FIRST FIVE-YEAR REVIEW REPORT FOR BONITA PEAK MINING DISTRICT SUPERFUND SITE SAN JUAN COUNTY, COLORADO

Prepared by

U.S. Environmental Protection Agency
Region 8
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LIST OF ABBREVIATIONS AND ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
ARSG	Animas River Stakeholders Group
BLM	United States Bureau of Land Management
BLT	Bandora Little Todd
BPMD	Bonita Peak Mining District
BPR	Bonita Peak Repository
CAG	Community Advisory Group
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
DRMS	Colorado Division of Reclamation, Mining and Safety
EC Statute	Colorado Environmental Covenants Statute
EPA	United States Environmental Protection Agency
FFS	Focused Feasibility Study
FS	Feasibility Study
FYR	Five-Year Review
GCCM	Geosynthetic Cementitious Composite Mat
HDPE	High Density Polyethylene
IC	Institutional Control
IRA	Interim Response Action
IROD	Interim Record of Decision
IWTP	Interim Water Treatment Plant
µg/dL	Micrograms per Deciliter
mg/kg	Milligrams per Kilogram
MIW	Mining-Influenced Water
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
ppm	Parts per Million
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
TP	Tailings Pond or Tailings Impoundment when referring to Mayflower TPs 1-4
USFS	United States Forest Service
UU/UE	Unlimited Use and Unrestricted Exposure
XRF	X-Ray Fluorescence

I. INTRODUCTION

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

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

This is the first FYR for the Bonita Peak Mining District (BPMD) Superfund site (Site). The triggering action for this statutory review is the on-site construction start date of the remedial action for operable unit 1 (OU1). The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

To manage investigations and cleanup, the EPA organized the Site into five OUs:

- OU1 – Sitewide: OU1 encompasses the entire Site.
- OU2 – Mayflower: OU2 includes the Mayflower tailing impoundments Nos. 1, 2, 3 and 4 (also known as TP 1, 2, 3 and 4) and the Mayflower Mill and Tailings Study Area.
- OU3 – Bonita Peak Groundwater System: OU3 generally includes the saturated and unsaturated workings of the Sunnyside Mine, associated drainage and haulage tunnels, nearby mines not known to be connected to the Sunnyside Mine by workings (e.g., the Red & Bonita Mine and the Gold King Mine) and the surrounding geographic area that may be hydraulically connected or influenced by current and/or historical releases from or management of these mines.
- OU4 – The OU consists of the Ben Franklin Mine.
- OU5 – The OU consists of the London Mine.

This FYR addresses OU1 because the EPA selected interim remedies for specific areas in OU1 in two Interim Records of Decision (IRODs) issued in 2019 and 2021 and began the OU1 remedial action in 2019. The FYR does not address OU2, OU3, OU4 or OU5 because the EPA has not yet selected remedies for these OUs. A sitewide remedial investigation (RI) is ongoing. This FYR also presents an overview of removal actions that have been conducted or are ongoing in various locations within OU1, OU4 and OU5.

EPA remedial project managers (RPM) Joy Jenkins, Jessica Duggan and Athena Jones led the FYR. The EPA community involvement coordinator (CIC) Meg Broughton also participated. Mark Rudolph from the Colorado Department of Public Health and Environment (CDPHE) and Ali Cattani, Jill Billus, Treat Suomi and Peri Bowser from EPA contractor Skeo also participated in the review. The review began on May 16, 2024.

The EPA found in this five-year review that the interim remedies for the Bonita Peak Mining District Superfund site will be protective once complete. In the meantime, exposure pathways that could result in unacceptable risks to human health are under control. Institutional controls that restrict land use in mine waste source areas are in place. Engineering controls such as soil covers and boulders that limit access to mine waste are also in place. These controls limit exposures to contamination above risk-based levels. The actions taken to date are helping prevent further impacts to the environment and are reducing risks to people camping in recreation staging areas.

Site Background

The Site consists of 48 historical mines or mining-related sources within the Mineral Creek, Cement Creek and Upper Animas River drainages in San Juan County in southwest Colorado (Figure 1). The three drainages flow into the Animas River at Silverton, Colorado. Mining operations were active in the area from the 1870s to the 1990s. Metals contamination of soils, groundwater and surface water has occurred due to historical and ongoing releases of mining-influenced water (MIW) and sediments.[1] As a result, the EPA listed the Site on the National Priorities List (NPL) in September 2016.

The three main drainages within the Site contain over 400 abandoned or inactive mines, where large- to small-scale mining operations occurred. The Site's NPL listing identified 48 mining-related sources as sources or potential sources for contaminated media affecting the three main drainages (Figure 1). In addition, "mining-impacted recreation staging areas" or trespass campsites on privately-owned land have been identified that contain contaminated media posing an unacceptable risk to human health.

The land within the Site includes several different ownership/management types: private mining claims, private property other than mining claims, areas managed by the U.S. Bureau of Land Management (BLM), and areas managed by the U.S. Forest Service (USFS). Mining-related sources identified in the 2019 IROD are located on private mining claims, except for the Brooklyn Mine located entirely on USFS land and the Mammoth Tunnel located partially on BLM land and partially on private land. Recreation is expected to remain the predominant future land use for both public property and private property.

