency, which represents the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to a chemical at a concentration of 1 microgram per cubic meter (μg /m^3) in air. For example, if the inhalation unit risk for a chemical were 2E-06 per μg /m^3, the risk to a person who was exposed to a concentration of 1 μg /m^3 for a lifetime would be 2E-06.

7.3.3 Human Toxicity Values

Toxicity values established by EPA are listed in the online database - Integrated Risk Information System (IRIS). In the absence of values or IRIS, toxicity values are available from other sources, including EPA's Superfund Technical Assistance Center.[1] Exhibit 7-3 shows toxicity values used to derive screening level risk-based concentrations for the non-lead COCs (antimony and arsenic).

7.3.4 Risk Characterization

7.3.4.1 Non-Cancer

The potential for health effects other than cancer from site-related exposures is evaluated by comparing estimated actual exposure to an exposure level that is believed to be safe. This ratio is

[1] www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf.

called a hazard quotient (HQ). If the HQ for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If an HQ exceeds one, there is some possibility that non-cancer effects may occur, although it does not indicate an effect will definitely occur. This is because of the margin of safety inherent in the derivation of all toxicity values. Generally, the larger the HQ value, the more likely it is that an adverse effect may occur.

For oral exposure, the potential for non-cancer effects is evaluated by comparing the estimated average daily oral intake of the chemical with the oral RfD for that chemical. If an individual is exposed to more than one chemical that causes effects on the same tissue or organ, an estimate of the total non-cancer risk is derived by summing the HQ values for those chemicals. This total is referred to as the hazard index (HI). If the HI value is less than one, non-cancer effects are not expected.

Data on antimony in surface soil were available at 345 currently residential properties. Non-cancer risks from antimony are below a level of concern for central tendency exposure (CTE) receptors at all locations, but risks are slightly above the level of concern (HQ = 2 to 3) at three locations (RY422, RY523, and RY600) for reasonable maximum exposure (RME) receptors. For arsenic, data were available at 518 currently residential properties. Non-cancer risks are below a level of concern (HQ ≤ 1) at all properties, both for CTE and RME receptors. Because antimony and arsenic do not act on the same target tissues (Exhibit 7-3), summation of non-cancer HQ values across chemicals is not appropriate.

Exhibit 7-3. Effects and Toxicity Factors (Non-Lead COCs)

Effect	Parameter	COC	
		Antimony	Arsenic
Non-cancer	Critical non-cancer effects	Decreased longevity Decreased blood glucose Altered cholesterol	Hyper-pigmentation, keratosis, and possible vascular lesions
	Oral RfD (mg/kg-day)	*4.0E-04*	*3.0E-04*
	Inhalation Rfc (mg/m^3)	*NA*	*1.50E-05*
Cancer	WOE category	Not evaluated (D)	A
	Characteristic cancer effects	NA	Inhalation: Lung cancer Oral: Skin cancer, other internal cancers (liver, kidney, lung, and bladder)
	Oral slope factor (mg/kg-day)-1	-NA	1.5
	Inhalation unit risk (µg /m^3)-1	-NA	4.30E-03

RfD = reference dose
NA = not applicable

7.3.4.2 Cancer

The excess risk of cancer from exposure to a chemical is described in terms of the probability that an exposed individual will develop cancer because of that exposure. Excess cancer risks are summed across all carcinogenic chemicals and all exposure pathways. In general, the EPA considers excess cancer risks that are below 1E-06 to be so small as to be negligible, and risks above 1E-04 to be sufficiently large that some sort of remediation is desirable. Excess cancer risks that range between 1E-04 and 1E-06 are generally considered to be acceptable, although this is evaluated case by case, and EPA may determine that risks lower than 1E-04 are not sufficiently protective and warrant remedial action. The 1E-06 risk level is the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure (NCP §300.430 (e)(2)(i)(A)(2)). The total cancer risk from a chemical is the sum of the risks by the oral and inhalation routes. In the case of the HHRA for OU1, the total cancer risk from a chemical is the sum of the risks by the oral and inhalation routes.

Exhibit 7-4 summarizes the results of detailed calculations of exposure and risk for area residents exposed to non-lead COCs in the soil at properties currently classified as residential. Data on arsenic in surface soil were available at 518 residential properties. For the CTE receptor, estimated excess cancer risks from arsenic range from 6E-08 to 2E-05, with no properties that exceed 1E-04. For the RME receptor, estimated excess cancer risks range from 6E-07 to 2E-04, and two properties (RY036 and RY523) exceed an estimated risk of 1E-04.

Exhibit 7-4. Estimated Risk from Non-Lead COCs

COC	Effect Category	Risk Level	Number of Properties	
			CTE	RME
Antimony	Non-cancer	HQ ≤ 1 HQ =2 to 3 HQ>3	345 0 0	342 3 0
Arsenic	Non-cancer	HQ ≤ 1 HQ >1	518 0	518 0
Arsenic	Cancer	<1E-06 1E-06 to 1E-05 1E-05 to 1E-04 >1E-04	479 37 2 0	2 479 35 2

CTE = central tendency exposure
RME = reasonable maximum exposure
HQ = hazard quotient

7.3.5 Uncertainty Assessment

Quantitative evaluation of the risks to humans from environmental contamination is limited by uncertainty regarding key data, including concentration levels, level of human contact with contaminated media, and dose-response curves for non-cancer and cancer effects. This uncertainty is addressed by making assumptions or estimates for uncertain parameters based on whatever data are available. Thus, the results of risk calculations are themselves uncertain, which is important for risk managers and the public to understand when interpreting the results of a risk assessment. The following are the major uncertainties at the site.

- Uncertainties from pathways not evaluated. Residents may be exposed to site-related chemicals in soil by dermal contact and by ingestion of contaminants in home-grown vegetables. Neither pathway was evaluated, but both are generally believed to be minor, so omission is likely to result in only a small underestimation of risk.

- Uncertainties in exposure point concentrations. In all exposure calculations, the desired input parameter is the true mean concentration of a contaminant within a medium, averaged over the area where random exposure occurs. In the case of area residents exposed to contaminants in soil, the exposure area is assumed to be equal to the yard. In yards with few samples, estimates of the mean concentration may not be accurate in all cases, with the true mean being either higher or lower than the sample mean.

- Uncertainties in human exposure parameters. Many parameters are not known with certainty and must be estimated from limited data or knowledge. In general, when exposure data are limited or absent, conservative exposure parameters are intentionally used. Because of this, the values selected are thought to be more likely to overestimate than underestimate actual exposure and risk.

- Uncertainties in relative bioavailability (RBA). The risk from an ingested chemical depends on how much is absorbed by the human body. This is especially important for metals in soil at mining sites, because some metals may exist in poorly absorbable forms, and failure to account for this may result in a substantial overestimation of exposure and risk. The default is to assume a 100 percent RBA, which was done for antimony. This will tend to overestimate risk. For arsenic, an RBA of 50 percent (typical of mining sites) was used. Site in vitro bioavailability (IVBA) for arsenic suggests the RBA may be lower, so risks from arsenic are likely to be overestimated.

- Uncertainties in toxicity values. Toxicity data are often limited, resulting in varying uncertainty. However, because of the conservative methods EPA uses in dealing with uncertainties, it is much more likely that uncertainty will more likely result in an overestimation rather than an underestimation of risk.

- Uncertainties in risk estimates. Risk estimates are derived by combining uncertain estimates of exposure and toxicity, so risk estimates for each COC are more uncertain than either the exposure estimate or the toxicity estimate alone.

While these uncertainties exist, ongoing evaluations and experience at other superfund sites shows that the assumptions EPA uses appear to be conservative enough to protect human health.

7.4 Evaluation of Exposure and Risk from Lead

Because lead is widespread in the environment (background soils, lead paint, and other sources), exposure can occur by many different pathways. Thus, lead risks are based on consideration of total exposure from all pathways rather than just site-related exposures. Studies of lead exposures and resultant health effects in humans have traditionally been described in terms of blood lead level, so lead exposures and risks are typically assessed by comparing levels of lead the blood of exposed populations with blood lead levels known to cause potential health concerns. The concentration of lead in blood (PbB) is expressed in units of micrograms per deciliter (µg/dL).

7.4.1 Blood Lead level of Concern

Concern over health effects from elevated blood lead levels is greatest for young children or fetuses. Reasons for this are: 1) higher exposures to lead-contaminated media per unit body weight than adults, 2) higher lead absorption rates than in adults, and 3) higher susceptibility to effects of lead than in adults. EPA identified 10 µg/dL as the concentration at which effects begin that warrant avoidance, and has set as a goal that there should be no more than a 5 percent chance that a child will have a blood lead value above 10 µg/dL. The Centers for Disease Control has established a guideline of 10 µg/dL in preschool children, which is believed to prevent or minimize lead-associated cognitive deficits. The probability of a blood lead value exceeding 10 µg/dL (P10) is also applicable to an unborn fetus.

7.4.2 Description of the IEUBK Model and Inputs

EPA has developed an integrated exposure uptake biokinetic (IEUBK) model to evaluate exposures from lead-contaminated media in children. The model requires data on lead in soil, dust, water, air, and diet at a particular residence and on the average amount of these media ingested or inhaled by a child living at that residence. The model calculates the expected distribution of blood lead values, and estimates the probability that any random child might have a blood lead value over 10 µg/dL. The HHRA used this model to calculate the P10 of exceeding a blood lead of 10 µg/dL at each property.

Key inputs are:

- Soil lead. Uses the average concentration for surface samples (upper 2 inches of soil) at a property that is currently listed as residential.

- Dust lead. Assumes indoor dust lead is 70 percent of that in soil.
- Age at evaluation. The age of the child was specified as 50 months.
- RBA. The IVBA of lead in soil under specified test conditions are well correlated with the in vivo RBA results for lead and can be used to estimate RBA values. EPA measured IVBA of lead in 2002 and 2011. Individual sample RBA values ranged from 48 to 89 percent, which is not meaningfully different from the IEUBK default value of 60 percent, so the default was retained.
- Geometric standard deviation (GSD). The GSD employed was 1.6, which is the IEUBK model default.

7.4.3 IEUBK Model Results

There is one current residential property (Exhibit 7-5) where exposures of average children from exposure to the upper 2 inches of soil could likely to be of concern (geometric mean [GM] PbB greater than 10 µg/dL), and there are six additional properties where the probability of exceeding 10 µg/dL from exposure to these shallow soils exceeds the health-based goal (P10 greater than 5 percent). Exposure of children to lead in the uppermost 2 inches of soil at these properties is of potential concern and may warrant additional cleanup. Exposures to lead in very shallow soils at the other currently residential properties are likely to be within the acceptable risk range established by EPA (P10 less than 5 percent).

7.4.4 Uncertainties in Lead Risk Evaluation

Quantification of risks to children from exposure to lead is subject to a number of data limitations and uncertainties. The most important factors at OU1 are summarized below.

Exhibit 7-5. Estimated Risks from Lead

Parameter	Range	# of Properties
GM (µg/dL)	<5 5-10 10-20 >20 **Total**	514 3 **1** 0 **518**
P10 (%)	<5 5-10 10-20 >20	512 **2** **2** **2**
	Total	**518**

GM = geometric mean
P10 = probability that blood lead will exceed 10 µg/dL

- Uncertainty in childhood exposure parameters. Exposure to lead from site media occurs through ingestion of soil and dust. However, actual intake rates of soil and dust by children are difficult to measure, and may vary from location to location. This is a significant source of uncertainty.
- Uncertainties in exposure point concentrations (EPCs). Ideally, the EPC for lead in soil would be the true yard-wide average concentration. However, the true mean may be either higher or lower than the yard mean. Also, the EPC for lead in indoor dust is assumed to be 70 percent of that in soil, which is conservative. True concentrations in dust attributable to soil are often 20 to 40 percent of that in soil. The contribution of lead in dust is likely overestimated, and actual blood lead values are likely to be lower than predicted.
- Uncertainty in GSD. The GSD is the most sensitive input to the model, and the HHRA used the 1.6 default. However, GSD values vary from site to site, depending on exposure pathways and the exposed population. Several blood lead studies from the Rocky Mountain West indicate this is a conservative estimate and may tend to overestimate risk.

- Uncertainty in model predictions. The rate and extent of blood lead absorption is a highly complex physiological process and can only be approximated by a model. Thus, predicted blood lead values should be understood to be uncertain, and are more likely to be high than low.

- Uncertainty in blood lead level of concern. Effects of low-level lead exposure are generally subtle, and clinically significant effects may not be observed in individuals. There is debate as to whether effects are sufficiently meaningful to warrant identifying 2 µg/dL as the health-based goal. However, Superfund guidance indicates that action to clean up lead in soil is not needed unless the probability of having a blood lead level above 10 µg/dL exceeds 5 percent.

7.5 Summary

Mine waste from the IMM was used as fill at some residential properties in Superior. In 2009, EPA initiated a RI at OU1 to characterize levels of contamination in the community to identify cleanup actions that may be needed. Data on mining-related contaminants in soil were collected at almost all properties in Superior. The samples were analyzed for arsenic and lead by XRF, and most were also analyzed by XRF for a number of other metals. Samples with elevated lead (greater than 250 ppm) were analyzed for metals in the laboratory. Three COCs for residents were identified: antimony, arsenic, and lead. The data set was used to evaluate risks to residents.

The HHRA focused solely on risks from the upper 2 inches of soil in properties currently used for residential purposes, because this is the soil residents are in daily contact with. It also used an exposure unit comprised of the entire property. The HHRA identified unacceptable risks for antimony, arsenic, and lead. For antimony, risks in soil at all residential properties are below a level of concern for CTE receptors, while three are slightly above a level of concern (HQ = 2-3) for RME receptors. For the non-cancer effects of arsenic, soil risks for all residential properties are below a level of concern for both CTE and RME receptors. For the cancer effects of arsenic, concentrations in soil at all current residential properties are below a risk of 1E-04 for the CTE receptor. For the RME receptor, two properties have excess cancer risk estimates of 2E-04, which slightly exceeds the upper end of EPA's risk range (1E-04) (Exhibit 7-6). These results indicate that risks to most residents from non-lead COCs in surface soils are likely to be within EPA's risk range (HQ ≤ 1, cancer risk ≤ 1E-04).

Exhibit 7-6. Summary of Risks in Surficial Residential Soil

Property ID	Antimony HQ		Arsenic Cancer Risk		Lead Risk	
	CTE	RME	CTE	RME	GM (ug/dL)	P10 (%)
RY036	0.4	1	2E-05	**2E-04**	4.4	4.1
RY086	0.2	1	8E-06	8E-05	4.8	**5.8**
RY101	0.3	1	2E-05	1E-04	6.1	**14.6**
RY257	0.2	1	7E-06	6E-05	6.1	**14.3**
RY422	1	**2**	6E-06	5E-05	4.8	**6**
RY523	1	**2**	2E-05	**2E-04**	**10.9**	**57.4**
RY600	1	**3**	1E-05	1E-04	8.3	**34.2**

CTE = central tendency exposure RME = reasonable maximum exposure
GM = geometric mean
P10 = probability that blood lead will exceed 10 µg/dL
Bold text indicates an exceedances of EPA's risk-based goals

For lead, one property (RY523) (Exhibit 7-5) is predicted to be of potential unacceptable risk to average children (GM PbB greater than 10 µg/dL), and there are five additional properties (a total of six) where the calculated probability of exceeding 10 µg/dL exceeds the health-based goal (P10 greater than 5 percent).

Based on the findings, the TCRAs performed to date at residential properties in Superior appear largely successful. The HHRA identified seven current residential use properties where concentrations in soil may warrant additional soil cleanup actions. Risks at these properties are summarized in Exhibit 7-6.

7.6 Basis For Action

The response action selected for OU1 in this ROD is necessary to protect the public health and welfare or the environment from actual or threatened releases of pollutants or contaminants EPA and DEQ believe that the selected response action satisfactorily addresses current risk (as identified in the seven properties cited in the HHRA) and potential future risk, both of which are represented by residential land use.

The HHRA analyzed data to describe the likelihood of harm to human health. As part of the risk management process, EPA relied upon the findings of the HHRA in conjunction with other information to make regulatory decisions. During the risk management process EPA took into account input from its regulatory stakeholders to arrive at acceptable cleanup decisions. Other factors relating to cleanup were also considered as part of the risk management process, such as the percentage of a property to be remediated, remediation depth, and contaminants to be addressed.

As a result of the risk management process at the site, EPA has identified additional properties for remediation beyond those seven properties identified by the HHRA. Exhibit 7-7 lists three of the seven properties identified in the HHRA (the other four were addressed under the TCRAs) and 35 additional properties for a total of 38. Factors that lead EPA to decide to remediate the 35 additional properties include:

- *Sampling locations versus yards.* Many properties have one or more sample locations with concentrations that exceed 400 ppm of lead and/or 100 ppm of arsenic, but where the yard-wide average is not exceeded. Therefore, these properties are not identified in the HHRA. However, EPA followed the Superfund Lead-Contaminated Residential Sites Handbook, which utilizes quadrants for the exposure unit rather than the entire yard, to manage current and future potential risks. All properties had at least one individual sampling area that exceeded 400 ppm of lead and/or 100 ppm of arsenic.

- *Below surface depths.* The HHRA assessed the upper 2 inches of soil, which did not account for exposures that might occur when residents disturb soils at 2 to 12 inches depth during minor home improvement activities, such as digging a flowerbed, installing a vegetable garden, or building a play area or patio. Concentrations of lead or arsenic in subsurface soils exceed 400 ppm of lead and/or 100 ppm of arsenic in 27 yards. Although these properties were not identified in the HHRA, EPA chose to add them to the remediation list.

- *Non-residential properties*. The HHRA considered current residential exposures to soils when calculating risk. However, the lack of zoning regulations in Superior allows for any of the currently non-residential properties to be used for residential purposes in the future, which could present a potential for unacceptable risk. With this in mind, EPA identified 11 additional properties for remediation.

As stated above, four of the seven properties (RY086, RY101, RY523, and RY600) identified by the HHRA were addressed through TCRAs in 2009 or 2010. They were cleaned to levels specified in this ROD, and they are no longer included on the final list of properties identified for remediation (Exhibit

7-7). The three remaining properties identified in the HHRA and the 35 additional properties chosen by EPA for remediation are shown on Figure 7-1. During the remedial design process, a final evaluation of properties that were not previously sampled will be conducted. If access to these properties can be obtained, EPA will sample them consistent with the Lead Handbook, and will remediate them consistent with this ROD. If access is not obtained, EPA will apply institutional controls designed to assure protection of human health.

Exhibit 7-7. Properties Identified for Remediation

Index	Property and Sampling Area(s) to be Remediated	Reason for Inclusion				Index	Property and Sampling Area(s) to be Remediated	Reason for Inclusion on List			
		In HHRA	High Conc. Near Surface Interval	High Conc. In Ind. Sampling Area	Future Land Use			In HHRA	High Conc. Near Surface Interval	High Conc. In Ind. Sampling Area	Future Land Use
1	RY007 A		X	X		20	RY176 E		X	X	
2	RY008 A			X		21	RY193 C&D		X	X	
3	RY021 D&E		X	X		22	RY213 B&C		X	X	X
4	RY023 A&B		X	X		23	RY234 D		X	X	
5	RY026 C		X	X		24	RY257 C	X		X	
6	RY036 C-D	X	X	X		25	RY271 D		X	X	
7	RY061 E		X	X		26	RY277 D		X	X	
8	RY089 I			X		27	RY284 A		X	X	
9	RY097 C			X	X	28	RY352 C		X	X	
10	RY098 A, B, C		X	X	X	29	RY366 A&D		X	X	X
11	RY099 B			X	X	30	RY369 B		X	X	X
12	RY100 A&B		X	X	X	31	RY386 A,B,D		X	X	X
13	RY108 E		X	X		32	RY402 A			X	X
14	RY109 A		X	X		33	RY422 D	X		X	
15	RY111 B		X	X	X	34	RY483 B&D		X	X	
16	RY130 B			X		35	RY485 F			X	
17	RY136 B		X	X	X	36	RY565 B&E		X	X	
18	RY144 D		X	X		37	RY597 D		X	X	
19	RY160 B			X		38	RY616 A		X	X	

The 38 properties include 47 individual sampling areas
Future land use refers to properties which are not presently residential but could be reasonably anticipated to be residential in the future

Exhibit 7-8 lists the 33 properties at which TCRAs occurred. It also shows property RY627, which was identified as a high concentration property in the RI and was visited by the Removal Group, but where no removal was conducted. This property is owned by Blackfoot Telephone Company, and an institutional control will be needed to protect human health.

Exhibit 7-8. Properties having Emergency Removals (2010 and 2011)

Property ID						
RY006	RY084	RY095	RY118	RY240	RY332	RY506
RY030	RY086	RY101	RY125	RY251	RY338	RY523
RY043	RY091	RY102	RY140	RY289	RY345	RY600
RY045	RY092	RY112	RY148	RY303	RY387	RY627#
RY053	RY094	RY115	RY198	RY304	RY398	

#= Waste present, but no removal conducted (industrial property)

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Section 8
Remedial Action Objectives and Remedial Action Levels

8.1 Remedial Action Objectives

This ROD was prepared in accordance with EPA guidelines. The remedy outlined in the ROD is the selected remedial action for OU1. Remedial action objectives (RAOs) are developed by EPA to protect human health and the environment at the OU. These are the overarching objectives that all cleanup activities selected for OU1 should strive to meet.