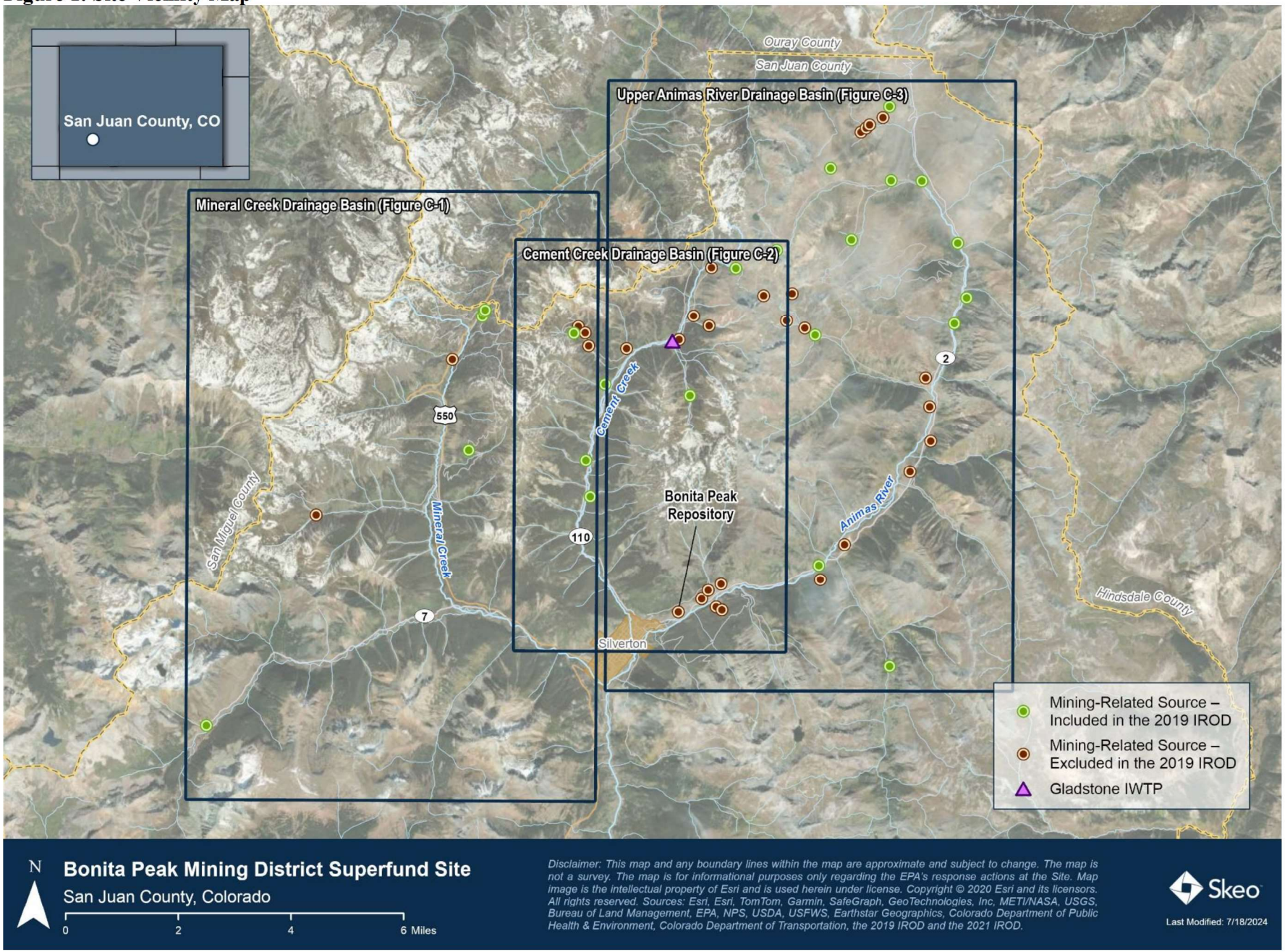
Like land use, some of the surface waters within the Site support recreational uses such as rafting and fishing. Some of these surface waters also serve as the habitat for benthic macroinvertebrate, fish communities and aquatic wildlife, although conditions in Mineral Creek, Cement Creek and the Upper Animas River were found to be severely impacted by past mining activities. It is assumed that recreation and ecological habitat will remain the predominant surface-water uses for the Site. Groundwater is not addressed under OU1 and therefore not discussed further in this report.

This FYR Report evaluates the protectiveness of the implemented and ongoing remedies at the 23 mining-related sources in OU1 identified in the 2019 IROD and discusses the ongoing remedial action at the Bonita Peak Repository (BPR) addressed in the 2021 IROD.

The 2019 IROD, the 2021 IROD and the EPA's website at www.epa.gov/superfund/bonita-peak provide additional background information and site history. Appendix A lists the references used during production of this FYR. Appendix B provides a chronology of major site events.

[1] MIW is water that is contaminated or influenced by mining-related activities and is a contaminant source medium where it discharges from a mine portal or is produced by contact with a solid source medium.

Figure 1: Site Vicinity Map



FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Bonita Peak Mining District		
EPA ID: CON000802497		
Region: 8	**State:** Colorado	**City/County:** Unincorporated/San Juan County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the Site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA		
Author name: Joy Jenkins, Athena Jones and Jill Billus		
Author affiliation: EPA Region 8 and Skeo		
Review period: 5/16/2024 – 9/13/2024		
Date of site inspection: 7/16/24 – 7/17/24		
Type of review: Statutory		
Review number: 1		
Triggering action date: 10/9/2019		
Due date *(five years after triggering action date)*: 10/9/2024		

II. RESPONSE ACTION SUMMARY

The BPMD site was listed on the NPL in 2016. The EPA is pursuing the use of an adaptive-management approach for the Site. Adaptive management is a formal and systematic site-management approach that targets management and resource decisions, to incrementally reduce site uncertainties, while supporting continued site progress toward achieving the protection of human health and the environment. At the Site, this strategy enables the EPA to continue to address site uncertainties through an ongoing sitewide RI while using existing information to evaluate, select and conduct interim response actions (IRAs). To date, the EPA has issued two IRODs to conduct IRAs – an IROD in 2019 that addresses 23 mining-related sources and an IROD in 2021 that creates the BPR for long-term disposal of mining-related wastes.

Overall cleanup goals for the remedial efforts on site include (1) achieving water quality improvement with a focus on mine drainage, (2) stabilizing source areas (solid media, waste rock and tailings), and (3) minimizing unplanned releases. The basis for taking action in the 2019 IROD and 2021 IROD, the selected interim remedies and the specific remedial action objectives (RAOs) associated with these actions are addressed below.

Basis for Taking Action

2019 OU1 IROD for 23 Mining-Related Sources

Initial investigations at the Site identified several mining-related sources where IRAs would be appropriate options for reducing contributions from the mining-related sources that add to unacceptable human-health and ecological risks in the Animas River watershed in advance of a comprehensive remedial action.

The contaminant migration issues identified include:

- Mine portal MIW discharges.
- Mining-related source/stormwater interactions.
- Mine portal pond sediments.
- In-stream mine wastes.
- Mining-impacted recreation staging areas.

While the sitewide risk assessments were ongoing, human health and ecological risk memoranda were prepared to support the development of a focused feasibility study (FFS) to address the contaminant migration issues. The EPA subsequently finalized the risk assessments, issuing the final Aquatic Baseline Ecological Risk Assessment report in February 2019, the final Human Health Risk Assessment report in June 2019, and the final Terrestrial Baseline Ecological Risk Assessment report in December 2020.

Human-Health Risks

The 2018 human-health risk memorandum, included as Appendix B in the 2019 IROD, evaluated risks associated with incidental ingestion and inhalation of soil and mine waste during camping.[2] It found that adverse health effects may occur from exposures to lead or arsenic in contaminated soils and waste rock at mining-related sources. The evaluation recommended IRAs for two dispersed campsites (Campground 4 and Campground 7) to address potentially unacceptable human-health exposures from lead in soil. The evaluation also recommended IRAs for three locations (Longfellow Mine, Junction Mine and Koehler Tunnel) to address potentially unacceptable human-health acute exposure of arsenic in waste rock. Thus, human-health risk was the basis for addressing mining-impacted recreation staging areas.

[2] Potential risks to recreational and occupational receptor populations from all exposure media and pathways were evaluated in the final human-health-risk assessment for the Site.

Ecological Risks

The 2018 ecological risk memorandum is also part of Appendix B in the 2019 IROD. It focused on aquatic ecological risk, primarily risks to fish and macroinvertebrate communities. The evaluation found that the health of aquatic ecosystems in the Animas River and its tributaries is impaired by high concentrations of toxic metals emanating from a wide range of mining-related and natural sources distributed throughout the greater Animas River watershed. Actions that result in sustained metal loading reduction function to reduce toxic metals exposure to resident (or potentially resident) organisms in these streams. If enough reduction of metals loading can be achieved, improved survival, abundance and diversity of aquatic life can reasonably be expected where aquatic ecosystems are currently marginal. Further, expansion of the spatial extent of aquatic communities may also be possible as instream water quality improves. Thus, ecological risk was the basis for addressing the following contaminant migration issues:

- Mine portal MIW discharge.
- Mining-related source/stormwater interactions.
- Mine portal pond sediments.
- In-stream mine wastes.

Table 1 in the Response Actions section of this FYR Report identifies the 23 mining-related sources addressed in the 2019 IROD and the contaminant migration issues identified at those mining-related sources.

2021 IROD for BPR

Ecological Risks

An Ecological Risk Assessment Memorandum was developed to support the BPR FFS, completed in 2020. The memorandum, included as Appendix A in the 2020 FFS Report, was developed to document and summarize unacceptable risks to aquatic ecological receptors. The study confirms the need to effectively manage mining-related wastes derived from the implementation of CERCLA response actions in the Animas River watershed in a sitewide mine-waste repository.