EPA considers current and future use of the site when determining RAOs. Based on current zoning of the site, plausible future uses at all properties include residential use. Thus, EPA has determined that OU1 should be remediated to meet residential land use criteria. If contaminated soils are knowingly left in place (because of the presence of buildings or other obstructions) institutional controls (ICs) will be implemented to limit human exposure to, and improper handling of, these soils in the future.

The RAOs for OU1 are presented below and are based on current and anticipated future residential use of the site.

- Mitigate inhalation and ingestion exposures by human receptors to antimony and arsenic in soil such that cancer risks will not exceed one additional case per ten thousand individuals (1E-04).
- Mitigate inhalation and ingestion exposures by human receptors to lead in soil such that risks of blood lead in children above 10 µg/dL will not exceed a 5 percent probability.
- Control erosion of antimony, arsenic, and lead contaminated soil by wind and water to prevent the spread of contamination of uncontaminated or less contaminated soil, surface water, and groundwater.

Ecological RAOs have not been developed for the site at this time. They will be developed as part of a site-wide investigation for OU2 and documented in a future ROD.

8.2 Remedial Action Levels

At a typical federal Superfund site, remedial action is generally warranted when contamination poses cancer risks that exceed 1 in 10,000. The remedial action levels (RALs) for OU1 (also known as the "cleanup levels") address contamination that exceeds this risk level for carcinogens (here, antimony and arsenic). They also address risks that exceed the RAO for lead, ensuring that risk does not exceed a 5 percent probability of blood lead in children greater than 10 µg/dL. This is consistent with the approach taken at lead-contaminated mining sites in Montana and elsewhere.

Exhibit 8-1. RALs for Remediation of Mining Contaminated Soils

Chemical	Remedial Goal
Antimony	130 mg/kg
Arsenic	100 mg/kg
Lead	400 mg/kg

mg/kg = milligram per kilogram

The specific numeric RALs that EPA selected to meet this goal were established in the HHRA (Exhibit 8-1). RALs are defined as the average concentration of a chemical in an exposure unit associated with a target risk level such that concentrations at or below the RAL do not pose an unacceptable risk. During the remedial design process, excavation procedures will be developed to ensure that the maximum concentration of a contaminant that can be left in place is such that the remaining exposure is at or below the RAL, given uncertainty in sampling protocols.

As with RAOs, ecological RALs have not been developed for the site at this time. They will be developed as part of a site-wide investigation of OU2 and documented in a future ROD. However, EPA expects they will be in accordance with the human health RALs established in this ROD for OU1.

Section 9
Description of Alternatives

This section describes the remedial alternatives developed and evaluated in the FS and provides a brief explanation of the alternatives developed for OU1. It includes: descriptions of remedy components, common elements and distinguishing features, as well as expected outcomes.

The following alternatives were assembled by combining the retained remedial technologies and process options for the contaminated medium (soil), at OU1:

- Alternative 1: No Further Action
- Alternative 2: In-Place Capping of Contaminated Soils
- Alternative 3: Excavation and Disposal of Contaminated Soils at Licensed Solid Waste Facilities
- Alternative 4: Excavation and Disposal of Contaminated Soils at the Mine Waste Joint Repository
- Alternative 5: Excavation of Contaminated Soils, Treatment, and Disposal of Treated Soils at the Mine Waste Joint Repository OU3

Properties targeted for remediation are shown in Figure 7-1 and the locations of the airport and Wood Gulch repositories are shown on Figure 5-1.

9.1 Description of Remedy Components

Each remedial alternative was evaluated against the screening criteria in the FS. Complete descriptions of each of these alternatives and the results of the screening are provided in the FS (CDM Smith 2011b). The evaluation determined overall effectiveness, implementability, and cost for each alternative. All of the alternatives evaluated (except the required Alternative 1 - No Further Action) performed well, and all were retained for detailed analysis against the two threshold criteria and five balancing criteria. The following is a summary of the components of each alternative.

9.1.1 Alternative 1: No Further Action

Alternative 1 is required by the NCP as a baseline for comparison against other alternatives. Alternative 1 would leave removal action activities previously performed as they are. No new remedial activities would be initiated to address contaminated soils or otherwise mitigate the associated risks to human health and the environment.

Because contaminants would remain at some properties under Alternative 1, 5-year site reviews would need to be completed as required by CERCLA and the NCP. Monitoring (non-intrusive visual inspections) would also be required to support conclusions made in the 5-year reviews.

9.1.2 Alternative 2: In-Place Capping of Contaminated Soils

Remedial components of Alternative 2 include covers, land use controls (LUCs), and monitoring, as presented below.

9.1.2.1 Covers

Alternative 2 would cap all contaminated soils on residential and other properties using covers. This would include construction of a permanent earthen cover over the existing waste repository at the Mineral County Airport to ensure the interim cover installed in 2010 is protective. This alternative assumes placement of 24 inches of clean cover material over contaminated soils at residential and other properties.

9.1.2.2 Land Use Controls

LUCs would consist of a combination of ICs (legal and administrative controls), and access controls (physical controls). EPA will work with the State, County, and local governments to establish these LUCs. The LUCs would be tailored to each property to provide protection of human health and to maintain the integrity of the remedy to the extent possible.

- ICs would consist of governmental controls, proprietary controls and/or informational devices selected on a per property basis depending on ownership status and degree of contamination. ICs would be layered to enhance protectiveness. Issuance and periodic review and update of a detailed ICs plan likely would be required to track the ICs at each property where contamination is left in place.

- ICs may also include community awareness activities such as informational and educational programs to inform the public about site risks and risk reduction activities. Information could be provided using electronic (e-mails and web site updates), printed (flyers, facts sheets, newspaper articles, or signs), and/or personal communication methods (public meetings or personal visits). These activities would occur throughout the remedial process, especially during implementation of remedial action and annually thereafter.

- Access controls (specifically posted warnings) would be implemented primarily at the airport repository until those wastes are transported to Wood Gulch OU3, but could also be used for specific areas of contamination on any property, in consultation with the owner. Long-term O&M would be required to maintain access controls damaged by weather or vandalism.

9.1.2.3 Monitoring

Monitoring would be performed during construction of the remedy (covers and access controls) and annually thereafter to determine if there is adequate protection of human health and the environment. Monitoring during construction would test the soil at potential borrow source areas for lead, arsenic, and antimony, at a minimum, and confirm the suitability of the materials before use. Routine monitoring would be performed for any properties where contaminated soils were covered as part of the remedy. Monitoring protocol for covered portions of properties would include routine non-intrusive visual inspections (i.e., surface inspections) to ensure integrity of the covers. LUCs should also be monitored annually.

Five-year site reviews are required by the NCP because contaminated soils would remain at OU1 with contaminant concentrations above RALs, which do not allow for unlimited use and unrestricted exposure under the current and reasonably anticipated future anticipated land use. Monitoring would be performed on all properties with soil covers and/or LUCs.

9.1.3 Alternative 3: Excavation and Disposal of Contaminated Soils at Licensed Solid Waste Facilities

9.1.3.1 Excavation of Contaminated Soils

All contaminated soils above RALs on individual properties would be excavated. Confirmation that soils remaining in excavations are below RALs for lead, arsenic, and antimony would be made by visual inspections for mine waste as well as sample collection and analysis. Soils failing confirmation sampling will be removed until RALs are achieved. The repository at the Mineral County Airport would also be completely excavated.

Health and safety precautions, dust suppression, personal protective equipment, and monitoring, would be used during excavation of contaminated soils to reduce risks to workers. Water- or chemical-based dust suppression would prevent inhalation exposure of contaminants.

Excavation of contaminated surface material would be conducted to the extent practicable. However, it may not be possible to excavate contaminated soils underneath or adjacent to structures or obstructions. Thus, residual contaminated soils may be left in place in some locations. A geotextile barrier or another barrier material placed in the sidewalls of these excavations coupled with LUCs may be used to address these situations, and will be determined on a property-by-property basis during remedial design.

9.1.3.2 Offsite Disposal at Licensed Facilities

Excavated contaminated soils would be transported off site via truck for disposal. Because they are derived from mineral processing, the soils are exempt from Resource Conservation and Recovery Act regulation as hazardous waste, and do not require treatment before disposal. However, these same wastes would be classified under State of Montana regulations as Group II solid wastes and would require disposal in a Class II facility. The closest such facility is about 60 miles away (the next closest is 170 miles). Final acceptance of contaminated soils is determined by the individual facility. Thus, some soils might require treatment before disposal.

9.1.3.3 Excavation Backfill

Excavations would be backfilled to existing grade. Clean soil would be transported from offsite borrow areas. Backfilled areas would be covered with topsoil and revegetated or otherwise restored to match the surface conditions that previously existed, such as structural fill and gravel for a driveway.

9.1.3.4 Land Use Controls

LUCs would consist of a combination of ICs and community awareness activities to restrict use of contaminated areas and provide awareness of risks from exposure. LUCs would be tailored for each property, based on the type and extent of contaminated soils and type of ownership. ICs and community awareness activities would be as described for Alternative 2. No access controls are anticipated.

9.1.3.5 Monitoring

As with Alternative 2, monitoring during construction would consist of borrow source testing for lead, arsenic, and antimony (at a minimum) to determine if the proposed offsite borrow area materials were suitable for use in construction.

Five-year site reviews would be performed at those properties where contaminated soils would or might remain at concentrations that do not allow for unlimited use and unrestricted exposure. This would include non-intrusive visual inspections. Annual monitoring of ICs would be required.

9.1.4 Alternative 4: Excavation and Disposal of Contaminated Soils at the Mine Waste Joint Repository

9.1.4.1 Excavation of Contaminated Soils

Excavation of contaminated soils would be performed as described for Alternative 3.

9.1.4.2 Disposal

Instead of being disposed of in an offsite Class II landfill (as in Alternative 3), the excavated contaminated soils would be disposed of at the newly-constructed Wood Gulch Repository, north of Superior on Flat Creek Road, within lands currently owned by the State of Montana, Department of Natural Resources and Conservation. As with Alternative 3, health and safety precautions would be used during placement of contaminated soils to reduce risks to workers. The repository would be operated and maintained under OU2.

9.1.4.3 Excavation Backfill

Excavation backfill would be performed as described for Alternative 3.

9.1.4.4 Land Use Controls

LUCs would be performed as described for Alternative 3.

9.1.4.5 Monitoring

Monitoring would be performed as described in for Alternative 3.

9.1.5 Alternative 5: Excavation of Contaminated Soils, Treatment, and Disposal of Treated Soils at the Mine Waste Joint Repository

9.1.5.1 Excavation of Contaminated Soils

Excavation of contaminated soils for disposal would be performed as described for Alternatives 3 and 4.

9.1.5.2 Treatment Before Disposal

As with Alternative 4, excavated contaminated soils would be transported to the Wood Gulch Repository. However, before disposal, the soils would be treated with a stabilization/solidification agent at a staging area adjacent to the repository. The exception is the soils excavated from the airport repository. These have previously been treated using Portland cement or triple super phosphate (TSP) before their current placement, thus no further treatment is required for these soils before final disposal.

As with the previous alternatives, health and safety precautions would be used during treatment and placement of contaminated soils at the repository to reduce risks to workers.

9.1.5.3 Disposal

Disposal of contaminated soils would be the same as for Alternative 4. All excavated soils would be disposed of in the Wood Gulch Repository. The repository will be operated and maintained under OU2.

9.1.5.4 Excavation Backfill

Excavation backfill would be performed as described for Alternatives 3 and 4.

9.1.5.5 Land Use Controls

LUCs would be performed as described for Alternatives 3 and 4.

9.1.5.6 Monitoring

Monitoring would be performed as described for Alternatives 3 and 4.

9.2 Common Elements and Distinguishing Features of Each Alternative

Exhibit 9-1 shows the common elements and distinguishing features of how the individual remedy components are combined into remedial alternatives for OU1. Each remedial component is discussed below.

Exhibit 9-1. Remedy Components by Alternative

Remedy Component	Alternative				
	1	2	3	4	5
Five-Year Reviews	●	●	●	●	●
Land use controls (as needed)		●	●	●	●
In-place capping of contaminated soil		●			
Excavation of contaminated soils			●	●	●
Offsite disposal at solid waste facility			●		
Disposal at onsite mine waste repository				●	●
Treatment of newly-excavated soils					●

9.2.1 Covers

Alternative 2 is the only alternative that uses covers as a remedy component.

9.2.2 Excavation of Contaminated Soil

Alternatives 3, 4, and 5 all specify the excavation of equal amounts of contaminated soil. The soils include newly excavated contaminated soils from residential and other properties, as well as previously excavated and treated soils that were disposed of at the airport repository as part of various emergency removals actions at the site. The remaining alternatives (1 and 2) do not use excavation as a remedy component.

9.2.3 Offsite Disposal

Alternative 3 is the only one to use offsite disposal for final disposition of excavated contaminated soils. Soils would be disposed of at a Class II solid waste landfill. The nearest such landfill is the municipal landfill near Missoula, Montana (approximately 60 miles away).

9.2.4 Onsite Disposal

Alternatives 4 and 5 both use onsite disposal for final disposition of excavated contaminated soil. The disposal site is the newly constructed Wood Gulch Repository. The repository will be operated and maintained under OU2.

9.2.5 Treatment

Alternative 5 is the only one to employ treatment of contaminated soils before disposal. Contaminated soils would be stabilized by the addition of TSP before disposal in the on-site repository. Treatment serves to stabilize the metals in the soils, which lessens the potential for metals-contaminated leachate.

The contaminated soils excavated by EPA's Removal Branch during the TCRAs were treated with Portland cement or TSP before disposal at the airport repository, because of their high concentrations of lead and arsenic. Thus, those soils would be either capped in place (Alternative 2) or excavated and disposed without additional treatment (Alternatives 3, 4, and 5).

9.2.6 Land Use Controls

All alternatives except Alternative 1 use LUCs, as needed, to control or reduce risks posed to human receptors from unaddressed contaminated soils. LUCs would consist of a combination of ICs, access controls, and community awareness activities to restrict use of contaminated areas and provide awareness of risks from exposure. They would be tailored by property to provide protection of human health and maintain remedy integrity.

ICs would consist of a combination of governmental controls, proprietary controls, and/or informational devices that would be selected on a per property basis depending on ownership and degree of contamination for Alternatives 2, 3, 4, and 5.

Access controls (specifically posted warnings) would be implemented at the airport repository under Alternative 2, but they could also be used for contamination on any property in consultation with the owner. Long-term O&M would be required to maintain controls damaged by weather or vandalism.

Community awareness activities include informational and educational programs to update the public about site risks and risk reduction activities for Alternatives 2, 3, 4, and 5. Methods used could include electronic, printed, and/or personal communication.

9.2.7 Monitoring

All alternatives use monitoring, although the degree of use varies. Five-year reviews are required for all, as contaminated soils would or may remain at concentrations that do not allow for unlimited use and unrestricted exposure. Non-intrusive visual inspections would be performed in support of these reviews. For Alternative 1, monitoring is limited to only the performance of 5-year reviews.

For Alternatives 2, 3, 4, and 5, monitoring would also occur during construction. Borrow source testing would determine that contamination is not present in proposed offsite borrow area materials before use.

For Alternative 2, additional routine monitoring would be performed for all properties with covers. Monitoring protocol for covered portions of properties would include routine non-intrusive visual inspections to ensure integrity of the covers; these are assumed to be performed at least annually.

Section 10

Comparative Analysis of Alternatives

The NCP identifies nine evaluation criteria to be used in assessing the individual remedial alternatives (Exhibit 10-1). The criteria fall into three groups: threshold, primary balancing, and modifying.

The threshold criteria must be met in order for an alternative to be eligible for selection. Primary balancing criteria are used to weigh major tradeoffs among alternatives. Modifying criteria (state and public acceptance), generally, can be fully evaluated only after public comment is received on the proposed plan. However, in the final balancing of trade-offs between alternatives upon which the final remedy selection is based, modifying criteria are of equal importance to the primary balancing criteria.

This section presents a summary comparison of the remedial alternatives with the two threshold criteria, five primary balancing criteria, and the two modifying criteria. The results of the detailed analysis (Exhibit 10-2) allow a comparative analysis of the alternatives and identify the key tradeoffs among them. A more detailed discussion of the comparative analysis is provided below. Modifying criteria are also discussed in the FS.

Exhibit 10-1. NCP Evaluation Criteria

Criterion	Description
Threshold Criteria	
Overall protection of human health and the environment	Determines if an alternative eliminates, reduces, or controls threats to public health and the environment.
Compliance with ARARs	Evaluates if the alternative meets federal, state, and tribal environmental statutes, regulations and requirements, or if a waiver is justified.
Primary Balancing Criteria	
Long-term effectiveness and permanence	Considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of toxicity, mobility, or volume through treatment	Evaluates use of treatment to reduce harmful effects of principal contaminants, the contaminant's ability to move, and the amount of contamination remaining after remedy implementation.
Short-term effectiveness	Considers time needed to implement an alternative and the risk the alternative poses to workers, residents, and the environment during implementation.
Implement-ability	Considers the technical and administrative feasibility of implementing the alternative, including factors such as the availability of materials and services.
Cost	Includes estimated capital and annual O&M costs, as well as present value cost (the total cost of an alternative over time in terms of today's value). Estimates are expected to be accurate within a range of +50 to -30 percent.
Modifying Criteria	
State/support agency acceptance	Considers whether the state agrees with EPA's analyses and recommendations, as described in the proposed plan and ROD.
Community acceptance	Considers whether the community agrees with EPA's analyses and preferred alternative. Comments received on the proposed plan are an indicator of community acceptance.

10.1 Threshold Criteria

10.1.1 Overall Protection of Human Health and the Environment

All of the alternatives, except Alternative 1, are protective of human health and the environment. Since Alternative 1 fails to meet this threshold criterion, it is not discussed further in this analysis. Alternative 2 addresses the RAOs primarily through in-place capping of contaminated soils using covers to reduce risks from contact with these materials. Capping provides a barrier to exposure to the contaminated soils. However, contaminated soils would still remain beneath covers across a large extent of the site and could pose risks if the covers are compromised.

Alternatives 3, 4, and 5 address RAOs primarily through excavation and disposal of contaminated soils. Long-term protection of human health and the environment is more certain than alternatives that leave contaminated soils in place. Alternative 3 uses offsite disposal at licensed solid waste disposal facilities and Alternatives 4 and 5 use on-site disposal at the Wood Gulch repository.

In Alternative 5, contaminated soils are treated using solidification/stabilization before disposal. Thus overall protection of human health and the environment is more certain than alternatives that do not employ treatment.

Exhibit 10-2. Ranking of Alternative Performance against NCP Evaluation Criteria

Alternative	Description	Threshold Criteria		Balancing Criteria					
		Protection of Human Health and Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Implementability	Present Value Cost (($)	
2	In-Place Capping of Contaminated Soils	❸	❺	❸	⓿	❹	❸	$$	$1.29M
3	Excavation and Disposal of Contaminated Soils at Licensed Solid Waste Facilities	❹	❺	❹	⓿	❸	❸	$$$$	$2.81M
4	**Excavation and Disposal of Contaminated Soils at Mine Waste Joint Repository**	❹	❺	❹	⓿	❹	❹	**$$**	**$1.50M**
5	Excavation of Contaminated Soils, Treatment, and Disposal of Treated Soils at the Mine Waste Joint Repository	❹	❺	❺	❸	❸	❸	$$$	$2.17M

The ranking on scale of 0 to 5 is NOT additive, but shows the general performance of the alternative against the criteria.
⓿ Does not apply ❶ low ❷ low to moderate ❸ moderate ❹ moderate to high ❺ high
Bold text indicates the selected remedy (Alternative 4)

10.1.2 Compliance with Applicable Relevant and Appropriate Requirements (ARARs)

All remaining alternatives (alternatives 2-5) are compliant. These include location-, action-, and chemical-specific ARARs (Appendix B).

10.2 Balancing Criteria

10.2.1 Long-Term Effectiveness and Permanence

Alternative 2 addresses contaminated soils primarily through in-place capping using covers to reduce risks from soil contact. This provides an exposure barrier to contaminated soils; however, contamination remains beneath the covers across a large extent of OU1 and could pose risks if the covers are compromised. Thus, long-term effectiveness and permanence is not as certain as for Alternatives 3, 4, and 5 where contaminated soils are excavated and disposed.

Long-term effectiveness and permanence are highest for Alternative 5, as newly-excavated contaminated soils are treated via solidification/ stabilization before disposal at the on-site repository. This provides added protection from leaching of contaminants into uncontaminated soils and groundwater.

10.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 2 through 4 provide no treatment. Therefore, they do not reduce toxicity, mobility, or volume of contaminants through treatment. By contrast, Alternative 5 treats contaminated soils by solidification/stabilization before disposal in the on-site repository. Treatment would provide additional protection to surrounding soils and groundwater from contaminated soils that are potentially leachable.

10.2.3 Short-Term Effectiveness

Alternatives 2-4 all address short-term risks to workers, the community, and the environment.

Alternative 2 has the smallest disturbance (construction of covers) to contaminated soils, and the disturbance is primarily at the surface and entails importation and placement of clean cover material over contaminated soils. Trucks used to haul offsite borrow for construction of the covers slightly, but temporarily, increase short-term risks to the community. Transport and placement of borrow may cause potential environmental impacts from equipment emissions and disturbance of borrow locations.

Alternatives 3, 4, and 5 involve excavating contaminated soils, which would create a greater short-term disturbance. They also require importation of greater amounts of imported material for backfill of excavations. Transport of borrow materials for backfilling excavations would increase truck traffic and related risks to workers and the community in comparison to Alternative 2.

With Alternatives 3, 4, and 5, hauling of contaminated soils for disposal increases short-term risks. Risks increase with distance traveled and population density. As such, risks are highest for Alternative 3, which specifies disposal at an off-site, licensed, solid waste facility.

For Alternatives 2, 3, 4, and 5, short-term risks to workers would be mitigated by health and safety measures. Short-term risks to workers, the community, and the environment could be mitigated by measures such as water-based dust suppression, traffic controls, and worker training. LUCs could be quickly implemented to limit potential exposure to contaminated soils.

10.2.4 Implementability

For Alternative 2, the resources and materials needed to construct the covers should be available, but borrow materials would require transportation to individual properties. There may also be difficulty transitioning covers into existing grades on residential properties. There may be additional difficulty associated with implementation of LUCs, but that difficulty applies to all remaining alternatives. Maintenance of covered areas and monitoring, especially on residential land, could be difficult in the future.

For Alternatives 3, 4, and 5, excavation of contaminated soils could be difficult in areas of underground utilities, trees, roads, and near structures. The resources and materials needed to backfill excavations should be available, but borrow materials would require transportation to individual properties. Logistical coordination would be needed because both contaminated soils and offsite borrow material would be transported simultaneously.

Alternative 3 specifies offsite disposal of large volumes of contaminated soil and would require coordination of trucks transporting backfill to excavation areas with the offsite disposal facilities. Obtaining necessary approvals and the logistics of transporting large volumes of contaminated soils over long distances to offsite disposal facilities makes this alternative more difficult to implement.

Alternative 5 has an additional challenge to implementability as treatment requires coordination of delivery of stabilization agents. Implementation of treatment before onsite disposal also increases complexity.

10.2.5 Present Value Cost

For the remaining alternatives, the cost from lowest to highest is: Alternative 2, 4, 3, and 5. The estimated present worth cost of Alternative 2 (capping) is approximately half that of the most expensive alternative (Alternative 5). Alternatives 3 and 4 differ in cost primarily because Alternative 3 requires off-site disposal and Alternative 4 uses onsite disposal. Alternative 5 is the most costly alternative, because it requires treatment of newly-excavated contaminated soils before disposal.

A summary of the cost components for each alternative is presented in Exhibit 10-2 in which the present value (PV) costs were evaluated over a 50-year period (Years 1 through 50). Based on this information, the retained alternatives achieved the following present value cost ratings:

- PV cost for Alternative 2 is approximately $1,292,000 and is rated as moderate.
- PV cost for Alternative 3 is approximately $2,811,000 and is rated as high.
- PV cost for Alternative 4 is approximately $1,496,000 and is rated as moderate.
- PV cost for Alternative 5 is approximately $2,174,000 and is rated moderate to high.

10.3 Modifying Criteria

Based on the comparative analysis of alternatives, and the Modifying Criteria explained below, Alternative 4 was selected as the preferred remedy for OU1. The final criteria for evaluation of alternatives are state acceptance and public acceptance. These criteria were applied after the conclusion of the public comment period.

10.3.1 State Acceptance

Representatives of DEQ participated in the development of the RI, FS, proposed plan, and ROD. Their comments were incorporated before the documents were released to the public. No DEQ comments were received during the public comment period for the proposed plan. DEQ supports the selection of

Alternative 4 as the remedy for OU1. DEQ provided written comments after the release of the RI and FS reports, which were used in developing the proposed plan. DEQ then provided comment during the development of the proposed plan.

In general, DEQ is interested in ensuring that the cleanup criteria for impacted properties in OU1 extend beyond those seven residential properties identified in the HHRA and include the risk management considerations discussed in Section 7.6 (Basis For Action). DEQ also wants to ensure the soils excavated during the TCRAs and placed in the airport repository are relocated to the Wood Gulch repository.

DEQ does not support selection of Alternative 2, as DEQ does not believe that reliance on a cover on multiple residential properties is adequately protective. DEQ does not support the risk analysis that only identified seven properties for remedial action, but appreciates and strongly supports EPA's risk management decision to address all sample locations in OU1 that exceed the cleanup levels identified in the ROD, in particular the soil lead cleanup level of 400 mg/kg.

10.3.2 Public Acceptance

EPA received a limited number of oral comments at the public hearing on the proposed plan and received no written comments from the public during the public comment period. The oral comments and EPA's detailed responses are presented in the responsiveness summary of this ROD (Part 3). Based on these comments and the general tone of discourse in public meetings held to date, the public seems to accept Alternative 4 as the remedy for OU1.

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Section 11
Principal Threat Wastes

Principal threat wastes are source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present significant risk to human health or the environment should exposure occur. At OU1, source materials such as mine waste and contaminated soils are not considered to be principal threat wastes. However, long-term exposure to COCs in these materials, through ingestion or inhalation, can pose a significant risk to human receptors. The selected remedy will address exposure to this non-principal threat waste primarily through excavation and disposal – not in-place treatment.

Contamination in groundwater and surface water has not yet been assessed and will be addressed under OU2. Because the OU1 selected remedy will address contaminant sources, ongoing impacts (if any) to groundwater and surface water are likely to be reduced. Site-wide ecological risks will also be addressed under OU2.

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Section 12
Selected Remedy

EPA's preferred alternative for cleanup of contamination at OU1, as presented in the proposed plan, is Alternative 4 (Excavation and Disposal of Contaminated Soils at the Mine Waste Joint Repository). Based on consideration of the CERCLA requirements, the detailed analysis of remedial alternatives, and state and public comments, EPA has determined that Alternative 4 is the appropriate selected remedy for OU1.

12.1 Short Description of the Selected Remedy

The selected remedy is an excavation and disposal remedy. It uses a remedial strategy that provides protection of human health through excavation of contaminated soils above the cleanup levels at individual properties and at the airport repository. Contaminated soil will be disposed of at the newly constructed, onsite Wood Gulch repository (OU3). Excavations will be backfilled with clean fill from an approved borrow source and finished with either topsoil and vegetation, or with gravel, depending on whether the area is a yard or driveway.

In the event that contaminated soils with concentrations exceeding the RALs are left in place (e.g., at Blackfoot Telephone Company, and under structures, utilities, or where access was not obtained) LUCs will be used on specific properties to minimize risks posed to residents and also to ensure that engineered elements of the remedy are not damaged.

12.2 Rationale for the Selected Remedy

The selected remedy, Alternative 4, provides the best balance among alternatives and attains an equal or higher level of achievement of the threshold and balancing criteria than the other alternatives. It achieves substantial risk reduction and is feasible, implementable, and has long-term cost-effectiveness.

It offers an equal level of overall protectiveness of human health and the environment and compliance with ARARs as Alternatives 3 and 5, and at a significantly lower cost. It is protective of human health and the environment and complies with ARARs. It is more protective of human health and the environment than Alternative 2. It reduces the long-term risk of exposure to contaminants in source areas. It is designed such that residents and visitors have no more than a 1×10^{-4} chance of contracting cancer from ingestion and inhalation of onsite soils, and it protects residents and visitors against non-cancer effects from inhalation and ingestion of contaminated soils.

The selected remedy is the most implementable of all alternatives studied, and has equal or better short-term effectiveness. As with Alternatives 2 and 5, it keeps the excavated soils in the general area where they were produced, reducing energy costs for transportation and minimizing transportation-related safety issues.

Unlike Alternative 2, the majority of contaminated soil is removed from individual properties and the airport repository and is consolidated in a single location that can be efficiently managed and monitored. Excavation offers less long-term disruption to local residents than capping and removes the perceived stigma of contamination on a property. Alternative 5 provides treatment, but the difficulties and additional costs to implement treatment outweigh the limited benefit because of relatively low concentrations of contaminants in newly excavated soils. Residual risks are effectively eliminated, mitigated, or managed under the selected remedy.

12.3 Detailed Description of the Selected Remedy

The selected remedy is described below. These details may be modified somewhat as a result of the remedial design and construction processes. Design changes will be documented and the documents made available to the public for review.

The primary implementation details are:

- Concentrations in the upper 12 inches of soils at a given property that exceed RALs for arsenic, antimony, or lead will trigger the implementation of the selected remedy at that property, as described below.

- Following the guidance in EPA's Lead Handbook (EPA 2003), properties where soil concentrations of arsenic, lead or antimony exceed respective RALs the sampling area having the exceedance will be excavated to a depth of 18 inches. Field XRF will be used to confirm that the contaminants are below RALs. The excavation may extend deeper than 18 inches if XRF data and visual observations indicate that a reasonable extension of the excavation depth would result in removal of all of the contamination in that sampling area. A selected percentage of samples shall be analyzed by a lab to ensure that RALs have been attained.

- Excavated mining impacted soils will be trucked to the onsite joint mine waste repository in Wood Gulch (OU3) for disposal.

- Fill, topsoil, and gravel from approved borrow sources will be brought from off site and analyzed for contaminants before being used to fill the excavations.

- The excavation will be backfilled with appropriate material and compacted. The surface will be finished with a layer of topsoil and revegetated with grass seed or, in the case of driveways, backfill will be topped with compacted gravel.

- If contamination above RALs is known or suspected to have been left in place because it is inaccessible (e.g., due to buildings or utilities), property-specific LUCs will address exposure. EPA envisions that the LUCs would be deed notices or some other administrative requirement implemented at the County or local government level, that would identify the existence of contamination to future potential landowners. These are expected to be limited to only a few, if any, properties. EPA will attempt to obtain access to all remaining properties not sampled during the RI, and remediate them in accordance with the selected remedy. Five-year reviews would be required, and the community would be kept informed during remedy implementation and by the 5-year reviews.

- Dust suppression will be used during construction. Temporary lay down areas and access roads will be constructed, as needed, to limit disturbance of contaminated soil. BMPs will be used to avoid spreading the contamination.

- Contaminated materials currently interred at the airport repository will be excavated and disposed of at the Wood Gulch joint repository. The excavated area will be backfilled and completed with topsoil and vegetation.

- The initial identification of properties (Exhibit 7-7) to be remediated will be based on the results of the Remedial Investigation in comparison with the RALs identified in this ROD. Additional properties may be added or deleted during the remedial design after details of the removals conducted under the 2011 TCRA are reviewed. Additional properties may be added during the design phase if analytical results from newly sampled properties (where access is obtained to any of the 5% of properties not sampled during the RI) indicate that remediation is warranted based on concentrations of COCs that exceed ROD cleanup levels.

- In the event that contaminated soils are uncovered in the future during excavation or construction activities, these soils shall be disposed of at the Wood Gulch Repository.

Exhibit 12-1. Selected Remedy Summary

Remedial Component	Unit	Quantity
Surface area of removal	Acres	6.2
Contaminated soil to be removed	Loose Cubic Yards	29,904
Gravel needed for excavations		1,207
Backfill needed for excavations		11,257
Topsoil needed for excavations		4,438
Residential properties to be remediated	Each	35
Non-residential properties remediated	Each	17

Details of quantities summarized are provided in the FS.

The summary of the major components of this remedy including volume estimates for excavated soil and backfill material and properties to be remediated, is shown in Exhibit 12-1. This summary is from the FS report, which uses a total number of properties that is slightly higher than what is now expected, primarily because some additional removals were conducted during the 2011 TCRA. Exhibit 7-7 lists 38 individual properties that will be addressed by the selected remedy for OU1. The FS assumed that remedial action would occur at 52 properties, and included the airport repository in that total. Also included were some properties where TRCAs had been conducted, but the exact details of the removals were not yet clear. For costing purposes, the assumption of 52 properties for OU1 is considered reasonable, and the cost has not been altered from the FS although the actual number of properties that will need to be addressed as part of the selected remedy is likely less than 52 and may even be less than 38. The actual number of properties requiring remediation will be determined during the remedial design.

12.4 Estimated Cost of the Selected Remedy

The PV cost for Alternative 4 is approximately $1,496,000. The individual components of this cost are:

- Estimated total capital costs: $1,369,000

- Estimated total O&M costs (first 50 years): $0

- Estimated total periodic costs (first 50 years): $490,000

- Estimated construction time: less than one season

Periodic costs are those costs that occur only once every few years or expenditures that occur only once during the entire O&M period or remedial time frame (e.g., site closeout, remedy failure/replacement). These costs may be either capital or O&M costs but, because of their periodic nature, it is more practical to consider them separately from other capital or O&M costs in the estimating process. At OU1, these periodic costs are principally the 5-year reviews. Appendix C presents the cost estimate summary for the selected remedy, including PV analysis on a year-by-year basis.

12.5 Expected Outcomes of the Selected Remedy

The purpose of this response action is to control risks posed by direct contact with and incidental ingestion of soil. The results of the RI indicate that 38 properties are known to have concentrations that exceed the RALs for lead or arsenic. The selected remedy shall address all properties contaminated with arsenic in excess of 100 ppm and lead in excess of 400 ppm. These RALs are in accordance with EPA's current nationwide guidance for lead sites and with cleanup levels for arsenic at mining sites in Montana. The site is expected to be available for unrestricted residential land use as a result of the remedy. The selected remedy will achieve acceptable exposure risks through excavation and disposal of contaminant sources. Exposure to other contaminated media at the site will be assessed during a future RI/FS at OU2.

12.6 Performance Standards

This ROD defines performance standards for contaminant sources at OU1 that will be used to measure the overall effectiveness of the remedy over the long term. Performance standards are directly linked to the long-term protection of human health and the environment from contaminants of concern present at the OU and include the final ARARs for the site. Because OU1 addresses only the mining contaminated soils and the remedy is soil excavation and disposal, ongoing monitoring will not require comprehensive and interrelated monitoring programs for all media. Performance monitoring will be defined during the remedial design phase and will mainly rely on 5-year reviews to confirm that if mining contaminated soil is left in place, it is adequately controlled through LUCs to protect human health. These monitoring programs will be planned, reviewed, and approved by EPA and DEQ.

12.7 Environmental Justice

In 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations," became effective. The purpose of the Executive Order is to ensure that environmental actions or decisions do not result in disproportionately high and adverse human health or environmental effects by including the examination of secondary effects, cultural concerns, and cumulative impacts/effects. Achieving environmental protection for all communities is a fundamental part of EPA's mission.

EPA believes the selected remedy meets the objectives of Executive Order 12898. The reported median household income in 2009 ($30,694) in Superior, Montana is approximately 25 percent lower than that reported statewide ($42,322). However, the percentage of people living below the poverty level (16.9 percent) in Superior is only slightly higher than that of the general population statewide (15.1 percent). There are no distinct populations of racial minorities in Superior.

The primary means of exposure to lead and arsenic in OU1 is through incidental ingestion of contaminated soils, and children present the greatest concern, because of the effects of lead on the developing neurological systems of children. Unfortunately, exposure is likely to be greater in low-income homes, as these homes typically have less robust vegetative cover (lawns) and the children often spend more time playing outside in the yard because of a lack of access to other recreational activities.

Section 13
Statutory Determinations

Under CERCLA Section 121 and the NCP, EPA must select a remedy that is protective of human health and the environment, complies with or appropriately waives ARARs, is cost effective, and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that include treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants or contaminants as a principal element. The following sections discuss how the selected remedy meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The selected remedy will protect human health through excavation and disposal of contaminated soils to a maximum depth of 18 inches, or greater if determined necessary on a property-specific basis. Excavated soils will be disposed of in an onsite repository (OU3). Protection will be maintained via a comprehensive O&M plan. LUCs will be implemented as needed to ensure the remedy is not disturbed inappropriately and that any contaminated soils knowingly left behind (at depth or under structures) are not mishandled in the future. Surface water and groundwater will be addressed under OU2.

The selected remedy will be monitored and maintained through comprehensive programs using LUCs, monitoring, and maintenance. There are no short-term threats associated with the selected remedy that cannot be readily controlled through health and safety measures, monitoring, and standard construction practices. In addition, no adverse cross-media impacts are expected from the selected remedy.

Exhibit 13-1. Evaluation of Compliance with ARARs for Selected Remedy

Evaluation Criteria Considerations for Compliance with ARARs	Justification for Rating
Compliance with Chemical-Specific ARARs	▪ Chemical-specific ARARs were not identified for contaminant sources other than air particulate standards.
Compliance with Location-Specific ARARs	▪ Location-specific ARARs for contaminant sources would be addressed during design and implementation of the alternative.
Compliance with Action-Specific ARARs	▪ Action-specific ARARs for containment of contaminant sources and reclamation of the site would be addressed during design and implementation of the alternative.

13.2 Compliance with ARARs

ARARs are determined by evaluating which requirements are applicable or relevant and appropriate to the distinctive set of circumstances and actions contemplated at a specific site. The NCP requires that ARARs be attained during implementation and at completion of the remedial action.

The overall rating for Alternative 4 on compliance with ARARs is high. Exhibit 13-1 presents the evaluation criteria considerations and the justification for the rating. The individual ARARs and "to be considered" (TBC) are summarized by statue or regulation (along with citations or references) in Appendix B. Appendix B also provides a brief description and comment (where applicable) for each ARAR or TBC and identifies the ARAR determination and the type of ARAR.

The following is a list of the Federal statutes, regulations, standards, or requirements considered for the remedy at OU1 (as outlined in Appendix B):

- National Historic Preservation Act and regulations
- Archeological and Historic Preservation Act and regulations
- Fish and Wildlife Coordination Act and regulations
- Floodplain management regulations
- Protection of wetlands regulations
- Endangered Species Act and regulations
- Migratory Bird Treaty Act
- Bald Eagle Protection Act
- Native American Graves Protection and Repatriation Act
- American Indian Religious Freedom Act
- Clean Water Act
- National Ambient Air Quality Standards
- Protection and Enhancement of the Cultural Environment
- Archaeological Resources Protection Act
- Resource Conservation and Recovery Act, Subtitles C and D
- Occupational Safety and Health Act
- Federal Aviation Administration regulations
- Federal Emergency Management Agency flood insurance maps

The following is a list of the Montana statutes, regulations, standards, or requirements considered for the remedy at OU1 (as outlined in Appendix B):

- Groundwater protection rules
- Montana Water Quality Act and regulations
- Montana Ambient Air Quality Regulations
- Montana Mine Reclamation Regulations
- Montana Antiquities Act
- Montana Human Skeletal Remains and Burial Site Protection Act
- Montana Floodplain and Floodway Management Act and regulations
- Montana Natural Streambed and Land Preservation Act and regulations
- Substantive Montana Pollutant Discharge Elimination System (MPDES) permit requirements
- Stormwater Runoff Control requirements
- State of Montana Solid Waste requirements
- Noxious Weeds
- Occupational Health Act
- Montana Safety Act
- Employee and Community Hazardous Chemical Information Act

13.2.1 Contaminant Sources

In accordance with Section 121(e) of CERCLA, no permits will be necessary to implement a remedial action at OU1.

13.2.2 Surface Water

The Clark Fork River is classified by the State of Montana as "B-1." Waters with this classification are to be maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

The State of Montana has promulgated specific water quality standards applicable to the use designation of the Clark Fork River. To the extent that point sources may be created temporarily by cleanup activities, best management practices will be used to assure compliance with the substantive requirements of a point source discharge permit. Surface water may be affected to some degree by contributions of contaminated groundwater and stormwater runoff, which will be addressed under OU2. The selected remedy will likely reduce any existing runoff of contaminated soils, which will benefit both groundwater and surface water. The selected remedy is not expected to impact any floodplains or wetlands.

Stormwater discharge best management practices (BMPs) will be implemented during remedy construction based on site-specific evaluation. They may include stormwater retention, rerouting, and engineered sediment controls to meet surface water ARARs. This will require adherence to substantive requirements of general stormwater permits for certain activities and refer to the requirement of BMPs to minimize or prevent discharge that may adversely affect human health or the environment.

A monitoring program will evaluate the effects of the BMPs on receiving water quality. Additional controls will be implemented if the monitoring program indicates further action is needed. The preferred remedy also specifies the use of LUCs for areas where contaminants may be left in place, and those LUCs will also protect surface water.

13.2.3 Other ARARs

Several federal location-specific ARARs are applicable to OU1 and will be met by the selected remedy through consultation with the appropriate state and federal agencies and other resources. These ARARs include acts designed to protect endangered species, bald eagles, and migratory birds and to encourage preservation of historic, archeological, and antiquities. EPA will involve the U.S. Fish and Wildlife Service and historical preservation agencies in remedial design to ensure compliance.