Response Actions

Early Cleanup Actions

The EPA and the CDPHE conducted a CERCLA site assessment in the 1990s. The assessment identified impacts on aquatic life in the Upper Animas River and its tributaries from naturally-occurring and mining-related heavy metals. The Animas River Stakeholders Group (ARSG) was a community organization that was successfully utilizing grant funding and other agency support for cleanup actions in the watershed. The EPA decided not to list the Site on the NPL at that time to allow for a community-based collaborative cleanup effort to continue. The water quality in the Animas River downstream of the Site showed signs of improvement. However, after 2005, it began to decline.

In support of the collaborative effort led by the ARSG, the EPA contributed resources for water quality sampling, ecological risk assessment and data analysis as well as grant funding. The EPA also contributed resources for the investigation and closure (bulkheading) of the Red & Bonita Mine tunnel as a removal action in summer 2015, prior to the listing of the Site on the NPL. Sunnyside Gold Corporation, the BLM and the state of Colorado also conducted reclamation activities at many mining-related source areas. These efforts included diverting runoff away from and capping mine waste piles, moving mine waste piles away from drainages, consolidating mine waste piles, placing bulkheads in draining adits, and revegetating mine waste piles.

While investigating the Gold King adit, pressurized water began leaking above the mine tunnel, spilling about three million gallons of water stored behind the collapsed material into Cement Creek. Since October 2015, the EPA has been treating the discharge from the Gold King Mine at the Gladstone Interim Water Treatment Plant (IWTP) in Gladstone, Colorado. The water treatment operation was initially constructed as an emergency response. Currently, water treatment is conducted as a Non-Time-Critical Removal Action.

Water treatment generated solids (sludge), generated from the treatment process, are being managed at the IWTP. An innovative use of a portion of the sludge was employed to stabilize tailings at the Kittimac Tailings area in 2018. Operation, maintenance and management of the Gladstone IWTP is ongoing; the system continues to remove metals from the MIW before its discharge to Cement Creek.

OU1 Remedy Selection

To date, the EPA has issued two IRODs for OU1:

- 2019 IROD
  The 2019 IROD addresses specific contaminant migration issues, including mine portal MIW discharges, mining-related source/stormwater interactions, mine-portal pond sediments, in-stream mine wastes and mining-impacted recreation staging areas (e.g., established campgrounds or dispersed campsites) at 23 mining-related sources. Table 1 lists the mining-related sources addressed in the 2019 IROD and the contaminant migration at those mining-related sources. Figure 1 and Figures C-1 to C-3 in Appendix C show the locations of the 23 mining-related sources.

- 2021 IROD
  The 2021 IROD addresses the construction of the BPR and operation and maintenance (O&M) activities for the repository. The sitewide repository is intended to store wastes associated with the Gladstone IWTP, mine wastes removed from the mining-related sources identified in the 2019 IROD (if needed) and mine wastes yet to be generated as part of future response actions. Figure 1 shows the repository's approximate location.

More information on the interim remedies selected in the 2019 IROD and the 2021 IROD follows Table 1.

Table 1: 23 Mining-Related Sources Addressed in the 2019 IROD, by Drainage Basin

Mining-Related Source	Description of Mining-Related Source[a]	Mine Portal MIW Discharges	Mining-Related Source/ Stormwater Interactions	Mine Portal Pond Sediments	In-Stream Mine Wastes	Mining-Impacted Recreational Staging Areas
Mineral Creek Drainage Basin						
Longfellow Mine	The Junction Mine and the Koehler Tunnel (along with Longfellow Mine) are co-located at the headwaters of Mineral Creek. Mine portal MIW discharges from both the Junction Mine's adit and the Koehler Tunnel combine into a pond. Waste rock samples at the three locations exceeded the human-health-risk-based level for arsenic. The area is used as a launch point for recreational tours and is visited frequently, based on evidence of previous camping.					X
Junction Mine		X		X		X
Koehler Tunnel		X		X		X
Brooklyn Mine	Located on the east side of Mineral Creek within Brown's Gulch. Existing mine portal MIW discharge is piped from the level 2 adit to a constructed channel lined with Burns Formation rock, which then discharges downgradient of the mine waste. The topography of the area is such that stormwater from upgradient of the Brooklyn Mine passes over mine waste. Two ponds are east of the primary mine area.	X	X	X		
Bandora Mine	Located along South Fork Mineral Creek. There are two flowing adits. Mine portal MIW discharge from the main flowing adit (which is collapsed) flows into a diversion channel and then downslope east of the main mine waste dump. However, breaks in the discharge channel allow MIW to flow over mine waste. Stormwater from upgradient of the Bandora Mine passes over mine waste due to local topography.	X	X			
Cement Creek Drainage Basin						
Grand Mogul Mine	Located in the Ross Basin about 0.5 miles east of the Mogul Mine. Three piles of mine waste from the workings of the mine are on the north side of Cement Creek. The topography of the area is such that stormwater from upgradient of the mine waste piles flows over them. Gullies are present on the waste-rock piles and the piles have a moderate degree of erosion.		X		X	
Natalie/ Occidental Mine	Located about 1 mile southeast of Gladstone along the South Fork of Cement Creek. Mine portal MIW discharge from the adit flows southwest over soil and adjacent to waste rock before entering the creek.	X				
Henrietta Mine	Located on the south side of Prospect Gulch. There are portals into at least six levels of this mine. Presently, the 700 level adit flows only during high-flow conditions and is diverted into a drainage channel that flows on the southeastern side of the waste rock. Waste rock partially blocks access to this adit.	X				
Mammoth Tunnel	Located along Cement Creek near the mouth of Georgia Gulch. Mine portal MIW discharges from a pipe protruding from the collapsed adit. The MIW flow is channelized and flows down the mine waste in a lined channel into two settling ponds.	X		X		
Anglo Saxon Mine	Located along Cement Creek about 3 miles upstream from Silverton. This mine consists of two adits: a main adit close to the road and the Porcupine Gulch adit located 400 feet up Porcupine Gulch from the main adit. Mine portal MIW discharge from the main adit flows across a moderately eroded waste pile and cascades down to a culvert underneath the road to a constructed settling pond before continuing to Cement Creek.	X		X		
Yukon Tunnel	Located along Cement Creek about 2.5 miles upstream from Silverton. Mine portal MIW discharge is directed within the adit into a pipe that discharges to the north of a large waste-rock pile in Illinois Gulch adjacent to the mine. The topography of the area is such that stormwater from upgradient of Yukon Tunnel passes over mine waste.	X	X			
Upper Animas River Drainage Basin						