Federal and state standards for air are action-specific ARARs at OU1. These standards are applicable to releases of particulate matter during remediation. EPA anticipates that these ARARs can be met through the implementation of appropriate standard operating procedures and monitoring.

13.3 Cost Effectiveness

The selected remedy is cost effective and represents a reasonable value for the cost. The NCP specifies a remedy is cost-effective if its costs are "proportional to its overall effectiveness." Overall effectiveness of the selected remedy (and the other alternatives) was evaluated by examining how the remedy meets three of the balancing criteria in combination: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume; and short-term effectiveness. The result was compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of the alternatives was not necessarily proportional to costs.

It is important to note that more than one cleanup alternative may be cost-effective, and that Superfund does not mandate the selection of the most cost-effective cleanup alternative. In addition, the most cost-effective remedy is not necessarily the remedy that provides the best balance of the remedy selection criteria nor is it necessarily the least costly alternative that is both protective of human health and the environment and ARAR-compliant.

Net PV costs for each alternative were compared in the FS, and a range of costs for each alternative was developed that represents the range and possible scope of actions. The cost of the selected remedy is expected to be approximately $1,496,000. EPA believes an appropriate balance between cost effectiveness and adequate protectiveness is achieved in the selected remedy.

13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

This determination looks at whether the selected remedy provides the best balance of tradeoffs among alternatives with respect to the balancing criteria set forth in the NCP, such that it represents the maximum extent to which permanence and treatment can be practicably used. The NCP provides that balancing shall emphasize the factors of long-term effectiveness and reduction of toxicity, mobility, or volume through treatment, and shall consider the preference for treatment and bias against offsite disposal. Modifying criteria were also considered in making this determination.

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner at OU1. Of the alternatives that are protective of human health and the environment and comply with ARARs, the selected remedy is the best in terms of the five balancing criteria, and considering the statutory preference for treatment as a principal element and bias against offsite treatment and disposal, and considering state and community acceptance.

Contaminated soils remaining after EPA's TCRAs have generally low to moderate COC concentrations. While treatment with TSP is possible, EPA does not believe that the additional level of protection justifies the additional costs or short-term effectiveness and implementability issues arising from use of TSP. The treatment alternative (Alternative 5) was carried through the entire FS evaluation, but was not selected in the end. The selected remedy (Alternative 4) is expected to have greater short-term effectiveness with a lower level of risk to the community, cleanup workers, and the environment. It is also among the most implementable of the alternatives evaluated.

13.5 Preference for Treatment as a Principal Element

Treatment is not a major component of the selected remedy, and the remedy does not satisfy the statutory preference for treatment. However, EPA has determined that the source materials do not represent a principal threat, thus eliminating the expectation for treatment of those materials. The source materials are low in toxicity, can be reliably contained, and present only a relatively low risk in the event of exposure.

13.6 Five-Year Reviews

Because this remedy will potentially result in hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action, and at a minimum every five years thereafter, to ensure that the remedy is or will be protective of human health and the environment. The 5-year reviews will focus on areas where waste may need to be left in place either because of an inability to obtain access, or because the waste removal would have jeopardized infrastructure.

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Section 14
Documentation of Significant Changes

The proposed plan for the site was released for public comment on October 3, 2011. It identified Alternative 4 as the preferred alternative. That alternative is described herein as the selected remedy. The public comment period ran for 30 days, and no extension was requested. EPA reviewed all written and verbal comments submitted during that comment period. A summary of EPA's Response to Comments is set forth below in Part 3. EPA determined that no significant changes to the remedy, as originally identified in the proposed plan, were necessary.

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Section 15
References

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EPA. 2003. *Superfund Lead-Contaminated Residential Sites Handbook*, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, OSWER 9285.7-50. August 2003.

EPA. 2009. *Flat Creek/IMM Hazard Ranking Documentation Record*. March 2009.

Shacklette, Hansford T. and Boerngen, Josephine G.. 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey professional paper 1270. http://pubs.usgs.gov/pp/1270/pdf/PP1270_508.pdf.

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Warren, K.B. and Patton, T.W. 2007. *Ground-water resource development in the Lolo-Bitterroot ground-water characterization area, Mineral, Missoula, and Ravalli counties, Montana*, Montana Bureau of Mines and Geology: Ground-Water Open-File Report 20.

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RECORD OF DECISION

FOR

FLAT CREEK IMM SUPERFUND SITE

OPERABLE UNIT 1

MINERAL COUNTY, MONTANA

Part 3

Responsiveness Summary

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1.0 Comment Received and EPA Response

EPA received a minimal amount of oral comment on the preferred alternative as described in the proposed plan for OU1. The comments, as reported by the stenographer, and EPA's response to the comments follows. No written comment was received from the public during the comment period. EPA received no comment from DEQ during the public comment period (see Section 10.3.1 State Acceptance).

1.1 General Approval of the Preferred Alternative:

1. **Comment**: If you need someone to say that they're okay with this plan you're proceeding forward with -- that you're proposing, plan no -- Alternative No. 4, I believe I'm great with it. Oral comment received at the public hearing.

   Response: No response required.

2. **Comment**: I would like the public comment to note that, at least from the County's perspective, and I'm going to extend myself and speak on behalf of the County, that we would strongly encourage that the cleanup levels be 400 parts per million for lead and 100 for arsenic and 130 for antimony. Oral comment received at the public hearing.

   Response: EPA agrees. Those are the cleanup levels identified in the proposed plan and the ROD.

3. **Comment**: I would like to say on behalf of the City, I think we support the levels that Tim and the County are looking at, the minimum levels for remediation of the properties. Oral comment received at the public hearing.

   Response: No response required.

4. **Comment**: I'd like to say that during the proposed plan and the record of decision, we'd like to see a certain amount of houses, around 400 houses as a cleanup. We don't want to leave anybody out who could use the cleanup and be able to use that in their records of sale and listings of their properties. Oral comment received at the public hearing.

   Response: The criteria for cleanup identified in EPA's proposed plan and then documented in the ROD support very conservative cleanup goals that go well beyond the remediation of seven properties identified in the risk assessment. EPA has included both current and future use in its risk management decisions, and DEQ supports this approach. A total of 42 properties were identified for cleanup, beyond the 30 properties already addressed by the emergency removals. There is no scientific basis to remediate 400 properties as identified by the commenter.

5. **Comment**: I don't see in here that there is an acknowledgement that there's material at the airport that, now I understand, is going to be moved through your mitigation part of the things, instead of it was under time critical for the longest time. So I just think that's important that somewhere in this record that you can state that. I know that you can request that funding and stuff, but it's unsure now of what the cost of that's going to be, I

think you can tie it down to a pretty good known sum and stuff like that. But I think that should be part of that, that the waste material out there is incorporated into this process, unless somebody can convince me that it's going to happen, it doesn't need to, maybe it's extreme. That's what I think is important from the County's aspect. Oral comment received at the public hearing.

Response: EPA's preferred alternative for cleanup as described in the proposed plan and documented (as the selected remedy) in the ROD includes removal of the materials currently placed at the airport repository.

6. **Comment**: I would like to comment that there were ongoing discussions about pooling wastes and obviously knowing that there was going to be different concentrations of waste. But, it seems to me that it could be very feasible that the treated material at the airport could be placed in such a fashion that the material that comes from this remedial action that you're going to undertake could actually be placed on top of that, and that you could use the material that has already been interjected in that soil so that that treatment capability and that binding capability would be available, even if there was some leaching through the materials that you've changed or excavated from all the many places that you've excavated, that you can take care of them at this time. All of the material that went out there was treated from what Duc did this last summer. So I think that's an important aspect to take a look at to try to incorporate that in there. Oral comment received at the public hearing.

   Response: During the remedial design process, EPA will explore the option of placing the treated materials currently stored at the airport repository in OU3 first, and they placing the newly excavated materials on top of those treated materials.

7. **Comment**: I'd like to say, when I went up there today, the road's in fairly decent shape up to the end of the county maintenance, and from the end of county maintenance on up to the repository site the road's getting pretty beat up, going up that steep grade just before you get to the repository, and it's pretty beat up, there's a couple of big potholes in there. I would like to see some remediation done on the road itself. Maybe even bring in some surface gravel to re-establish it as an intact road, not just blade it. Blading will just kind of mix it up and let the fines erode off. And I'd like to see something a little bit better done on it, at least from that segment at the end of the county maintenance on up to the repository site, what may be a half mile or quarter mile. Oral comment received at the public hearing.

   Response: During the actual implementation of the remedial action at OU1, road maintenance issues will be addressed to ensure that hauling of the excavated materials does not unduly impact the road surface, and any impacts will be addressed at the conclusion of the hauling. BMPs and road maintenance will be conducted to minimize or eliminate stormwater runoff containing contaminants. Dust mitigation measures will also be used. After remediation is complete at OU1, long-term road maintenance issues will be addressed under OU2.

FIGURES

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Figure 5-1
Locations of Airport and Wood Gulch Repositories

Flat Creek Record of Decision
Superior, Montana

0 1,000 2,000 3,000 4,000 Feet

N W E S

CDM Smith

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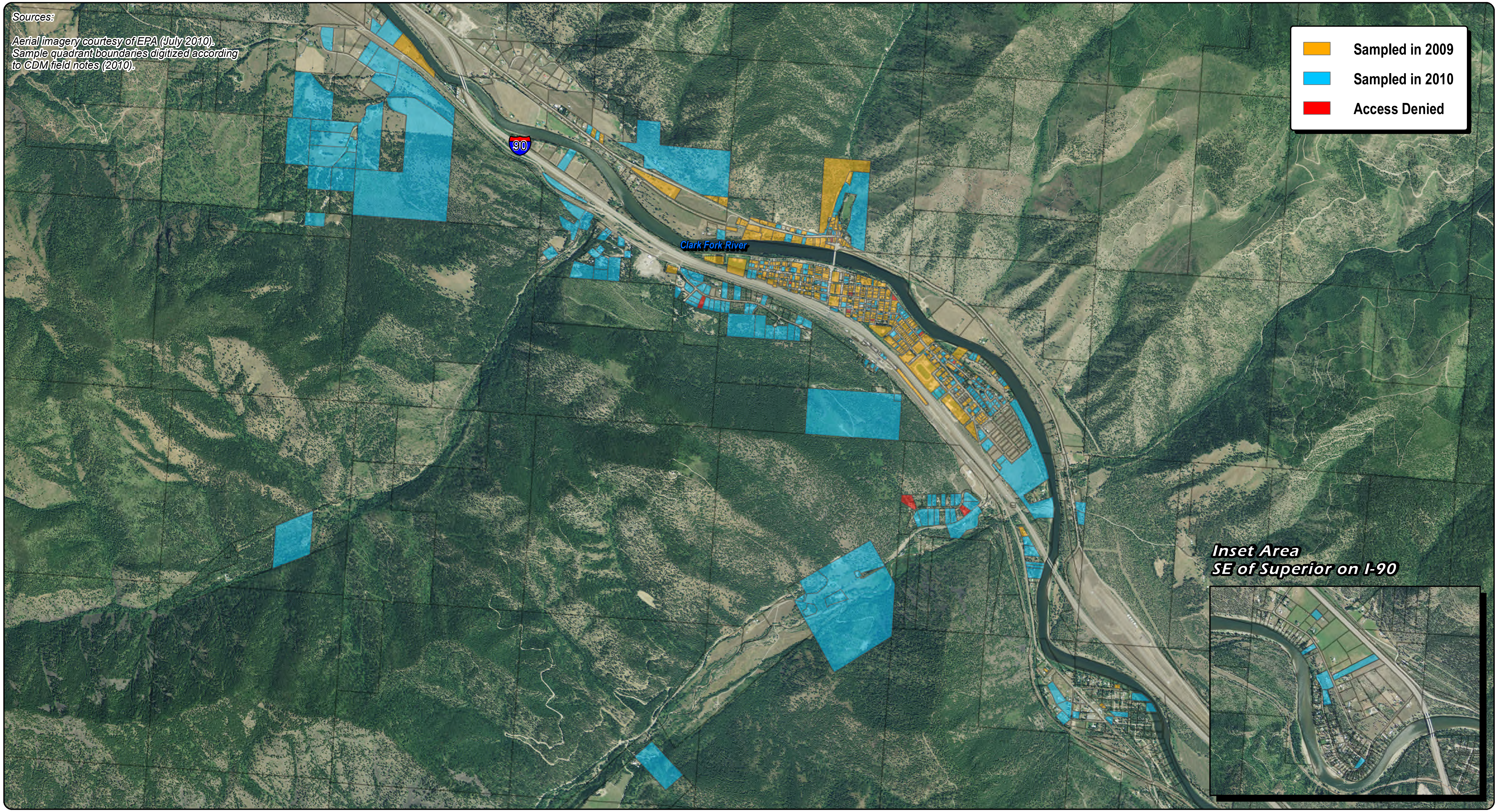

Figure 5-2
Properties Included in the RI Screening (2009 and 2010)

Flat Creek/IMM RI/FS
Superior, Montana

0 0.5 1 1.5 2 Miles

N W E S

CDM Smith

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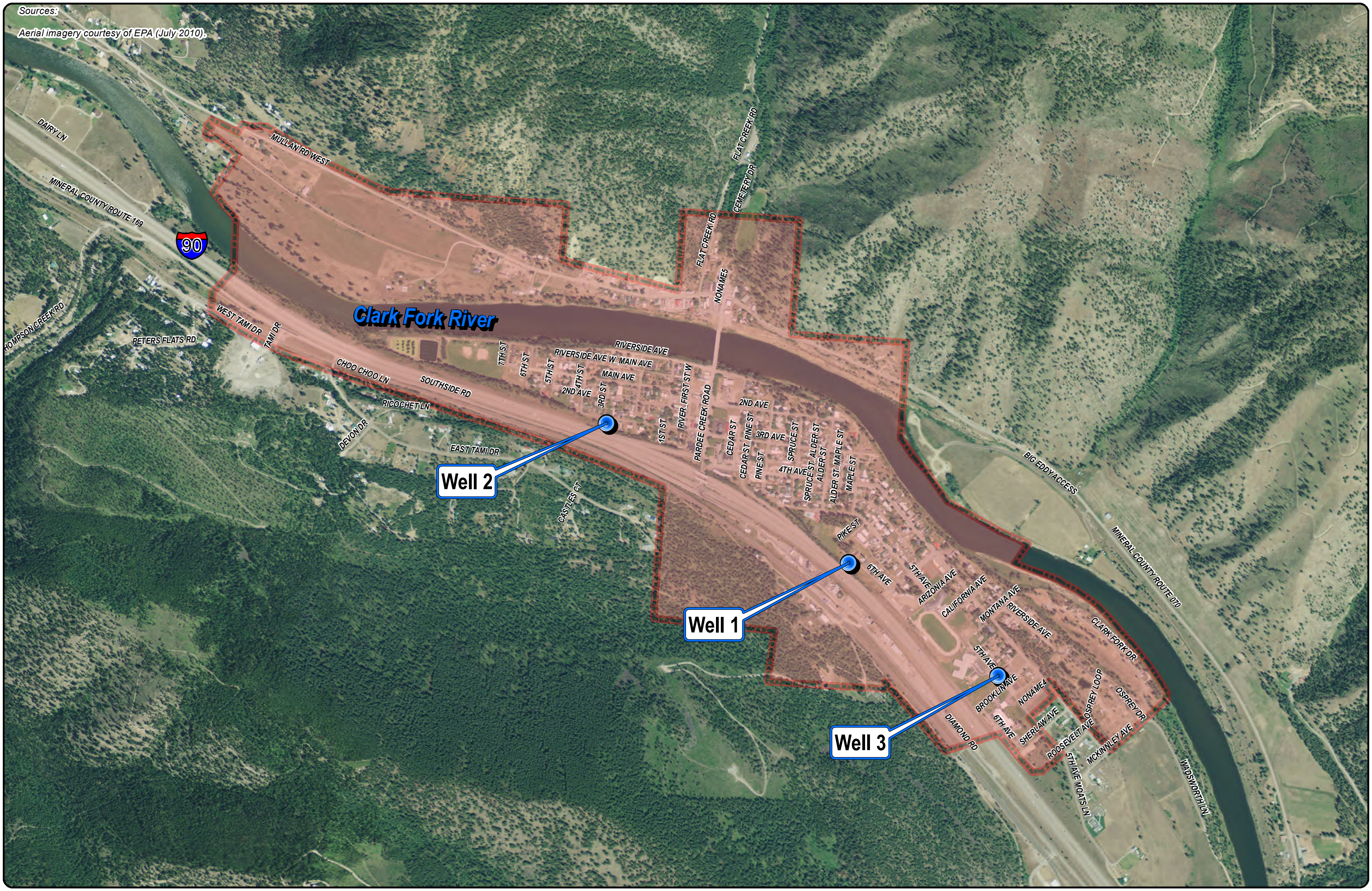

Figure 6-1
Locations of Municipal Water Supply Wells

Flat Creek/IMM RI/FS
Superior, Montana

Municipal Well Location
City Limit

0 1,000 2,000 3,000 4,000 Feet

N W E S

CDM Smith

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Figure 7-1
Locations of Properties Identified for Remediation

Flat Creek Record of Decision
Superior, Montana

0 500 1,000 1,500 2,000 Feet

N W E S

United States Environmental Protection Agency

CDM Smith

APPENDICES

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APPENDIX A

Community Involvement Materials (Proposed Plan, Public Meeting Advertisement, and Public Meeting Agenda)

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EPA Issues A Proposed Plan for Cleanup

Flat Creek/IMM Superfund Site, Mineral County, MT

On October 3, 2011 the U.S. Environmental Protection Agency (EPA) issued a *Proposed Plan* for cleanup of shallow soils on residential and non-residential properties in Superior, Montana, otherwise known as Operable Unit 1 (OU1). The plan describes the environmental situation, work done to date, and work that EPA plans to ensure protection of human health at the OU. It also provides the contact information for submitting public comment.

A 30-day public comment period runs from October 3 to November 3, 2011. EPA will present details of the plan at a public meeting. You can provide comments at the meeting, or you can send written comments directly to EPA at the address provided in the plan. EPA will address the comments it receives in a *Responsiveness Summary* that will be attached to the final *Record of Decision*.

The plan was recently mailed to all residential addresses in Superior. It can also be viewed online at *(www.epa.gov/region8/superfund/mt/flatcreekimm/).*

Public Meeting

October 12, 2011, 6:30 to 8:30 pm
Ambulance Barn, 1202 5th Ave. East, Superior, MT

Please contact EPA project manager, Les Sims, at (406) 457-5032 or sims.leslie@epa.gov, if you have questions.

Meeting Agenda

Flat Creek/IMM Superfund Site

Proposed Plan Public Comment Meeting

Wednesday, October 12, 2011

6:30 p.m. to 8:30 p.m.

Introduction and
Presentation……………………………………………………………6:40 - 7:00 p.m.
Les Sims, U.S. EPA Remedial Project Manager

Questions/Discussion..7:00 - 7:30 p.m.
Audience

Break ....7:30 - 7:45 p.m.

Public Comment Period……………………………………………7:45 - 8:30 p.m.

U.S. EPA, Region VIII – Helena, MT October 2011

EPA Announces Proposed Plan

This Proposed Plan identifies the Preferred Alternative for cleaning up the contaminated soil at Operable Unit 1 (OU1) of the Flat Creek/Iron Mountain Mine (IMM) Superfund Site and provides the rationale for this preference. In addition, this Plan includes summaries of other cleanup alternatives evaluated for use at this site. This document is issued by the U.S. Environmental Protection Agency (EPA), the lead agency for site activities, and the Montana Department of Environmental Quality (MDEQ), the support agency. EPA, in consultation with the MDEQ, will select a final remedy for the site after reviewing and considering all information submitted during the 30-day public comment period. EPA, in consultation with the MDEQ, may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the remedial investigation (RI) and feasibility study (FS) reports and other documents contained in the Administrative Record file for this site. EPA and the State encourage the public to review these documents to gain a more comprehensive understanding of the site and Superfund activities that have been conducted at the site.

This plan provides an overview of site history, contamination, and risk; summarizes the remedial alternatives EPA is considering; and details EPA's preferred remedial alternative and supporting rationale. Issuance of the plan denotes the start of a 30-day public comment period (October 3, 2011 to November 3, 2011). At the end of that period, EPA will review and consider all comments provided. EPA will then either move forward with the preferred alternative, modify it, or select another of the alternatives presented in this plan.

Information on how to provide comments or questions to EPA is provided on page 12 along with site contacts and public meeting details. Page 13 provides a list of commonly used environmental terms.

Understanding the Superfund Process

Issuance of this Proposed Plan is part of a step-wise process that starts with discovery and ends with cleanup (Exhibit 1). The RI and FS for OU1 were completed in June and July 2011. These documents are prepared concurrently.

The RI characterizes site conditions, determines the nature of the waste, and assesses risk to human health and the environment. The FS uses information from the RI. It is the mechanism for identification, development, screening, and detailed evaluation of remedial alternatives capable of addressing risks to human health and the environment.

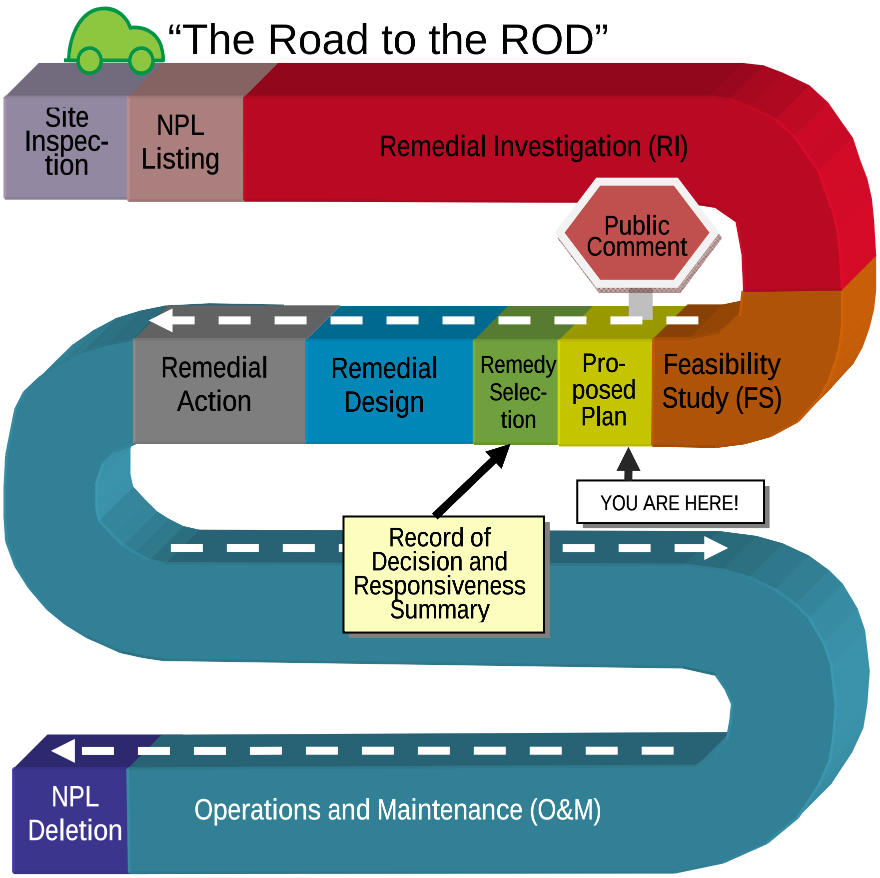
After the RI and FS reports are finalized, a preferred alternative for cleanup of OU1 is presented to the public in a Proposed Plan. A subsequent public comment period allows state and local governments and the public to provide comment on the preferred alternative.

The final phase of the RI/FS process is to prepare a Record of Decision (ROD). Following receipt and evaluation of public comments and any final comment from MDEQ, EPA selects and documents the cleanup decision in a ROD.

Site Background

The IMM is the primary source for contamination at the site. It operated from 1909 to 1930 and again from 1947 to 1953, producing silver, gold, lead, copper, and zinc ores. The now abandoned property includes tunnels, tailings, and the remnants of a mill and other mine buildings.

Exhibit 1. Superfund Process



Mine tailings contain elevated concentrations of metals. While the mine was in operation, tailings were disposed of along Flat Creek using gravity drainage. Those tailings have been distributed along Flat Creek as far as its confluence with the Clark Fork River. Although wastes still exist on the IMM, most of the tailings were washed down onto the Flat Creek floodplain. Mine waste has also been imported into Superior by the local government and various individuals for use as fill material in yards, roadways, and other locations (e.g., the school track).

EPA conducted a preliminary assessment/site inspection (PA/SI) at the site in 2001, at the request of local government and DEQ. As a result, additional sampling and a time critical removal action (TCRA) were conducted in 2002. Wastes were stockpiled in a repository at the local airport. The PA was updated in 2007 in preparation for potential listing on EPA's National Priorities List (NPL). The site was listed in 2009, which is when the RI began. Prior to being listed, the site was known as the *Superior Waste Rock* site. An additional TCRA was conducted in 2010 on the basis of the initial results obtained in 2009. A permanent repository (OU3) is under construction and will be used to inter the contaminated soil in fall of 2011.

Site Characteristics

The site is located in and around the community of Superior, in western Montana, approximately 47 miles east of the Idaho border (Exhibit 2). The Clark Fork River and Flat Creek are within its boundaries. The nearest community is St. Regis (14 miles west), and the nearest city is Missoula (58 miles east). Superior is located at exit 47 of U.S. Interstate 90 (I-90) and has an area of 1.18 square miles. Most of Superior lies north and west of I-90 and south and east of the Clark Fork River.

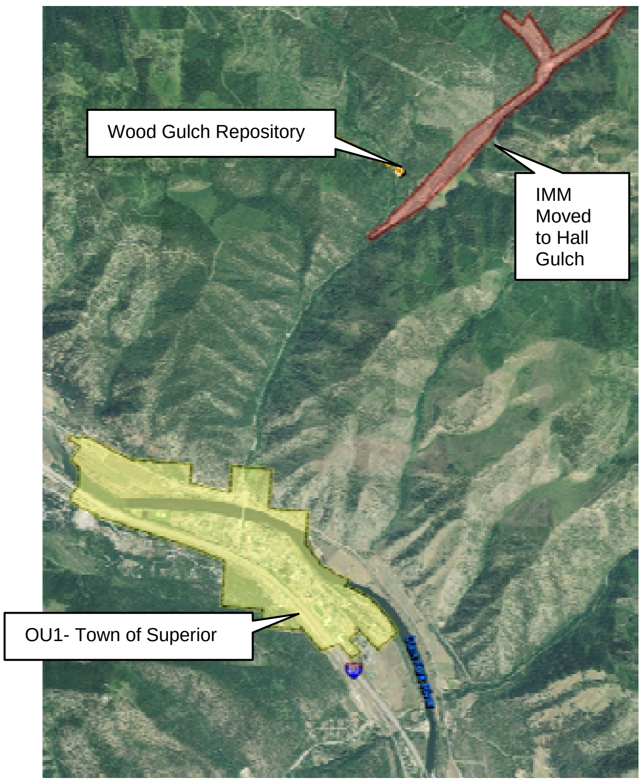
OU1 is one of three site OUs:

- **OU1 – Town of Superior**. This OU is limited to the shallow soils at residential and other properties in Superior.
- **OU2 – Flat Creek Watershed.** This OU includes the mine site where the contamination originated, the stream corridor down gradient of the mine, and the overall site groundwater and surface water issues.
- **OU3 – Wood Gulch Mine Waste Repository.** This is the mine waste repository being constructed specifically to accept wastes from OU1 and OU2.

Exhibit 2. Site Location Map

Exhibit 3 shows the location of layout of the Town of Superior as well as the location of the Wood Gulch repository. The airport repository is approximately one mile beyond the southeast boundary of the exhibit. As yet, there are no site boundaries or OU boundaries.

Exhibit 3. Site Layout



EPA designated the shallow soils of Superior as a separate OU so the contamination that potentially presented the greatest risk to residents of Superior could be addressed in an expedited fashion, without having to wait for the investigation of the entire site to be completed. Issues in Superior beyond the shallow soils, such as groundwater and surface water, will be addressed in the overall site remedy under OU2.

The 2010 census showed a population of 812 in Superior, with 239 children enrolled in school. Within OU1, land ownership is primarily privately-owned residential parcels (85 percent versus 15 percent for non-residential). Non-residential properties include municipal, state, or federal land used for open space, roadways, or buildings (e.g., schools). A small percentage of properties are privately-owned for commercial purposes (e.g., gas stations and shops). Superior has no zoning regulations, so land use at a given property can change over time. Therefore, future anticipated land use assumes that all properties could be residential.

RI Scope and Results

The RI included screening by visual observation and x-ray fluorescence (XRF) of all properties for which access was granted and for which there was at least a reasonable expectation that material might have been imported. Large, open fields that appeared to be unaltered were not sampled. EPA estimates that approximately 95 percent of all properties in town were screened. This is more than sufficient to characterize nature and extent of contamination in local soils. Most alleys were also screened to provide information on locations that had the potential to generate dust.

Samples collected during screening were analyzed for lead and arsenic by XRF. Those samples with concentrations greater than 250 parts per million (ppm) of lead were sent for laboratory analysis of a list of contaminants typical of mining sites – the Target Analyte List. At least 5 percent of all non-elevated samples were submitted to the laboratory for quality assurance purposes. Samples were also sent to the laboratory, as needed, to account for special requests or to address issues at a property.

A total of 7,209 samples from 588 properties were screened by XRF. Most (500) of those properties were residential. The screening included 6,197 residential samples and 1,174 non-residential samples. A total of 1,012 samples from 345 properties were submitted to the laboratory. This represents 14 percent of all samples collected and 59 percent of all properties screened. Only 279 (4 percent of all samples collected or 27 percent of the samples sent to the laboratory) of those samples were submitted because of lead concentrations above the 250 ppm screening level.

The results of the RI confirm the original understanding of the contaminant model for the site. Mine waste tailings were transported to town on an individual basis by land owners or local government for use as fill material. Because of this random process of importing waste, there is no obvious spatial pattern to the distribution of contamination in the upper 12 inches of soils in OU1. However, clusters of contamination are seen in properties adjacent to where the material was brought in for use in construction of Mullan and River Roads. This random distribution is why EPA sampled the upper 12 inches of soil at almost every property in town. Approximately 95 percent of the properties located in town were sampled during the RI. This provided enough data to confirm the contaminant model and to select a protective remedy.

Mine waste material from the IMM was free, easy to obtain, and had physical properties that made it desirable for use in driveways, road beds, and as fill for building pads. These same physical characteristics made it undesirable for areas such as gardens or children's play areas (e.g., sand boxes). As a result, it was not seen in those areas during the RI field sampling events. It was also reportedly used along the sides of properties to keep down the growth of weeds, and it was seen along the edges of some properties.

Key Findings from the RI

- There are no principal threat wastes at the site. Principal threat wastes are source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.
- The contaminants of concern (COCs) in soils from OU1 identified in the human health risk assessment (HHRA) are lead, arsenic, and antimony.
- Most properties (88 percent) in Superior are in the low concentration category (less than 400 ppm of lead, 100 ppm of arsenic, or 130 ppm of antimony).
- A total of 29 properties (5 percent) (22 residential and 7 non-residential) had moderate concentrations of arsenic (100 to 400 ppm) or lead (400 to 1,200 ppm) in one or more of the three depth intervals sampled.
- A total of 42 properties (7 percent) (30 residential and 12 non-residential) had concentrations in the high category for arsenic (greater than 400 ppm) or lead (greater than 1,200 ppm) in one or more of the three depth intervals.
- Elevated antimony concentrations generally ranged from 130 to 3,490 ppm, and were seen in properties that also had elevated concentrations of arsenic and/or lead.
- Contamination is scattered, rather than clustered in specific areas, confirming reports that waste was imported on a yard-by-yard basis as fill in driveways or other small areas. Mine waste was also used in municipal road construction and on municipal properties such as the school track and the fairgrounds.
- Emergency removals were conducted on 29 properties (25 residential: 4 non-residential) in 2010, addressing concentrations greater than 3,000 ppm of lead or 400 ppm of arsenic.
- Emergency removals significantly reduced the overall concentrations of contaminants at the site. However, moderate to high concentrations remain. These concentrations do not present an immediate unacceptable risk, but are likely to be addressed in the risk management decisions made for the site.

Summary of Site Risks

The source of excess concentrations of lead, arsenic, and antimony is believed to be mine waste from the IMM that was imported to individual properties, generally for use as fill in driveways and under structures. The material was free, easy to transport, and had characteristics that made it desirable for these uses.

Migration routes considered at OU1 include migration in soil and wind erosion. Migration of COCs in surface water and groundwater is possible and will be addressed under OU2. Ecological risk will also be addressed under OU2.

Current potential human receptors at OU1 include area residents and visitors. The routes of exposure for those receptors are:

- **Incidental Ingestion of Outdoor Soil.** Residents (especially children) may ingest soil that sticks to their hands during outdoor work or play. Contact is primarily with surface soil.
- **Ingestion of Indoor Dust.** Outdoor soil may be tracked inside or may enter by deposition of dust and ingestion of dust can occur.
- **Inhalation of Airborne Soil Particulates**. Particles of exposed contaminated soil may be

suspended in air by wind or mechanical disturbance and be inhaled. This is generally minor compared to ingestion.

Additional pathways that were considered but not evaluated further in the HHRA because of low potential for risk are skin contact with soil and ingestion of homegrown produce.

The HHRA showed there was significant hazard to receptors, particularly children, from concentrations of COCs in shallow soils. The most highly-contaminated properties (those with concentrations greater than 3,000 ppm of lead and/or 400 ppm of arsenic) have been addressed through emergency removals conducted by EPA's Removal Group. Concentrations of lead and arsenic that were removed at those properties were as high as 36,800 ppm and 1,880 ppm, respectively. However, elevated concentrations remain at other properties that result in unacceptable long-term risk (up to 4 times the acceptable risk for arsenic and antimony and up to 7 times the acceptable risk for lead). This contamination will be addressed by a remedial action (clean up).

Preliminary Remedial Action Objectives

Preliminary Remedial Action Objectives (PRAOs) are goals developed by EPA to protect human health and the environment. These are the overarching goals that selected cleanup activities should strive to meet. EPA considers current and future site use when determining PRAOs. Future use for OU1 is assumed to continue to be residential and non-residential. The expectation and assumption is that remediation that results in acceptable risks for residential use would also result in acceptable risks for nonresidential uses.

The final RAOs for OU1 soils will be documented in the ROD. The PRAOs are:

1. Mitigate inhalation and ingestion exposures by human receptors to antimony and arsenic in soil resulting in cancer risks that exceed one additional case per ten thousand individuals (1E-04).

2. Mitigate inhalation and ingestion exposures by human receptors to lead in soil resulting in risks exceeding a 5 percent probability of blood lead in children above 10 micrograms per deciliter (µg/dL).

3. Control erosion of antimony, arsenic, and lead in soil by wind and water to prevent the spread of contamination to unimpacted locations and media.

Preliminary Remediation Goals

A Preliminary Remediation Goal (PRG) is the average concentration below which a contaminant does not pose an unacceptable risk. For cancer risk, EPA prefers the risk for additional occurrences to be one in one million (1E-06) or less. This is referred to as the "point of departure." After that is established, other factors are taken into account to determine where within the acceptable range the remediation goals for a given contaminant at a specific site should be established. A 1E-06 risk is often not possible at western mining sites, including the Flat Creek site. Risks from naturally occurring background concentrations in soils at such sites are sometimes in the 1E-04 to 1E-05 range. The RAOs for the Flat Creek site focus on keeping risk below 1E-04.

Selection of PRGs is based on PRAOs, current and expected future land uses, and ARARs. The PRGs are typically presented as chemical- and media-specific values that directly address the PRAOs.

The HHRA identified antimony, arsenic, and lead as the contaminants that constituted unacceptable risk at the site. The PRGs selected for those contaminants in site soils are: 130 mg/kg for antimony, 100 mg/kg for arsenic, and 400 mg/kg for lead. The final remedial goals will be documented in the ROD.

Properties Identified for Remedial Action

Based on the presence of exposure pathways, receptors (particularly children in the case of lead), and elevated concentrations of COCs in shallow soils at properties where emergency removals had not occurred, the HHRA identified seven residential properties where exposures to antimony, arsenic and/or lead exceed the PRGs, indicating a need for cleanup or further investigation.

The HHRA focused on shallow soils and used yard-wide average concentrations for the three COCs. EPA's risk management team considered future land use and other factors to broaden the list of properties to be remediated. Non-residential properties were added, as the lack of zoning allows them to be used for residential purposes in the future. Subsurface depths were included, as disturbances (e.g. building or gardening) could expose contamination in the 2 to 12 inch depth interval. Finally, individual quadrants, rather than yard-wide averages, were used to trigger cleanup for lead or arsenic. Yard-wide averages were used for antimony. As a result, 35 residential and 17 non-residential properties have been indentified for potential cleanup.

Summary of Remedial Action Alternatives

A number of proven, remedial technologies and process options were used to develop remedial alternatives for cleanup. The five alternatives that were screened in the FS consisted of combinations of those technologies and process options.

As shown in Exhibit 4, the main differences between alternatives relate to the following:

- Are contaminated soils capped in place (Alt. 2) or excavated (Alts. 3, 4, and 5)?
- Are excavated soils disposed locally (Alts. 4 and 5) or at a licensed facility elsewhere (Alt. 3)?
- Are excavated soils treated prior to disposal (Alt. 5) or disposed untreated (Alts. 3 and 4)?

For the evaluation, assumptions were made regarding the number of properties that would potentially require cleanup based on the RI sampling results. Those assumptions are detailed in the FS and summarized in the description of EPA's Preferred Alternative (page 8). Fifty-two properties were estimated to require potential cleanup. The actual number of properties and volume of material to be remediated may increase in the design phase, after the ROD is issued, based on new information from properties not sampled during the RI or in areas where additional contamination may be discovered.

Each remedial alternative was evaluated to determine overall effectiveness, implementability, and cost. All alternatives (except Alternative 1) were deemed to have at least a moderate level of effectiveness and were retained for detailed analysis. Alternatives 2 through 5 include institutional controls (ICs). Five-year reviews are required if contaminated soils are knowingly left in place. In Alternatives 3, 4, and 5, such soils are expected to be limited to only a few properties (at most) due to inaccessibility from structures or obstructions. ICs related to the repository (OU3) or other areas of the site (e.g., under Mullan Road) would be addressed as site-wide ICs under OU2.

Exhibit 4. Remedy Components by Alterative

Remedy Component	Alternative				
	1	2	3	4	5
Five-Year Reviews	●	●	●	●	●
Land use controls (as needed to prevent exposure to contaminated soils)		●	●	●	●
In-place capping of contaminated soil		●			
Excavation of contaminated soils			●	●	●
Offsite disposal at licensed solid waste facility (assumed to be 60 miles away)			●		
Disposal at local mine waste joint repository				●	●
Treatment of newly-excavated soils					●

Alternative 1

- **No Further Action**

Est. Total Capital Costs: $0
Est. Total Operations and Maintenance (O&M) Costs (first 50 years): 0
Est. Total Periodic Costs (first 50 years): $480,000
Est. Construction Timeframe: None
Est. Total Alternative Cost (Present Value [PV]): $123,000

Superfund requires EPA to retain a no further action alternative as a baseline for comparison to other alternatives. This alternative would require that site operations be suspended and no further action be taken. Periodic costs are for five-year reviews for a period of 50 years. The alternative is not protective and does not comply with PRAOs.

Alternative 2

- **In-Place Capping of Contaminated Soil**
- **Land Use Controls with Monitoring**
- **Five-Year Reviews**

Est. Total Capital Costs: $897,000
Est. Total O&M Costs (first 50 years): $784,000
Est. Total Periodic Costs (first 50 years): $680,000
Est. Construction Time: less than one season

Est. Total Alternative Cost (PV): $1,292,000

Alternative 2 provides protection of human health through in-place containment (cover) of contaminated surface soil using covers. It would also include construction of a permanent cover over the existing waste repository at the airport to ensure the interim cover installed in 2010 is protective. Two feet of clean cover would be placed over contaminated soils at residential and commercial properties to serve as a permanent cover. The repository at the airport would also receive an earthen cap to ensure protectiveness. Land use controls would be used to provide protection of human health and protect the remedy. Monitoring and five-year reviews would be performed.

Alternative 3

- **Excavation of Contaminated Soils**
- **Offsite Disposal at Licensed Waste Facility**
- **ICs and Five-Year Reviews**

Est. Total Capital Costs: $2,685,000
Est. Total O&M Costs (first 50 years): $0
Est. Total Periodic Costs (first 50 years): $490,000
Est. Construction Time: less than one season
Est. Total Alternative Cost (PV): $2,811,000

Most contaminated soils on individual properties would be excavated to a depth of 18 inches. Confirmation that soils remaining in excavations are below PRGs would be made using visual inspections and sampling and analysis. Excavations would be backfilled with clean soil, covered with topsoil, and revegetated or otherwise restored to match pre-existing surface conditions (e.g., fill and gravel for a driveway). The airport repository would be excavated.

Trucks would transport contaminated soils to the nearest available Class II solid waste facility (approximately 60 miles). Generally, exempt mining waste will be accepted at such a facility without prior treatment, and that assumption was made in the FS. However, final acceptance is determined by the individual facility.

In the event that contamination greater than the PRGs is knowingly left in place, ICs and inspections during five-year reviews would be required on that property to limit exposure and ensure protectiveness. No maintenance or monitoring would be required. Maintenance of filled areas would be the property owner's responsibility.

Alternative 4

- **Excavation of Contaminated Soils**
- **Disposal of Contaminated Soils at Mine Waste Joint Repository**
- **ICs and Five-Year Reviews**

Est. Total Capital Costs: $1,369,000
Est. Total O&M Costs (first 50 years): $0
Est. Total Periodic Costs (first 50 years): $490,000
Est. Construction Time: less than one season
Est. Total Alternative Cost (PV): $1,496,000

As with Alternative 3, most contaminated soils would be excavated to a depth of 18 inches. Confirmation that soils remaining in excavations are below PRGs would be made with visual inspection and sampling and analysis. Excavations would be backfilled with clean soil and topsoil and revegetated, or otherwise restored, to match pre-existing surface conditions. The airport repository would be excavated.