Mining-Related Source	Description of Mining-Related Source[a]	Mine Portal MIW Discharges	Mining-Related Source/ Stormwater Interactions	Mine Portal Pond Sediments	In-Stream Mine Wastes	Mining-Impacted Recreational Staging Areas
Ben Butler Mine	Located on the north side of Burrows Creek on the south slope of Denver Hill, about 1,200 feet north of the London Mine. There are no direct roads to access the mining-related source. There are two shafts and three stopes at the site, which are all filled with water. The topography of the area is such that stormwater from upgradient of Ben Butler Mine passes over mine waste. A 200-yard-long vegetation kill zone extends downslope from the waste dump toward Burrows Creek.		X			
Mountain Queen Mine	Located on the east side of Hurricane Peak at the headwaters of California Gulch, with a shaft near the top of California Pass and a draining adit east of the shaft. The adit opening is covered with a grate. A rock fall occurred recently above the grate. The mine portal MIW discharge from this adit flows around both sides of the waste-rock pile at the adit and into California Gulch. The topography of the area is such that stormwater from upgradient of the adit flows over the mine waste located at the adit.	X	X			
Vermillion Mine	Located in a large gentle swale high on the north side of California Gulch near the southwest flank of Houghton Mountain. There is one draining adit. The adit discharge flows south over soil before infiltrating into the waste-rock pile. The drainage continues to flow about 2,000 feet south and southeast, where it enters the West Fork Animas River. The topography of the area is such that stormwater from upgradient of Vermillion Mine flows over mine waste.	X	X			
Sunbank Group Mine	Located within Placer Gulch. The main adit is sealed with a concrete block. However, flow is coming out of the top of the concrete block and from seeps upgradient of the adit block. Adit discharge is directed into a series of settling ponds immediately next to Placer Gulch. The ponds appear to no longer be functional and adit drainage no longer flows sequentially through the ponds before discharging into Placer Gulch. An existing stormwater diversion is located upgradient of the main waste-rock pile.	X	X	X		
Frisco/Bagley Mine	The Frisco/Bagley Tunnel is located about 0.5 miles west of Animas Forks on the north side of California Gulch. A rock and mortar closure with a grate is installed at the adit portal on top of the waste-rock pile on the north side of the road. The mine portal MIW discharge is channelized southwest across a waste-rock pile, and red staining is highly visible throughout the channels, which flow into California Gulch. A small settling pond is present in the channel. Additional adit flow ponds on top of the waste-rock pile during periods of high flow.	X		X		
Columbus Mine	Located across the stream in California Gulch from Animas Forks. It has a single discharging adit from which mine portal MIW discharge infiltrates into the waste rock pile and then emerges at the base. There are a series of seeps below both levels of waste rock that may be from the adit discharge. The topography of the area is such that stormwater from upgradient of the Columbus Mine passes over mine waste.	X	X			
Campground 7	Campground 7 is located about 1.1 miles south of Animas Forks, on the west side of the Upper Animas River at the road fork below a bridge crossing the Upper Animas River. Campground 7 is considered a dispersed campsite. It is near the former location of the Eclipse Smelter. A sample of soil/waste rock from this location exceeded the human-health-risk-based level for lead. It is accessible to the public and used for recreational purposes.					X
Silver Wing Mine	Located on the east side of the Upper Animas River, south of Animas Forks. Adit flow is directed into a settling pond and was formerly directed through bioreactor tanks before discharge to the Upper Animas River. The bioreactor tanks are not functional. Flow	X	X	X		