Unlike Alternative 3, trucks would transport contaminated soil to the mine waste joint repository in Wood Gulch (3 miles north of Superior). The repository will be constructed, operated, and maintained under OU3. ICs, five-year reviews, and maintenance and monitoring would be the same as those for Alternative 3.

Alternative 5

- **Excavation of Contaminated Soils**
- **Treatment of Newly-Excavated Soils**
- **Disposal of Contaminated Soils at Mine Waste Joint Repository**
- **ICs and Five-Year Reviews**

Est. Total Capital Costs: $2,048,000
Est. Total O&M Costs (first 50 years): $0
Est. Total Periodic Costs (first 50 years): $490,000
Est. Construction Time: less than one season
Est. Total Alternative Cost (PV): $2,174,000

Alternatives 4 and 5 are the same, except prior to disposal, newly excavated soils would be treated with a stabilization/solidification agent at a staging area adjacent to the repository. ICs, five-year reviews, and maintenance and monitoring would be as for Alternatives 3 and 4.

Evaluation of Alternatives

The remedial alternatives were evaluated in detail with respect to seven of EPA's nine evaluation criteria (Exhibit 5). The criteria fall into three groups: Threshold, Primary Balancing, and Modifying. Each alternative (except no further action) must meet the Threshold criteria. The Primary Balancing criteria are used to weigh major trade-offs among alternatives. The Modifying criteria are State and public acceptance and can be fully evaluated only after public comment is received on this Proposed Plan.

Exhibit 5. FS Evaluation Criteria

Criterion	Description
Overall protection of human health and the environment	Determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through ICs, engineering controls, or treatment.
Compliance with ARARs	Evaluates whether the alternative meets Federal, State, and Tribal environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Long-term effectiveness and permanence	Considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of toxicity, mobility, or volume through treatment	Evaluates an alternative's use of treatment to reduce a) the harmful effects of principal contaminants, b) the contaminant's ability to move in the environment, and c) the amount of contamination remaining after remedy implementation.
Short-term effectiveness	Considers the length of time needed to implement an alternative and the risk the alternative poses to workers, residents, and the environment during implementation.
Implement-ability	Considers the technical and administrative feasibility of implementing the alternative, including factors such as the availability of materials and services.
Cost	Includes estimated capital and annual operations and maintenance costs, as well as present value (PV) cost. PV cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support agency acceptance	Considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and proposed plan.
Community acceptance	Considers whether the local community agrees with the EPA's analyses and preferred alternative. Comments received on the proposed plan are an important indicator of community acceptance.

The following is a discussion of how the various alternatives compare against the threshold and modifying evaluation criteria.

Overall Protection of Human Health and the Environment

All of the alternatives, except Alternative 1, are protective of human health and the environment.

Alternative 2 addresses the PRAOs primarily through in-place capping of contaminated soils using covers to reduce risks from contact with these materials. Capping provides an exposure barrier to the contaminated soils. However contaminated soils still remain beneath covers across a large extent of the site and could pose risks if the covers are compromised.

Alternatives 3, 4, and 5 address PRAOs primarily through excavation and disposal of contaminated soils. Long-term protection of human health and the environment is more certain than alternatives that leave contaminated soils in place. Alternative 3 uses offsite disposal at licensed solid waste disposal facilities and Alternatives 4 and 5 use on-site disposal at the Wood Gulch repository.

In Alternative 5, contaminated soils are treated using solidification/stabilization prior to disposal. Thus overall protection of human health and the environment is more certain than alternatives that do not employ treatment.

Compliance with ARARs

Alternative 1 is not compliant with ARARs since no further action is taken. All remaining alternatives are compliant. These include location-action-, and chemical-specific ARARs.

Long-term Effectiveness and Permanence

No additional cleanup measures are initiated for Alternative 1, and contaminated soils are left exposed. Alternative 2 addresses contaminated soils primarily through in-place capping using covers to reduce risks from soil contact. This provides an exposure barrier to contaminated soils; however, contamination remains beneath the covers across a large extent of OU1 and could pose risks if the covers are compromised. Thus, long-term effectiveness and permanence is not as certain as for Alternatives 3, 4, and 5 where contaminated soils are excavated and disposed.

Long-term effectiveness and permanence is highest for Alternative 5, as newly-excavated contaminated soils are treated via solidification/stabilization before disposal at the on-site repository. This provides added protection from leaching of contaminants to soils and groundwater.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Alternatives 1 through 4 provide no treatment. Therefore, they do not reduce toxicity, mobility, or volume of contaminants through treatment. By contrast, Alternative 5 treats contaminated soils by solidification/stabilization prior to disposal in the on-site repository. Treatment would provide additional protection to surrounding soils and groundwater from contaminated soils that are potentially leachable.

Short-Term Effectiveness

Alternative 1 uses no additional cleanup measures and contaminated soils are left exposed. Thus there are no short-term effectiveness issues.

The remaining alternatives address short-term risks to workers, the community, and the environment. Alternative 2 has the smallest disturbance (construction of covers) to contaminated soils. Its disturbance is primarily at the surface and entails importation and placement of clean cover material over contaminated soils. Trucks used to haul offsite borrow for construction of the covers slightly increase short-term risks to the community. Transport and placement of borrow has potential environmental impacts from equipment emissions and disturbance of borrow locations.

Alternatives 3, 4, and 5 involve excavating contaminated soils, which creates a greater short-term disturbance. They also require importation of greater amounts of imported material for backfill of excavations. Transport of borrow materials for backfilling excavations increases truck traffic and related risks workers and to the community as compared to Alternative 2.

With Alternatives 3, 4, and 5, the hauling of contaminated soils for disposal increases short-term risks. Risks increase with distance traveled and population density. As such, risks are highest for Alternative 3, which specifies disposal at an off-site, licensed, solid waste facility.

For Alternatives 2, 3, 4, and 5, short-term risks to workers would be mitigated through use of safety measures such as personal protective equipment. Short-term risks to workers, the community, and the environment could be mitigated through measures such as water-based dust suppression, traffic controls, and worker training. Land use controls could be quickly implemented to address potential exposure to contaminated soils.

Implementability

Alternative 1 requires no further action other than five-year site reviews, so this alternative has no implementability issues.

For Alternative 2, the construction resources and materials needed to construct the quantity of covers should be available, but borrow materials would require transportation to properties requiring covers. There may be difficulties transitioning covers into existing grades on properties that are relatively level while still facilitating residential uses. There may be additional difficulties associated with implementation of ICs and access controls. Maintenance of covered areas and monitoring, especially on residential properties, could provide difficulties in the future.

For Alternatives 3, 4, and 5, excavation of contaminated soils could be difficult in areas of underground utilities, trees, roads, and near structures. The construction resources and materials needed to backfill excavations should be available, but borrow materials would require transportation to the properties requiring backfill. Logistical coordination is needed since both contaminated soils and offsite borrow would be transported simultaneously.

Alternative 3 specifies offsite disposal of large volumes of contaminated soils and will require coordination with trucks transporting backfill to excavation areas as well as additional coordination with the offsite disposal facilities. The ability to obtain the necessary approvals and the logistics of transporting and disposing of large volumes of contaminated soils for long distances to offsite disposal facilities decreases the implementability of this alternative.

Alternative 5 has an additional challenge to implementability as the treatment process requires additional coordination for delivery of stabilization agents. Implementation of the treatment process before disposal at the Wood Gulch Repository also increases complexity.

Cost

The estimated present worth cost of Alternative 1 is the lowest, as that alternative requires only implementation of Five-year reviews. For the remaining alternatives, the cost from lowest to highest is: Alternative 2, 4, 3, and 5. The estimated present worth cost of Alternative 2 (capping) is approximately half that of the most expensive alternative (Alternative 5). Alternatives 3 and 4 differ in cost primarily because Alternative 3 requires off-site disposal and Alternative 4 uses the on-site Wood Gulch Repository. Alternative 5 is the most costly alternative, because it requires the additional step of treatment of newly-excavated wastes prior to disposal.

State Acceptance

MDEQ generally concurs with EPA's selection of Alternative 4 for the Preferred Alternative. Final concurrence has not yet been obtained.

Community Acceptance

Community acceptance will be evaluated after the public comment period ends and will be described in the ROD for the site.

EPA's Preferred Alternative (Alternative 4)

EPA's Preferred Alternative for cleanup of contamination at OU1 is Alternative 4 (*Excavation and Disposal of Contaminated Soils at the Mine Waste Joint Repository*). Alternative 4 provides protection of human health through excavation of contaminated soils at individual properties and at the repository at the airport. Disposal of contaminated soil would be at the newly constructed Wood Gulch repository.

Est. Total Capital Costs: $1,369,000
Est. Total O&M Costs (first 50 years): $0
Est. Total Periodic Costs (first 50 years): $490,000
Est. Construction Time: less than one season
Est. Total Alternative Cost (PV): $1,496,000

The Preferred Alternative offers an equal level of overall protectiveness of human health and the environment and compliance with ARARs as Alternatives 3 and 5 at a significantly lower cost. It is protective of human health and the environment and complies with ARARs. The Preferred Alternative is the most implementable of all alternatives, and has equal or better short-term effectiveness. As with Alternatives 2 and 5, it keeps the excavated soils in the general area where they were produced, reducing energy costs for transportation and minimizing transportation-related safety issues.

Unlike Alternative 2, the majority of contaminated soils is removed from individual properties and the airport repository and is consolidated in a single location that can be efficiently managed and monitored. Excavation offers less long-term disruption to local residents than capping and removes the perceived stigma of contamination on a residential property. Alternative 5 provides treatment, but the difficulties and additional costs to implement treatment outweigh the limited benefit due to relatively low concentrations of contaminants in newly-excavated soils.

The primary implementation details are:

- During construction, water or chemical-based suppression would be used to limit dust. Temporary lay down areas and access roads would be constructed to limit disturbance of contaminated soil.
- Clean soil would be brought from offsite and analyzed for contaminants before use.
- If elevated contamination is knowingly left in place property-specific ICs would address exposure. Such ICs are expected to be limited to only a few properties - at most. Five-year reviews would be required in this instance, and the community would be kept informed during implementation and by the Five-year reviews.

The summary of the major components of this remedy and their associated quantities is shown in Exhibit 6.

Exhibit 6. Remedy Summary

Remedial Component	Unit	Quantity
Surface Area of Removal	Acres	6.2
Contaminated Soil Removed	Loose Cubic Yards	29,904
Gravel Required for Excavations		1,207
Backfill Required for Excavations		11,257
Topsoil Required for Excavations		4,438
Residential Properties Remediated	Each	35
Non-Residential Properties Remediated	Each	17

Quantities summarized in this exhibit are contained in the FS.

Based on the HHRA and the subsequent risk management decisions, the residential properties included for cleanup are: RY007, RY008, RY021, RY023, RY026, RY036, RY043, RY061, RY086, RY089, RY091, RY092, RY095, RY101, RY102, RY108, RY130, RY144, RY148, RY160, RY176, RY193, RY234, RY257, RY271, RY277, RY284, RY352, RY422, RY483, RY485, RY523, RY597, RY600, and RY616. The non-residential properties are: RY097, RY098, RY099, RY100, RY111, RY115, RY136, RY146, RY213, RY289, RY332, RY366, RY369, RY386, RY398, RY402, and RY627. These properties are shown above in purple to illustrate their distribution throughout the community. They are not identified to protect owner privacy.

Opportunities for Public Involvement

Public Meeting

EPA will provide a short presentation about the proposed plan at a public meeting in October 2011. It's a great opportunity to learn more about the details.

Flat Creek/IMM Superfund Site
Public Comment Meeting

October 12, 2011
6:30 to 8:30 pm
Ambulance Barn
1202 5th Ave. East
Superior, MT

If you like, you can provide your comment orally at the public meeting, and the meeting stenographer will record it.

Contacts

If you have questions or need additional help, please feel free to contact the following representatives:

U.S. EPA, Region 8
Helena, MT
1-866-457-2690 (toll free)

Leslie Sims
Remedial Project Manager
(406) 457-5032
Sims.leslie@epa.gov

Montana DEQ
Helena, MT
Daryl Reed
(406) 841-5041
dreed@mt.gov

Written Comments

The public has 30 days to comment on this Proposed Plan. The public comment period runs from October 3, 2011 to November 3, 2011. You can submit a comment in writing (by mail, email, or at the public meeting).

The mailing address for written comments is:

Leslie Sims
U.S. EPA, Region 8, 10 West 15th Street, Suite 3200, Helena, MT 59626
sims.leslie@epa.gov

Documents

All public project reports and documents are available for viewing at EPA's website or at one of the document repositories. These are also excellent sources for all sorts of project information (fact sheets, brochures, etc.).

www.epa.gov/region8/superfund/mt/flatcreek/index.html

EPA Superfund Records Center
10 West 15th Street, Suite 3200, Helena, MT

Mineral County Courthouse
300 River Street, Superior, MT

Useful Terms

Understanding environmental cleanup can be daunting for the average person. The following are definitions of commonly used terms at the site to aid your understanding of this document.

- **Applicable or relevant and appropriate requirements (ARARs).** State or federal statutes or regulations that pertain to protection of human health and the environment in addressing specific conditions or use of a particular cleanup technology at a Superfund site.

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

- **Exposure Pathway**. The path from sources of pollutants via, soil, water, or food to humans and other species or settings.

- **Institutional Controls (ICs).** ICs are actions, such as legal controls, that help minimize the potential for human exposure to contamination by ensuring appropriate land or resource use.

- **National Priorities List (NPL).** EPA's list of the most serious uncontrolled or abandoned hazardous substance sites identified for possible long-term remedial action under Superfund. A site must be on the NPL to receive money from the Trust Fund for remedial action.

- **Operable Unit (OU).** A designation based on geography or other characteristics that defines a specific area of a site and enables the Superfund process to move forward in different areas at different times, speeding up the overall cleanup process at the site.

- **Operation and Maintenance (O&M).** Activities conducted after a Superfund site action is completed to ensure that the action is effective.

- **Present Value (PV)**. The present worth (of a sum payable in the future) calculated by deducting interest that will accrue between the present and future date.

- **Remedial Action (RA)**. The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

- **Interim Removal Action.** Short-term immediate actions taken to address releases of hazardous substances that require expedited response.

- **Record of Decision (ROD)**. A public document that explains which cleanup alternative(s) will be used at NPL sites under CERCLA.

- **Superfund.** The program that funds and carries out EPA hazardous waste emergency and long-term removal and remedial activities. These activities include establishing the NPL, investigating sites for inclusion on the list, determining their priority, and conducting and/or supervising cleanup and other remedial actions.

US Environmental Protection Agency
10 West 15th Street, Suite 3200
Helena, Montana 59626

Attn: Leslie Sims

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Please look inside for EPA's Proposed Plan for cleanup and for information on the upcoming public meeting on October 12, 2011!

APPENDIX B

Summary of Federal and State Applicable Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBCs)

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Appendix B
Summary of Federal and State
Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered Information (TBCs)
Flat Creek IMM Site

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical-Specific	Location -Specific	Action-Specific
Federal ARARs and TBCs							
National Historic Preservation Act (NHPA) National Register of Historic Places Determinations of eligibility for inclusion in the National Register of Historic Places Protection of historic properties Requirements for environmental information documents and third-party agreements for EPA actions subject to NEPA Historic Sites Act of 1935	16 United States Code (U.S.C.). 470 36 Code of Federal Regulations (CFR) 60 36 CFR 63 36 CFR 800 40 CFR 6.301(b) 16 U.S.C. 461, et seq. 40 CFR 6.310(a)	Applicable	This statute and implementing regulations require federal agencies to take into account the effect of this response action upon any district, site, building, structure, or object that is included in or eligible for the National Register of Historic Places (generally, 50 years old or older).	It is not anticipated that properties that are eligible for the National Register of Historic Places exist within the areas for remediation at OU1. If cultural resources on or eligible for the national register are identified, it will be necessary to determine if there will be an adverse effect and, if so, how the effect may be minimized or mitigated, in consultation with the appropriate State Historic Preservation Office.		✓	
Archaeological and Historic Preservation Act Requirements for environmental information documents and third-party agreements for EPA actions subject to NEPA Protection of archaeological resources	16 U.S.C. 469 40 CFR 6.301(c) 43 CFR 7	Applicable	This statute and implementing regulations establish requirements for the evaluation and preservation of historical and archaeological data, which may be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	The unauthorized removal of archaeological resources from public or Indian lands is prohibited without a permit and any archaeological investigations at a site must be conducted by a professional archaeologist.		✓	

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical-Specific	Location -Specific	Action-Specific
Federal ARARs and TBCs							
Fish and Wildlife Coordination Act Responsible official requirements Rules implementing the Fish and Wildlife Conservation Act of 1980	16 U.S.C. 661 et seq., 40 CFR 6.302(g) 50 CFR 83	Applicable	This statute and implementing regulations require coordination with federal and state agencies for federally funded projects to ensure that any modification of any stream or other water body affected by any action authorized or funded by the federal agency provides for adequate protection of fish and wildlife resources.	Several properties to be remediated under OU1 are located adjacent to the Clark Fork River and appear to be within the special flood hazard area delineated by Zone A. If the remedial action involves activities that affect wildlife and/or non-game fish, federal agencies must first consult with the USFWS and the relevant state agency with jurisdiction over wildlife resources.		✓	
Floodplain Management Regulations	40 CFR 6.302(b) Executive Order No. 11988	Applicable	These require that actions be taken to avoid, to the extent possible, adverse effects associated with direct or indirect development of a floodplain, or to minimize adverse impacts if no practicable alternative exists.	Several properties to be remediated under OU1 are located adjacent to the Clark Fork River and appear to be within the special flood hazard area delineated by Zone A. These standards are applicable to all actions within these floodplain areas.		✓	
Protection of Wetlands Regulations	40 CFR 6, Appendix A Executive Order No. 11990	Applicable	This ARAR requires federal agencies and the PRPs to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists.	It is not anticipated that jurisdictional wetlands exist within the areas for remediation at OU1. However if jurisdictional wetlands are delineated within areas for designated for remediation, these standards would be applicable.		✓	✓
Endangered Species Act (ESA) Responsible official requirements Endangered and threatened wildlife and plants Interagency cooperation-Endangered Species Act of 1973, as amended	16 U.S.C. 1531 40 CFR 6.302(h) 50 CFR 17 50 CFR 402	Applicable	This statute and implementing regulations provide that federal activities not jeopardize the continued existence of any threatened or endangered species. ESA Section 7 requires consultation with the United States Fish and Wildlife Service (USFWS) to identify the possible presence of protected species and mitigate potential impacts on such species.	Two endangered species (Canada lynx and bull trout) and two threatened or candidate species (wolverine and whitebark pine) have been identified in Mineral County. If threatened or endangered species are identified within the areas identified for remediation, activities must be designed to conserve the species and their habitat.		✓	

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical-Specific	Location-Specific	Action-Specific
Federal ARARs and TBCs							
Migratory Bird Treaty Act List of Migratory Birds	16 U.S.C. 703, et seq. 50 CFR 10.13	Relevant and Appropriate	Makes it unlawful to "hunt, take, capture, kill," or take various other actions adversely affecting a broad range of migratory birds, without the prior approval of the Department of the Interior.	The selected remedial actions will be carried out in a manner to avoid adversely affecting migratory bird species, including individual birds or their nests.		✓	
Bald Eagle Protection Act	16 U.S.C. 668, et seq.	Applicable	This requirement establishes a federal responsibility for protection of bald and golden eagles, and requires continued consultation with the U.S. Fish and Wildlife Service during remedial design and remedial construction to ensure that any cleanup of the site does not unnecessarily adversely affect the bald and golden eagles.	If bald or golden eagles are identified within the areas identified for remediation, activities must be designed to conserve the species and their habitat.		✓	
Native American Graves Protection and Repatriation Act	25 U.S.C. 3001, et seq.	Applicable	The Act prioritizes ownership or control over Native American cultural items, including human remains, funerary objects and sacred objects, excavated or discovered on federal or tribal lands. Federal agencies and museums that have possession or control over Native American human remains and associated funerary objects are required under the Act to compile an inventory of such items and, to the extent possible, identify their geographical and cultural affiliation. Once the cultural affiliation of such objects is established, the federal agency or museum must expeditiously return such items, upon request by a lineal descendent of the individual Native American or tribe identified.	No known cultural items, including human remains, funerary objects and sacred objects are located on the site. If such items are discovered during excavation activities then the provisions of this regulation will be applicable.		✓	✓