Mining-Related Source	Description of Mining-Related Source[a]	Mine Portal MIW Discharges	Mining-Related Source/ Stormwater Interactions	Mine Portal Pond Sediments	In-Stream Mine Wastes	Mining-Impacted Recreational Staging Areas
	bypasses the former tanks and is piped to the river. The topography of the area is such that stormwater from upgradient of Silver Wing Mine passes over mine waste.					
Tom Moore Mine	Located about 0.5 miles south of the Silver Wing Mine. There is no maintained road access. There is one discharging adit from which mine portal MIW discharge flows over the waste-rock pile and into the Upper Animas River.	X				
Terry Tunnel	Located about 0.25 miles southeast of the Ben Franklin Mine. It is bulkheaded and buried. Most mine portal MIW discharge flows out of the bulkheaded tunnel into a drainage ditch that directs water around the reclaimed waste-rock pile. MIW also seeps out below the bulkheaded tunnel and pools on the mine waste below the tunnel.	X				
Pride of the West Mine	Located on the east side of Cunningham Gulch. The primary adit has a metal frame cover and is chained and padlocked. The primary adit's mine portal MIW discharges through a channel on top of a large waste-rock pile, through a culvert and down a gully on the waste-rock pile into the stream. Two more nonflowing grated adits are north of the flowing adit.	X				
Campground 4	Located near the Animas River adjacent to a spur off County Road 2 below Howardsville, Colorado, about 900 feet below the Howardsville bridge over the Upper Animas River. Campground 4 is considered a dispersed campsite. It was identified as a mine tailings area by the Colorado Division of Minerals and Geology. A sample of soil/waste rock from this location exceeded the human-health-risk-based level for lead. The campground is accessible to the public and used for recreational purposes.					X

Notes:
a) Source descriptions are from Section 5.4.2 of the Site's 2019 IROD.
X = mining-related issue addressed in the 2019 IROD.
Light gray cells = not a mining-related issue for the area.

2019 OU1 IROD for 23 Mining-Related Sources

The EPA issued the first IROD for OU1 in May 2019. The selected interim remedy applies to 23 mining-related sources identified in Table 1. Table 2 presents the RAOs for the interim remedy, as well as interim remedy components selected to achieve the RAOs, by mining-related source type.

Table 2: 2019 IROD RAOs and Remedy Components, by Mining-Related Source

RAOs	Mining-Related Source	Remedy Components[a]
RAO 1: Reduce transport from mine waste, contaminated soil and contaminated sediment into surface water of chemicals of potential concern (COPCs) that contribute to unacceptable ecological risks.	Mine Portal MIW Discharges	• Construction of diversion and isolation components to route mine portal MIW discharge around contaminated mine waste with the potential for interaction and co-mingling at mining-related sources. • Maintenance of previously existing and newly constructed diversion and isolation components. • Excavation of mine wastes for open-channel diversion or removal of obstructions at mine portals. • Management of excavated wastes locally. • Monitoring to evaluate performance standards and achievement of RAO 1. Monitoring may include visual inspection and surface water measurements and/or sample collection and analysis.
	Mining-Related Source/ Stormwater Interactions	• Construction of diversion or isolation components to be chosen on a location-by-location basis during remedial design and may include construction of open channels, construction of berms, collection, diversion piping or liners, or a combination of multiple types of components. • Repairs as needed at existing stormwater diversion or isolation components. • Construction of subsurface components such as interception trenches and French drains, as needed. • Maintenance of the diversion/isolation components, as needed.
	Mine Portal Pond Sediments	• Excavation of existing sediment and repair of berms within mine portal ponds to allow continued pond function. • Draining of mine portal ponds, as needed, with the management of the MIW locally. • Management of excavated wastes locally, which may include construction of berms around the waste in the interim. • Monitoring to evaluate performance standards and achievement of RAO 1. Monitoring may include visual inspection and surface water measurements and/or sample collection and analysis. • Maintenance of the pond berms and interim local waste management locations, including removal of sediment accumulated in the ponds.
	In-Stream Mine Wastes	• Excavation of in-stream mine wastes at mining-related sources to remove wastes that impede flow or are susceptible to erosion or leaching of contaminants. • Dewatering as needed. • Management of excavated wastes locally, which may include construction of berms around the waste in the interim. • Monitoring to evaluate performance standards and achievement of RAO 1 to include visual inspection and surface water measurements and/or sample collection and analysis. • Maintenance of the interim local waste management locations.

RAOs	Mining-Related Source	Remedy Components[a]
RAO 2: Reduce human exposure through ingestion and inhalation to mine waste and contaminated soils containing lead that result in greater than a 5% chance of exceeding a blood lead level of 5 micrograms per deciliter during camping activities. **RAO 3:** Reduce human exposure through ingestion of mine waste and contaminated soils containing arsenic that exceeds risk-based levels for acute exposures during camping activities.	Mining-Impacted Recreation Staging Areas	• Containment/isolation of mine wastes within mining-impacted recreation staging areas using covers to reduce disturbances of mine wastes and migration of contaminants. • Pre-design investigations to delineate the horizontal extent of remediation at the mining-impacted recreation staging areas. • Monitoring to evaluate performance standards and achievement of RAOs 2 and 3 to include visual inspection to monitor the integrity of the covers. • Maintenance activities to maintain the integrity of the covers.