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical-Specific	Location-Specific	Action-Specific
Federal ARARs and TBCs							
American Indian Religious Freedom Act	42 U.S.C. 1996 et seq.	Applicable	This Act establishes a federal responsibility to protect and preserve the inherent right of American Indians to believe, express and exercise the traditional religions of American Indians. This right includes, but is not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.	The Act requires Federal agencies to protect Indian religious freedom by refraining from interfering with access, possession and use of religious objects, and by consulting with Indian organizations regarding proposed actions affecting their religious freedom.		✓	
Clean Water Act	33 U.S.C. 1251 et seq. 33 CFR 330	Relevant and Appropriate	Regulates discharge of dredged or fill materials into waters of the United States.	Several properties to be remediated under OU1 are located adjacent to the Clark Fork River and appear to be within the special flood hazard area delineated by Zone A. No discharges are planned during remedial actions into waters of the United States, but measures must be taken to prevent any discharges. As provided under Section 303 of the Clean Water Act, 33 U.S.C. 1313, the State of Montana has promulgated water quality standards. See the discussion concerning State surface water quality requirements.		✓	
National Ambient Air Quality Standards	40 CFR 50.6 (PM-10) 40 CFR 50.12 (lead)	Applicable	These provisions establish standards for PM-10 and lead emissions to air. (Corresponding state standards are found at ARM 17.8.222 [lead] and ARM 17.8.223 [PM-10].) The PM-10 standard is 150 micrograms per cubic meter ($\mu g/m^3$), 24-hour average concentration, and the lead standard is 1.5 $\mu g/m^3$, maximum arithmetic mean averaged over a calendar quarter.	The selected remedial actions will be carried out in a manner that will comply with all the National Ambient Air Quality Standards.	✓		✓

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical-Specific	Location-Specific	Action-Specific
Federal ARARs and TBCs							
Protection and Enhancement of the Cultural Environment	16 U.S.C. 470 Executive Order No. 11593	Applicable	Directs federal agencies to institute procedures to ensure programs contribute to the preservation and enhancement of non-federally owned historic resources.	Consultation with the Advisory Council on Historic Preservation is required if remedial activities should threaten cultural resources.		✓	
The Archaeological Resources Protection Act of 1979	16 U.S.C. 470aa-47011	Relevant and Appropriate	Requires a permit for any excavation or removal of archeological resources from public lands or Indian lands.	Substantive portions of this act may be relevant and appropriate if archeological resources are encountered during onsite remedial action activity involving public lands or Indian lands.		✓	
Federal and State RCRA Subtitle D and Solid Waste Management Requirements	40 CFR 257	Applicable	Establishes criteria under Subtitle D of the Resource Conservation and Recovery Act for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment.	Solid waste requirements are listed herein because contaminated soil to be addressed in the remedial action is considered solid waste.			✓
Federal RCRA Subtitle C Requirements	42 U.S.C. Section 9621, et seq. 40 CFR 261-268	Relevant and Appropriate	RCRA Subtitle C and implementing regulations are designated as applicable for any hazardous wastes that are actively “generated” or that were “placed” or “disposed” after 1980.	RCRA Subtitle C requirements will generally not be relevant and appropriate for those wastes for which EPA has specifically determined that Subtitle C regulation is not warranted (i.e., wastes covered by the Bevill exclusion). Thus mining contaminated soil is assumed to not be classified as hazardous waste. However these regulations may be relevant and appropriate to any unknown, potentially hazardous wastes encountered during excavation of contaminated soils (e.g. buried drums, etc.).			✓

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical-Specific	Location -Specific	Action-Specific
Federal ARARs and TBCs							
Occupational Safety and Health Act	29 CFR 1910	To Be Considered	Provides standards and guidance for worker protection during conduct of construction activities.	OSHA regulations are construction standards and not environmental standards. These regulations are requirements for remedial activities as provided by law.			
Federal Aviation Administration (FAA) Regulations	14 CFR 77.13, et seq. 14 CFR 139.341 14 CFR 157	To Be Considered	Describes the standards used for determining obstructions to air navigation, navigational aids, or navigational facilities. Provides procedures for identifying, marking, and lighting construction and other unserviceable areas. Includes procedures for providing notice of construction, alteration, activation, and deactivation of airports.	FAA regulations are construction standards and not environmental standards. While no permit is required for response actions conducted entirely on-site, these regulations would be considered for onsite remedial activities at the existing repository at the Mineral County Airport.			
FEMA Flood Insurance Rate Map	Map ID 3001280005A, (01/05/2001)	To Be Considered	The FEMA flood insurance rate map (FIRM) indicates the special flood hazard area delineated by Zone A and areas outside delineated by Zone X.	Several properties to be remediated under OU1 are located adjacent to the Clark Fork River and appear to be within the special flood hazard area delineated by Zone A. This map contains TBC information to be used when remediating properties within these floodplain areas.			

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
Groundwater Protection	Administrative Rules of Montana (ARM) 17.30.1005 ARM 17.30.1006 ARM 17.30.1011	Applicable	Explains the applicability and basis for the groundwater standards in ARM 17.30.1006, which establish the maximum allowable changes in groundwater quality and may limit discharges to groundwater. Provides that groundwater is classified I through IV based on its present and future most beneficial uses and also sets the standards for the different classes of groundwater listed in department Circular WQB-7.[1] This section provides that any groundwater whose existing quality is higher than the standard for its classification must be maintained at that high quality in accordance with MCA 75-5-303 and ARM 17.30.7.	The OU addressed in this feasibility study does not address contaminated groundwater. However, measures will be taken to prevent contamination of groundwater.	✓		✓
Montana Water Quality Act and Regulations	Montana Code Annotated (MCA) 75-5-101, et seq. ARM 17.30.607	Applicable	The Montana Water Quality Act establishes requirements for restoring and maintaining the quality of surface and groundwater. Montana's regulations classify State waters according to quality, place restrictions on the discharge of pollutants to State waters, and prohibit degradation of State waters. Tributaries to the Clark Fork River have been classified B-1. Flat Creek and its tributaries are part of the Clark Fork River drainage.	The OU addressed in this feasibility study does not address contaminated groundwater or surface water. However, several properties to be remediated under OU1 are located adjacent to the Clark Fork River and appear to be within the special flood hazard area delineated by Zone A. Due to the proximity of remedial actions to surface waters, measures will be taken to prevent contamination of surface waters.	✓		✓

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
Montana Water Quality Act and Regulations (Continued)	ARM 17.30.623		Waters classified B-1 are, after conventional treatment for removal of naturally present impurities, suitable for drinking, culinary and food processing purposes. These waters are also suitable for bathing, swimming and recreation, growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers, and use for agricultural and industrial purposes. This regulation also specifies water quality standards for waters classified B-1, which set limits on the allowable levels of pollutants and prohibit certain discharges to those waters.				
	ARM 17.30.637		Provides that surface waters must be free of substances attributable to industrial practices or other discharges that will: (a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines; (b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials; (c) produce odors, colors or other conditions which create a nuisance or render undesirable tastes to fish flesh or make fish inedible; (d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; (e) create conditions which produce undesirable aquatic life.				

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
	MCA 75-5-303 MCA 75-5-605 ARM 17.30.705		This provision states that existing uses of state waters and the level of water quality necessary to protect the uses must be maintained and protected. This section of the Montana Water Quality Act prohibits the causing of pollution of any state waters. Pollution is defined as contamination or other alteration of physical, chemical, or biological properties of state waters which exceeds that permitted by the water quality standards. Also, it is unlawful to place or cause to be placed any wastes where they will cause pollution of any state waters Existing and anticipated uses of surface water and water quality necessary to support those uses must be maintained and protected unless degradation is allowed under the nondegradation rules at ARM 17.30.708.				
Substantive MPDES Permit Requirements	ARM 17.30.1342-1344	Applicable	These set forth the substantive requirements applicable to all MPDES and National Pollutant Discharge Elimination System (NPDES) permits.	Several properties to be remediated under OU1 are located adjacent to the Clark Fork River and appear to be within the special flood hazard area delineated by Zone A. No discharges are planned during remedial actions into waters of the State of Montana, but measures must be taken to prevent any discharges.[2]	✓		✓
Stormwater Runoff Control Requirements	ARM 17.24.633	Applicable	All surface drainage from a disturbed area must be treated by the best technology currently	These requirements would be applicable to disturbed remedial areas.			✓

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
			available.				
	ARM 17.30.1341		DEQ has issued general storm water permits for certain activities. The substantive requirements of the permits are applicable for the following activities: for construction activities B General Permit for Storm Water Discharge Associated with Construction Activity, Permit No. MTR100000 (April 16, 2007).	Generally, the permits require best management practices (BMP) and all reasonable steps to minimize or prevent any discharge which has a reasonable likelihood of adversely affecting human health or the environment.			
Montana Ambient Air Quality Regulations	ARM 17.8.206	Applicable	This provision establishes sampling, data collection, and analytical requirements to ensure compliance with ambient air quality standards.	No Comments.	✓		✓
	ARM 17.8.220		Settled particulate matter shall not exceed a thirty (30) day average of 10 grams per square meter.				
	ARM 17.8.222		Lead emissions to ambient air shall not exceed a ninety (90) day average of 1.5 micrograms per cubic liter of air.				
	ARM 17.8.223		PM-10 concentrations in ambient air shall not exceed a 24 hour average of 150 micrograms per cubic meter of air and an annual average of 50 micrograms per cubic meter of air.				
	ARM 17.8.304(2)		Emissions into the outdoor atmosphere shall not exhibit an opacity of 20% or greater averaged over 6 consecutive minutes.				
	ARM 17.8.308		There shall be no production, handling, transportation, or storage of any material, use of any street, road, or parking lot, or operation of a construction site or demolition				

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
	ARM 17.8.604(2)		project unless reasonable precautions are taken to control emissions of airborne particles. The 20% opacity limit described above is also specified for these activities. Lists material that may not be disposed of by open burning except as approved by the department.	Open burning may be applicable if actions addressed clearing and grubbing debris through open burning.			
Montana Mine Reclamation Regulations	ARM 17.24.761	Relevant and Appropriate	Specifies measures for controlling fugitive dust emissions during reclamation activities, such as watering, chemically stabilizing, or frequently compacting and scraping roads, promptly removing rock, soil or other dust-forming debris from roads, restricting vehicle speeds, and promptly revegetating regraded lands.	Some measures identified in this regulation could be considered relevant and appropriate to control fugitive dust emissions in connection with excavation, earth moving and transportation activities conducted as part of the remedy at the site.			
Montana Antiquities Act	MCA 22-3-421, et seq	Relevant and Appropriate	Addresses the responsibilities of State agencies regarding historic and prehistoric sites including buildings, structures, paleontological sites, archaeological sites on state owned lands	If historic or prehistoric sites are discovered during excavation activities on any state-owned lands then the provisions of this regulation may apply. These regulations may be relevant and appropriate for lands with other types of ownership.		✓	
Montana Human Skeletal Remains and Burial Site Protection Act	MCA 22-3-801	Applicable	Provides that all graves within the State of Montana are adequately protected.	If human skeletal remains or burial site are encountered during remedial activities at the site, then requirements will be applicable.		✓	✓
Montana Floodplain and Floodway Management Act and Regulations	MCA 76-5-101, et seq. ARM 36.15.601, et seq.	Applicable	Specifies types of uses and structures that are allowed or prohibited in the designated 100-year floodway and floodplain. These regulations prohibit, in both the floodway and the floodplain, solid and hazardous waste disposal and	Several properties to be remediated under OU1 are located adjacent to the Clark Fork River and appear to be within the special flood hazard area delineated by Zone A. These standards are applicable to all		✓	

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
			the storage of toxic or hazardous materials.	actions within these floodplain areas.			
Montana Natural Streambed and Land Preservation Act and Regulations	MCA 75-7-101, et.seq. ARM 36.2.401, et.seq.	Applicable	Establishes minimum standards which would be applicable if a response action alters or affects a streambed, including any channel change, new diversion, riprap or other streambank protection project, jetty, new dam or reservoir or other commercial, industrial or residential development. Projects must be designed and constructed using methods that minimize adverse impacts to the stream (both upstream and downstream) and future disturbances to the stream.	Several properties to be remediated under OU1 are located adjacent to the Clark Fork River and appear to be within the special flood hazard area delineated by Zone A. If the remedial actions will alter or affect a streambed or its banks, the adverse effects of any such action must be minimized.		✓	✓
Montana Natural Streambed and Land Preservation Act and Regulations (continued)	MCA 87-5-502 and 504	Applicable	Provides that a state agency or subdivision shall not construct, modify, operate, maintain or fail to maintain any construction project or hydraulic project which may or will obstruct, damage, diminish, destroy, change, modify, or vary the natural existing shape and form of any stream or its banks or tributaries in a manner that will adversely affect any fish or game habitat.				
Montana Solid Waste Requirements	MCA 75-10-212 ARM 17.50.523	Applicable	Prohibits dumping or leaving any debris or refuse upon or within 200 yards of any highway, road, street, or alley of the State or other public property, or on privately owned property where hunting, fishing, or other recreation is permitted. Specifies that solid waste must be transported in such a manner as to prevent its discharge, dumping, spilling or leaking from the transport vehicle.	The listed requirements apply to the offsite transportation of solid wastes to disposal facilities.			✓

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
	ARM 17.50.1009(1)(c)		Requires that solid waste facilities not discharge pollutants in excess of state standards. A solid waste facility must contain a leachate collection system unless there is no potential for migration of a constituent in Appendix I or II to 40 CFR 258.	While a repository for placement of the wastes from this OU may be obtained and developed as part of other response actions for this site, the placement of the wastes from the remedial actions for OU1 must be consistent with these applicable requirements.			
	ARM 17.50.1204		Solid waste facilities must either be designed to ensure that MCLs are not exceeded or the solid waste facility must contain a composite liner and leachate collection system that complies with specified criteria.				
	ARM 17.50.1109		Requires a run-on control system to prevent flow onto the active portion of the solid waste facility during the peak discharge from a 25-year storm and a run-off control system from the active portion of the solid waste facility to collect and control at least the water volume resulting from a 24-hour, 25-year storm.				
	ARM 17.50.1403		Sets forth closure requirements for solid waste facilities. Solid waste facilities must meet the following criteria: (1) install a final cover that is designed to minimize infiltration and erosion; (2) design and construct the final cover system to minimize infiltration through the closed unit by the use of an infiltration layer that contains a minimum 18 inches of earthen material and has a permeability less than or equal to the permeability of any bottom liner, barrier layer, or				

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
			natural subsoils or a permeability no greater than 1 X 10-5 cm/sec, whichever is less; and (3) minimize erosion of the final cover by the use of a seed bed layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.				
	ARM 17.50.1404		Post closure care requires maintenance of the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the cover and compliance with the groundwater monitoring requirements found at ARM Title 17, chapter 50, subchapter 13.				
	MCA 75-10-206		Allows variances to be granted from solid waste regulations if failure to comply with the rules does not result in a danger to public health or safety or compliance with specific rules would produce hardship without producing benefits to the health and safety of the public that outweigh the hardship.				

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
Noxious Weeds	MCA 7-22-2101 (8)(a) ARM 4.5.201, et seq.	Applicable	Defines "noxious weeds" as any exotic plant species established or that may be introduced in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities and that is designated: (I) as a statewide noxious weed by rule of the department; or (ii) as a district noxious weed by a board, following public notice of intent and a public hearing.	Applicable requirements for the alternatives which include establishment of seed during restoration.			✓
Occupational Health Act	MCA 50-70-101, et seq ARM 17.74.101 ARM 17.74.102	To Be Considered	Addresses occupational noise. In accordance with this section, no worker shall be exposed to noise levels in excess of the levels specified in this regulation. Addresses occupational air contaminants. The purpose of this rule is to establish maximum threshold limit values for air contaminants under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects.	OSHA regulations are construction standards and not environmental standards. These regulations would be considered for onsite remedial activities. This regulation addresses only limited categories of workers and for most workers the similar federal standard in 29 CFR 1910.95 applies. In accordance with this rule, no worker shall be exposed to air contaminant levels in excess of the threshold limit values listed in the regulation. This regulation addresses only limited categories of workers and for most workers the similar federal standard in 29 CFR 1910.1000 applies			

Statues, Regulations, Standards, or Requirements	Citations or References	ARAR Determination	Description	Comment	Chemical -Specific	Location -Specific	Action-Specific
State of Montana ARARs and TBCs							
Montana Safety Act	MCA 50-71-201 through 203	To Be Considered	States that every employer must provide and maintain a safe place of employment, provide and require use of safety devices and safeguards, and ensure that operations and processes are reasonably adequate to render the place of employment safe.	The employer must also do everything reasonably necessary to protect the life and safety of its employees during remedial activities.			
Employee and Community Hazardous Chemical Information Act	MCA 50-78-201, 202, and 204	To Be Considered	States that each employer must post notice of employee rights, maintain at the work place a list of chemical names of each chemical in the work place, and indicate the work area where the chemical is stored or used.	Employees must be informed of the chemicals at the work place and trained in the proper handling of the chemicals during remedial activities.			

[1]Montana Department of Environmental Quality, Water Quality Division, Circular DEQ-7, Montana Numeric Water Quality Standards (August 2010).
[2]Montana's MPDES regulations are more stringent than the Federal NPDES regulations

Acronyms

ARAR	Applicable or Relevant and Appropriate Requirements
ARM	Administrative Rules of Montana
BTCA	best technology currently available
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
MCA	Montana Code Annotated
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
OU	operable unit
PRP	potentially responsible party
TBCs	to be considered information
U.S.C	United States Code
USFWS	United States Fish and Wildlife Services

Color Code Legend

(green)	ARARs that only apply to alternatives which include disposal at a local engineered repository.
(yellow)	Regulations that are not considered environmental or facility location standards but are important regulations for remedial alternatives. These are “to be considered.”
(lavender)	Groundwater ARARs that will potentially apply to OU2 but not necessarily OU1 since groundwater is not identified as contaminated media.

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APPENDIX C

Present Value and Cost Estimate Summary

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Present Value and Cost Estimate Summary

Alternative 4
Excavation and Disposal of Contaminated Soils at the Mine Waste Joint Repository

TABLE PV-4

PRESENT VALUE ANALYSIS

Alternative 4

Excavation and Disposal of Contaminated Soils at the Mine Waste Joint Repository

Site: Flat Creek/IMM Superfund Site - OU1
Location: Mineral County, Montana
Phase: Final Feasibility Study
Base Year: 2011

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Earthwork)[2]	Annual O&M Costs	Periodic Costs	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$15,000	$1,354,000	$0	$0	$1,369,000	1.0000	$1,369,000
1	$0	$0	$0	$0	$0	0.9346	$0
2	$0	$0	$0	$0	$0	0.8734	$0
3	$0	$0	$0	$0	$0	0.8163	$0
4	$0	$0	$0	$49,000	$49,000	0.7629	$37,382
5	$0	$0	$0	$0	$0	0.7130	$0
6	$0	$0	$0	$0	$0	0.6663	$0
7	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$0	0.5820	$0
9	$0	$0	$0	$49,000	$49,000	0.5439	$26,651
10	$0	$0	$0	$0	$0	0.5083	$0
11	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$49,000	$49,000	0.3878	$19,002
15	$0	$0	$0	$0	$0	0.3624	$0
16	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$0	0.2959	$0
19	$0	$0	$0	$49,000	$49,000	0.2765	$13,549
20	$0	$0	$0	$0	$0	0.2584	$0
21	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$0	0.2257	$0
23	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$49,000	$49,000	0.1971	$9,658
25	$0	$0	$0	$0	$0	0.1842	$0
26	$0	$0	$0	$0	$0	0.1722	$0
27	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$49,000	$49,000	0.1406	$6,889
30	$0	$0	$0	$0	$0	0.1314	$0
31	$0	$0	$0	$0	$0	0.1314	$0
32	$0	$0	$0	$0	$0	0.1228	$0
33	$0	$0	$0	$0	$0	0.1147	$0
34	$0	$0	$0	$49,000	$49,000	0.1072	$5,253
35	$0	$0	$0	$0	$0	0.1002	$0
36	$0	$0	$0	$0	$0	0.0937	$0
37	$0	$0	$0	$0	$0	0.0875	$0
38	$0	$0	$0	$0	$0	0.0818	$0
39	$0	$0	$0	$49,000	$49,000	0.0765	$3,749
40	$0	$0	$0	$0	$0	0.0715	$0
41	$0	$0	$0	$0	$0	0.0668	$0
42	$0	$0	$0	$0	$0	0.0624	$0
43	$0	$0	$0	$0	$0	0.0583	$0
44	$0	$0	$0	$49,000	$49,000	0.0545	$2,671
45	$0	$0	$0	$0	$0	0.0509	$0
46	$0	$0	$0	$0	$0	0.0476	$0
47	$0	$0	$0	$0	$0	0.0445	$0
48	$0	$0	$0	$0	$0	0.0416	$0
49	$0	$0	$0	$49,000	$49,000	0.0389	$1,906
TOTALS:	$15,000	$1,354,000	$0	$490,000	$1,859,000		$1,495,710
TOTAL PRESENT VALUE OF ALTERNATIVE 4[5]							**$1,496,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpituity since soils left beneath structures could have contaminant concentrations above RGs that would not allow for unlimited use and unrestricted exposure under the current and potential future land uses. However the period of analysis was assumed to be 50 years (Years 0 through 49) because the increase of present value cost after Year 49 due to small periodic expenditures is minimal relative to the accuracy range of the estimate.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-4.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $1,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE PV-ADRFT

PRESENT VALUE ANALYSIS

Annual Discount Rate Factors Table

Site: Flat Creek/IMM Superfund Site - OU1
Location: Mineral County, Montana
Phase: Final Feasibility Study
Base Year: 2011

Discount Rate (Percent): 7.0

Year	Discount Factor[1,2]	Year	Discount Factor[1,2]
0	1.0000	26	0.1722
1	0.9346	27	0.1609
2	0.8734	28	0.1504
3	0.8163	29	0.1406
4	0.7629	30	0.1314
5	0.7130	31	0.1228
6	0.6663	32	0.1147
7	0.6227	33	0.1072
8	0.5820	34	0.1002
9	0.5439	35	0.0937
10	0.5083	36	0.0875
11	0.4751	37	0.0818
12	0.4440	38	0.0765
13	0.4150	39	0.0715
14	0.3878	40	0.0668
15	0.3624	41	0.0624
16	0.3387	42	0.0583
17	0.3166	43	0.0545
18	0.2959	44	0.0509
19	0.2765	45	0.0476
20	0.2584	46	0.0445
21	0.2415	47	0.0416
22	0.2257	48	0.0389
23	0.2109	49	0.0363
24	0.1971		
25	0.1842		

Notes:

1 Annual discount factors were calculated using the formulas and guidance presented in Section 4.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.

2 The real discount rate of 7.0% was obtained from "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000, Page 4-5.

TABLE CS-4

Alternative **4**

Excavation and Disposal of Contaminated Soils at the Mine Waste Joint Repository

COST ESTIMATE SUMMARY

Site: Flat Creek/IMM Superfund Site - OU1
Location: Mineral County, Montana
Phase: Final Feasibility Study
Base Year: 2011
Date: August 26, 2011

Description: Alternative 4 includes excavation of contaminated soils on residential and commercial properties and within the repository at the Mineral County Airport to facilitate disposal. Excavation of contaminated surface materials would be conducted to the extent practicable. Confirmation that soils remaining within excavations are below PRGs will be determined using visual inspections coupled with sample collection and analysis. However, it may not be possible to fully excavate contaminated soils underneath or adjacent to structures or obstructions such as homes, trees, subsurface utilities, and roads. Thus contaminated soils may be left in place under or adjacent to these structures or obstructions. For purposes of this FS, land use controls are assumed to address these situations on a property by property basis. Clean soil or rock would be used to backfill excavation areas to match the surface conditions that previously existed. Clean soil or rock is assumed to be transported from offsite borrow areas tested to ensure that contamination is not present. The backfill placed in yards would be covered with topsoil and revegetated. Excavated contaminated soils would be transported for disposal at a permanent mine waste joint-repository (Wood Gulch Repository) for mine waste rock and tailings associated with the Flat Creek/IMM Site. Wood Gulch Repository will be constructed, operated, and maintained as part of OU3. Five-year site reviews would be performed since contaminated soils would remain under or adjacent to structures and obstructions at some properties within the site with contaminant concentrations above PRGs that do not allow for unlimited use and unrestricted exposure under the current and potential future land uses.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Implementation of Institutional Controls	CW4-1	1	LS	$8,806	$8,806	
SUBTOTAL					$8,806	
Contingency (Scope and Bid)		20%			$1,761	10% Scope, 10% Bid (Low end of the recommended range).
SUBTOTAL					$10,567	
Project Management		10%			$1,057	The high end of the recommended range in EPA 540-R-00-002 was used.
Remedial Design		20%			$2,113	The high end of the recommended range in EPA 540-R-00-002 was used.
Construction Management		15%			$1,585	The high end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$15,322	
TOTAL CAPITAL COST					**$15,000**	Total capital cost is rounded to the nearest $1,000.

EARTHWORK CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	CW4-8	1	LS	$39,610	$39,610	
Contaminated Soil Excavation	CW4-4	1	LS	$76,466	$76,466	
Transportation and Disposal of Contaminated Soil at Mine Waste Joint Repository	CW4-5	1	LS	$229,197	$229,197	
Confirmatory Soil Sampling Within Excavations	CW4-11	1	LS	$103,869	$103,869	
Borrow Material Sampling	CW4-2	1	LS	$1,502	$1,502	
Backfilling of Excavated Areas	CW4-6	1	LS	$303,814	$303,814	
Sod Establishment Over Backfilled Areas	CW4-7	1	LS	$86,827	$86,827	
Property Fixture Removal and Re-Installation	CW4-3	1	LS	$26,258	$26,258	
Surveying for Construction Control	CW4-9	1	LS	$8,759	$8,759	
Site Maintenance and Control During Construction	CW4-10	1	YR	$19,474	$19,474	
SUBTOTAL					$895,776	
Contingency (Scope and Bid)		20%			$179,155	10% Scope, 10% Bid (Low end of recommended range in EPA 540-R-00-002).
SUBTOTAL					$1,074,931	
Project Management		6%			$64,496	Middle value of the recommended range in EPA 540-R-00-002 was used.
Remedial Design		12%			$128,992	Middle value of the recommended range in EPA 540-R-00-002 was used.
Construction Management		8%			$85,994	Middle value of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$1,354,413	
TOTAL CAPITAL COST					**$1,354,000**	Total capital cost is rounded to the nearest $1,000.

ANNUAL OPERATION AND MAINTENANCE (O&M) COSTS

TOTAL ANNUAL O&M COST	**$0**	No O&M costs are included; contaminated soil left in place is assumed to exist under structures.

TABLE CS-4

Alternative **4**

Excavation and Disposal of Contaminated Soils at the Mine Waste Joint Repository

COST ESTIMATE SUMMARY

Site: Flat Creek/IMM Superfund Site - OU1
Location: Mineral County, Montana
Phase: Final Feasibility Study
Base Year: 2011
Date: August 26, 2011

Description: Alternative 4 includes excavation of contaminated soils on residential and commercial properties and within the repository at the Mineral County Airport to facilitate disposal. Excavation of contaminated surface materials would be conducted to the extent practicable. Confirmation that soils remaining within excavations are below PRGs will be determined using visual inspections coupled with sample collection and analysis. However, it may not be possible to fully excavate contaminated soils underneath or adjacent to structures or obstructions such as homes, trees, subsurface utilities, and roads. Thus contaminated soils may be left in place under or adjacent to these structures or obstructions. For purposes of this FS, land use controls are assumed to address these situations on a property by property basis. Clean soil or rock would be used to backfill excavation areas to match the surface conditions that previously existed. Clean soil or rock is assumed to be transported from offsite borrow areas tested to ensure that contamination is not present. The backfill placed in yards would be covered with topsoil and revegetated. Excavated contaminated soils would be transported for disposal at a permanent mine waste joint-repository (Wood Gulch Repository) for mine waste rock and tailings associated with the Flat Creek/IMM Site. Wood Gulch Repository will be constructed, operated, and maintained as part of OU3. Five-year site reviews would be performed since contaminated soils would remain under or adjacent to structures and obstructions at some properties within the site with contaminant concentrations above PRGs that do not allow for unlimited use and unrestricted exposure under the current and potential future land uses.

PERIODIC COSTS (Years 4, 9, 14, 19, 24, 29, 34, 39, 44, and 49)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Five-Year Site Reviews	CW4-12	1	LS	$26,098	$26,098	Includes five-year site inspection and report; assumed to be statutory review that occurs every five years after initiation of remedial action (Year 0).
Community Awareness Activities	CW4-13	1	LS	$5,528	$5,528	
Institutional Controls Maintenance	CW4-14	1	LS	$1,258	$1,258	Includes reviewing and updating institutional controls.
SUBTOTAL					$32,884	
Contingency (Scope and Bid)		20%			$6,577	10% Scope, 10% Bid (Low end of recommended range in EPA 540-R-00-002).
SUBTOTAL					$39,461	
Project Management		10%			$3,946	The high end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		15%			$5,919	Middle value of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$49,326	
TOTAL PERIODIC COST					**$49,000**	Total capital cost is rounded to the nearest $1,000.

Notes:

Percentages used for indirect costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:

EA Each
LS Lump Sum
QTY Quantity
YR Year

Present Value and Cost Estimate Summary

Alternative 5
Excavation of Contaminated Soils, Treatment, and Disposal of Treated Soils at the Mine Waste Joint Repository

TABLE PV-5

PRESENT VALUE ANALYSIS

Alternative 5

Excavation of Contaminated Soils, Treatment, and Disposal of Treated Soils at the Mine Waste Joint Repository

Site: Flat Creek/IMM Superfund Site - OU1
Location: Mineral County, Montana
Phase: Final Feasibility Study
Base Year: 2011

Year[1]	Capital Costs (Institutional Controls)[2]	Capital Costs (Earthwork)[2]	Annual O&M Costs	Periodic Costs	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
0	$15,000	$2,033,000	$0	$0	$2,048,000	1.0000	$2,048,000
1	$0	$0	$0	$0	$0	0.9346	$0
2	$0	$0	$0	$0	$0	0.8734	$0
3	$0	$0	$0	$0	$0	0.8163	$0
4	$0	$0	$0	$49,000	$49,000	0.7629	$37,382
5	$0	$0	$0	$0	$0	0.7130	$0
6	$0	$0	$0	$0	$0	0.6663	$0
7	$0	$0	$0	$0	$0	0.6227	$0
8	$0	$0	$0	$0	$0	0.5820	$0
9	$0	$0	$0	$49,000	$49,000	0.5439	$26,651
10	$0	$0	$0	$0	$0	0.5083	$0
11	$0	$0	$0	$0	$0	0.4751	$0
12	$0	$0	$0	$0	$0	0.4440	$0
13	$0	$0	$0	$0	$0	0.4150	$0
14	$0	$0	$0	$49,000	$49,000	0.3878	$19,002
15	$0	$0	$0	$0	$0	0.3624	$0
16	$0	$0	$0	$0	$0	0.3387	$0
17	$0	$0	$0	$0	$0	0.3166	$0
18	$0	$0	$0	$0	$0	0.2959	$0
19	$0	$0	$0	$49,000	$49,000	0.2765	$13,549
20	$0	$0	$0	$0	$0	0.2584	$0
21	$0	$0	$0	$0	$0	0.2415	$0
22	$0	$0	$0	$0	$0	0.2257	$0
23	$0	$0	$0	$0	$0	0.2109	$0
24	$0	$0	$0	$49,000	$49,000	0.1971	$9,658
25	$0	$0	$0	$0	$0	0.1842	$0
26	$0	$0	$0	$0	$0	0.1722	$0
27	$0	$0	$0	$0	$0	0.1609	$0
28	$0	$0	$0	$0	$0	0.1504	$0
29	$0	$0	$0	$49,000	$49,000	0.1406	$6,889
30	$0	$0	$0	$0	$0	0.1314	$0
31	$0	$0	$0	$0	$0	0.1228	$0
32	$0	$0	$0	$0	$0	0.1147	$0
33	$0	$0	$0	$0	$0	0.1072	$0
34	$0	$0	$0	$49,000	$49,000	0.1002	$4,910
35	$0	$0	$0	$0	$0	0.0937	$0
36	$0	$0	$0	$0	$0	0.0875	$0
37	$0	$0	$0	$0	$0	0.0818	$0
38	$0	$0	$0	$0	$0	0.0765	$0
39	$0	$0	$0	$49,000	$49,000	0.0715	$3,504
40	$0	$0	$0	$0	$0	0.0668	$0
41	$0	$0	$0	$0	$0	0.0624	$0
42	$0	$0	$0	$0	$0	0.0583	$0
43	$0	$0	$0	$0	$0	0.0545	$0
44	$0	$0	$0	$49,000	$49,000	0.0509	$2,494
45	$0	$0	$0	$0	$0	0.0476	$0
46	$0	$0	$0	$0	$0	0.0445	$0
47	$0	$0	$0	$0	$0	0.0416	$0
48	$0	$0	$0	$0	$0	0.0389	$0
49	$0	$0	$0	$49,000	$49,000	0.0363	$1,779
TOTALS:	$15,000	$2,033,000	$0	$490,000	$2,538,000		$2,173,818
TOTAL PRESENT VALUE OF ALTERNATIVE 5 [5]							**$2,174,000**

Notes:

[1] The alternative is expected to require cost expenditures for perpituity since soils left beneath structures could have contaminant concentrations above RGs that would not allow for unlimited use and unrestricted exposure under the current and potential future land uses. However the period of analysis was assumed to be 50 years (Years 0 through 49) because the increase of present value cost after Year 49 due to small periodic expenditures is minimal relative to the accuracy range of the estimate.

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-5.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $1,000. Inflation and depreciation are excluded from the present value cost.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

TABLE PV-ADRFT

PRESENT VALUE ANALYSIS

Annual Discount Rate Factors Table

Site: Flat Creek/IMM Superfund Site - OU1
Location: Mineral County, Montana
Phase: Final Feasibility Study
Base Year: 2011

Discount Rate (Percent): 7.0

Year	Discount Factor[1,2]	Year	Discount Factor[1,2]
0	1.0000	26	0.1722
1	0.9346	27	0.1609
2	0.8734	28	0.1504
3	0.8163	29	0.1406
4	0.7629	30	0.1314
5	0.7130	31	0.1228
6	0.6663	32	0.1147
7	0.6227	33	0.1072
8	0.5820	34	0.1002
9	0.5439	35	0.0937
10	0.5083	36	0.0875
11	0.4751	37	0.0818
12	0.4440	38	0.0765
13	0.4150	39	0.0715
14	0.3878	40	0.0668
15	0.3624	41	0.0624
16	0.3387	42	0.0583
17	0.3166	43	0.0545
18	0.2959	44	0.0509
19	0.2765	45	0.0476
20	0.2584	46	0.0445
21	0.2415	47	0.0416
22	0.2257	48	0.0389
23	0.2109	49	0.0363
24	0.1971		
25	0.1842		

Notes:

1 Annual discount factors were calculated using the formulas and guidance presented in Section 4.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.

2 The real discount rate of 7.0% was obtained from "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000, Page 4-5.

TABLE CS-5

Alternative **5**

Excavation of Contaminated Soils, Treatment, and Disposal of Treated Soils at the Mine Waste Joint Repository

COST ESTIMATE SUMMARY

Site: Flat Creek/IMM Superfund Site - OU1
Location: Mineral County, Montana
Phase: Final Feasibility Study
Base Year: 2011
Date: August 26, 2011

Description: Alternative 5 includes excavation of contaminated soils on residential and commercial properties and within the temporary repository at the Mineral County Airport to facilitate disposal. Excavation of contaminated surface materials would be conducted to the extent practicable. Confirmation that soils remaining within excavations are below PRGs will be determined using visual inspections coupled with sample collection and analysis. However, it may not be possible to fully excavate contaminated soils underneath or adjacent to structures or obstructions such as homes, trees, subsurface utilities, and roads. Thus contaminated soils may be left in place under or adjacent to these structures or obstructions. For purposes of this FS, land use controls are assumed to address these situations on a property by property basis. Excavated contaminated soils would be transported for disposal after treatment at the Wood Gulch Repository as discussed for Alternative 4. Alternative 5 also includes treatment of newly-excavated contaminated soils prior to disposal. A treatment additive such as Portland cement, TSP, or other types of stabilization agents would be added to the newly-excavated contaminated soils prior to disposal to bind the contaminants and reduce their mobility from leaching. Soils excavated from the temporary repository at the Mineral County Airport have previously been treated using Portland cement or TSP. Thus no further treatment of these soils would be required prior to final disposal at the mine waste joint repository. Five-year site reviews would be performed since contaminated soils would remain under or adjacent to structures and obstructions at some properties within the site with contaminant concentrations above PRGs that do not allow for unlimited use and unrestricted exposure under the current and potential future land uses.

INSTITUTIONAL CONTROLS CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Implementation of Institutional Controls	CW5-1	1	LS	$8,806	$8,806	
SUBTOTAL					$8,806	
Contingency (Scope and Bid)		20%			$1,761	10% Scope, 10% Bid (Low end of the recommended range).
SUBTOTAL					$10,567	
Project Management		10%			$1,057	The high end of the recommended range in EPA 540-R-00-002 was used.
Remedial Design		20%			$2,113	The high end of the recommended range in EPA 540-R-00-002 was used.
Construction Management		15%			$1,585	The high end of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$15,322	
TOTAL CAPITAL COST					**$15,000**	Total capital cost is rounded to the nearest $1,000.

EARTHWORK CAPITAL COSTS: (Assumed to be Incurred During Year 0)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Mobilization/Demobilization	CW5-8	1	LS	$44,879	$44,879	
Contaminated Soil Excavation	CW5-4	1	LS	$76,466	$76,466	
Transportation and Disposal of Contaminated Soil at Mine Waste Joint Repository	CW5-5	1	LS	$207,123	$207,123	
Confirmatory Soil Sampling Within Excavations	CW5-11	1	LS	$103,869	$103,869	
Borrow Material Sampling	CW5-2	1	LS	$1,502	$1,502	
Backfilling of Excavated Areas	CW5-6	1	LS	$303,814	$303,814	
Sod Establishment Over Backfilled Excavations	CW5-7	1	LS	$86,827	$86,827	
Property Fixture Removal and Re-Installation	CW5-3	1	LS	$26,258	$26,258	
Surveying for Construction Control	CW5-9	1	LS	$8,759	$8,759	
Site Maintenance and Control During Construction	CW5-10	1	YR	$19,474	$19,474	
Treatment (Stabilization) of Untreated Soils at Staging Area	CW5-12	1	LS	$465,420	$465,420	
SUBTOTAL					$1,344,391	
Contingency (Scope and Bid)		20%			$268,878	10% Scope, 10% Bid (Low end of recommended range in EPA 540-R-00-002).
SUBTOTAL					$1,613,269	
Project Management		6%			$96,796	Middle value of the recommended range in EPA 540-R-00-002 was used.
Remedial Design		12%			$193,592	Middle value of the recommended range in EPA 540-R-00-002 was used.
Construction Management		8%			$129,062	Middle value of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$2,032,719	
TOTAL CAPITAL COST					**$2,033,000**	Total capital cost is rounded to the nearest $1,000.

ANNUAL OPERATION AND MAINTENANCE (O&M) COSTS

TOTAL ANNUAL O&M COST	**$0**	No O&M costs are included; contaminated soil left in place is assumed to exist under structures.

TABLE CS-5

Alternative 5
Excavation of Contaminated Soils, Treatment, and Disposal of Treated Soils at the Mine Waste Joint Repository

COST ESTIMATE SUMMARY

Site: Flat Creek/IMM Superfund Site - OU1
Location: Mineral County, Montana
Phase: Final Feasibility Study
Base Year: 2011
Date: August 26, 2011

Description: Alternative 5 includes excavation of contaminated soils on residential and commercial properties and within the temporary repository at the Mineral County Airport to facilitate disposal. Excavation of contaminated surface materials would be conducted to the extent practicable. Confirmation that soils remaining within excavations are below PRGs will be determined using visual inspections coupled with sample collection and analysis. However, it may not be possible to fully excavate contaminated soils underneath or adjacent to structures or obstructions such as homes, trees, subsurface utilities, and roads. Thus contaminated soils may be left in place under or adjacent to these structures or obstructions. For purposes of this FS, land use controls are assumed to address these situations on a property by property basis. Excavated contaminated soils would be transported for disposal after treatment at the Wood Gulch Repository as discussed for Alternative 4. Alternative 5 also includes treatment of newly-excavated contaminated soils prior to disposal. A treatment additive such as Portland cement, TSP, or other types of stabilization agents would be added to the newly-excavated contaminated soils prior to disposal to bind the contaminants and reduce their mobility from leaching. Soils excavated from the temporary repository at the Mineral County Airport have previously been treated using Portland cement or TSP. Thus no further treatment of these soils would be required prior to final disposal at the mine waste joint repository. Five-year site reviews would be performed since contaminated soils would remain under or adjacent to structures and obstructions at some properties within the site with contaminant concentrations above PRGs that do not allow for unlimited use and unrestricted exposure under the current and potential future land uses.

PERIODIC COSTS (Years 4, 9, 14, 19, 24, 29, 34, 39, 44, and 49)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Five-Year Site Reviews	CW5-13	1	LS	$26,098	$26,098	Includes five-year site inspection and report; assumed to be statutory review that occurs every five years after initiation of remedial action (Year 0).
Community Awareness Activities	CW5-14	1	LS	$5,528	$5,528	
Institutional Controls Maintenance	CW5-15	1	LS	$1,258	$1,258	Includes reviewing and updating institutional controls.
SUBTOTAL					$32,884	
Contingency (Scope and Bid)		20%			$6,577	10% Scope, 10% Bid (Low end of recommended range in EPA 540-R-00-002).
SUBTOTAL					$39,461	
Project Management		10%			$3,946	The high end of the recommended range in EPA 540-R-00-002 was used.
Technical Support		15%			$5,919	Middle value of the recommended range in EPA 540-R-00-002 was used.
TOTAL					$49,326	
TOTAL PERIODIC COST					**$49,000**	Total capital cost is rounded to the nearest $1,000.

Notes:
Percentages used for indirect costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for FS evaluation purposes.

Abbreviations:
EA Each
LS Lump Sum
QTY Quantity
YR Year