Notes:

a) In addition to the remedy components listed, common remedy components for all areas include pre-construction surveys, erosion and sediment control measures, dust suppression activities, access road improvements, site rehabilitation/reclamation of affected areas, institutional controls (ICs), periodic monitoring and maintenance activities to maintain the integrity of remedial components. ICs to protect engineered remedial features likely to be permanent and to restrict land use at the mine-impacted recreation staging areas will be implemented in accordance with the Colorado Environmental Covenants Statute (EC Statute).

Source: Sections 8.1 (RAOs) and 12.0 (Selected Remedy) of the Site's 2019 IROD.

Cleanup Criteria

The Site's 2019 IROD presents human-health-based interim cleanup levels for lead and arsenic in mine wastes and contaminated soil at the mining-impacted recreation staging areas (see Appendix B of the 2019 IROD). Achievement of interim cleanup levels through implementation of remedial actions would result in acceptable risks to human health from camping.

- Lead:
  The interim human-health-risk-based level for lead in soil at the dispersed campsites is 2,081 milligrams per kilogram (mg/kg). This risk-based level is based on the fine fraction (250 micrometers) and a default lead relative bioavailability of 0.6. The risk-based level employs a target blood-lead-level threshold of 5 micrograms per deciliter (µg/dL). The risk-based level applies to the average soil-lead concentration across an entire campsite exposure area.

  In January 2024, the EPA issued the *Updated Residential Soil Lead Guidance for CERCLA Sites and Resource Conservation and Recovery Act (RCRA) Corrective Action Facilities*. The IROD's interim cleanup level for lead is in compliance with the updated lead guidance since it is based on a target blood-lead level threshold of 5 µg/dL. Question B of this FYR Report provides further discussion of the updated lead guidance.

- Arsenic:
  The interim human-health-risk-based level for arsenic in soil at the dispersed campsites is 122 mg/kg. The interim human-health-risk-based level for arsenic in waste rock is 1,419 mg/kg.

The 2019 IROD did not establish media-specific cleanup levels to address unacceptable ecological risks. In place of cleanup levels, the IROD stated that the IRAs were to be guided based on remedial clearance criteria.

Remedial clearance criteria define the conditions that must be met for the remedial components or approaches of the remedial action to be deemed complete. Because the focus of remedial alternatives addressing unacceptable aquatic ecological risks is source isolation/separation and contaminant migration control, there are no chemical-based criteria directly applied to contaminated source media (e.g., mine wastes and mine portal pond sediment) to determine completion. Rather, clearance criteria for each IRA will be established during remedy implementation to determine that the IRA components have been constructed to achieve source isolation/separation and migration control. Examples of remedial clearance criteria could include, but are not limited to, maximum allowable depths of accumulated sludge in mine portal ponds, minimum separation distances between MIW mine portal discharges and mine wastes, or lack of visual indications of mine waste remaining in streams.

2021 OU1 IROD for the BPR

The EPA issued a second IROD for OU1 in April 2021 to allow for the consolidation of wastes on site at the BPR. The repository will be located at the Mayflower tailings impoundments (associated with the former Mayflower Mill) that are part of OU2. However, because the mining-related wastes generated for potential disposal at the repository are generated from various locations across the Site, the EPA considers the BPR a sitewide action (OU1).

Table 3 includes the RAOs for the BPR interim remedy as well as remedy components selected to achieve the RAOs. The BPR will be constructed at Mayflower tailings impoundment 4 (Figure 1). Mayflower tailings impoundments 1 and 2 are secondary locations for mine-waste management and/or disposal cells if the capacity of the Mayflower tailings impoundment 4 waste disposal cell is exhausted.

Table 3: 2021 IROD RAOs and Remedy Components

RAOs	Remedy Components
RAO 1: Manage mining-related wastes placed in the repository and contain resulting MIW leachate to minimize migration of contamination from the repository to groundwater and surface water outside the repository, contributing to unacceptable ecological risks in the Upper Animas River adjacent to the repository location. **RAO 2:** Control surface water runoff from the repository to minimize transport and control deposition of chemicals of potential ecological concern (COPECs) into a receiving stream that contribute to unacceptable ecological risk in the Upper Animas River adjacent to the repository location.	• Construction of drying cells to dewater mining-related wastes before placement into the disposal cell. • Construction of a stockpile cell at the repository to temporarily store mining-related wastes before placement into the disposal cell. • Construction of a disposal cell as the final disposal location for mining-related wastes; leachate from the cell will be collected and conveyed to the leachate holding cell/tank. • Construction of a leachate holding cell/tank to temporarily store MIW leachate before disposal or treatment of leachate, if necessary. • Construction of stormwater controls, road improvements and access controls, as needed. • Placement of wastes into the repository, once constructed. Wastes include treatment sludges from the Gladstone IWTP, mine wastes from the IRAs in the 2019 IROD for OU1 and mine wastes from future response actions. • Placement of a temporary cover of disposal cells that reach capacity until final disposal cell closure. • Maintenance and monitoring of the BPR, including implementation of a groundwater monitoring and cell leak detection program, periodic inspections of the cover system and access controls.
RAO 3: Limit uses of the property that are incompatible with a mining-related waste repository.	• Implementation of ICs to protect engineered remedial features and to limit public access to the repository; the ICs would be in addition to any current or future ICs for OU2.
Source: Sections 8.1 (RAOs) and 12.3 (Detailed Description of the Selected Interim Remedy) of the Site's 2021 IROD.	

The 2021 IROD did not select conventional chemical- or media-specific cleanup levels for the BPR IRA given its scope (i.e., containment of wastes generated from other locations within the Site from other response actions) and the uncertainty regarding those other response actions. Instead, qualitative criteria consisting of action-specific applicable or relevant and appropriate requirements (ARARs) related to the design, construction and operation of solid-waste-disposal facilities are the cleanup criteria. Attainment of the cleanup criteria for this interim action will be demonstrated through compliance with the action-specific ARARs in conjunction with the achievement of RAOs. Section 8.2.1 of the 2021 IROD provides more information.

Status of Implementation

This section addresses the status of implementation of the IRAs at the 23 mining-related sources addressed in the 2019 IROD and the BPR selected in the 2021 IROD. In addition, a summary of recent removal activities at OU4 and OU5 is provided.

2019 IROD Remedial Actions (23 Mining-Related Sources)

The responsibilities for designing and implementing the IRAs at the mining-related source areas are being divided among the EPA, the USFS, the CDPHE and the Colorado Division of Reclamation, Mining and Safety (DRMS). The CDPHE and DRMS sites are completed through a cooperative agreement with the EPA for remedial action. Interim remedy construction began in October 2019. The IRAs at 20 of the 23 mining-related source areas are complete; the IRAs at the remaining sites are in progress. A Final Remedial Action Report is expected in 2025, pending completion of all IRAs.

More information on the status of the IRAs at each of the 23 mining-related source areas, by drainage basin, is below. The party conducting the IRA is provided in parentheses after each source area.

Mineral Creek Drainage Basin IRAs

Five of the 23 mining-related sources addressed in the 2019 IROD are in the Mineral Creek Drainage Basin (Table 4 and Figure C-1, Appendix C).

Table 4: Mining-Related Sources within Mineral Creek Drainage Basin and IRA Status

Mining Related-Source	IRA Status	Mine Portal MIW Discharges	Mining-Related Source/ Stormwater Interactions	Mine Portal Pond Sediments	In-Stream Mine Wastes	Mining-Impacted Recreational Staging Areas
Longfellow Mine	Complete					X
Junction Mine	Complete	X		X		X
Koehler Tunnel	Complete	X		X		X
Brooklyn Mine	In progress	X	X	X		
Bandora Mine	Complete	X	X			

Notes:
X = mining-related issue addressed in the 2019 IROD.
Light gray cells = not a mining-related issue for the area.

- Koehler/Junction/Longfellow Complex (EPA)

  The Koehler/Junction/Longfellow complex consists of three mines: Longfellow Mine, Junction Mine and Koehler Tunnel (Figure C-1 and Figure C-4, Appendix C). The three mines are co-located at the headwaters of Mineral Creek, about six miles northwest of Silverton. The Koehler/Junction/Longfellow complex is a popular recreation area. Many areas throughout the complex have been used for dispersed camping. Table 1 provides more information.

The objective of the IRA at the Koehler Tunnel and Junction Mine sites was to remove sludge from the settling pond and create space to allow the pond to settle out metals from MIW more efficiently. The IRA began in summer 2020. Remedial activities included the construction of two temporary repositories (Repository 1 and Repository 2) north of the settling pond and the removal of settling pond sludge, with placement of the material into the temporary repositories. The repositories were substantially complete by September 2021. After completion of the settling pond desludging, EPA contractors placed boulders on the road leading up to the Koehler Tunnel, excavated the drainage channel from the Koehler Tunnel to the edge of the talus pile to a depth of 12 inches, and graded disturbed areas. In addition, the camping area on the south side of the pond was capped with 12 inches of common fill material and hydroseeded.

The Koehler/Junction/Longfellow complex was originally selected for an IRA, in part, due to potential unacceptable human-health risks associated with exposure to arsenic in waste rock and potentially lead. Of the recreation staging areas that were assessed for unacceptable levels of lead and arsenic, three were identified within the complex and have been covered with clean material since then. Confirmation sampling is anticipated in 2024 or 2025 to determine whether this cover-material placement was sufficient to meet human-health RAOs.

The EPA and the CDPHE conducted a site inspection on September 7, 2021. The agencies determined that the IRAs at the Koehler/Junction/Longfellow complex were operational and functional.[3] The MIW channel and portal pond were functioning as intended. However, post-IRA confirmation sampling is needed to determine if the IRAs achieved the human-health interim cleanup levels at mining-impact recreation staging areas.

Additional removal activities (not part of the IRA) took place at the site in 2023. They included sludge removal from the Koehler Tunnel (with placement of the material in the settling pond), re-establishment of a conveyance channel from the Koehler Tunnel portal to the talus slope, and re-establishment of the channel used for run-off control that runs directly south of the two temporary repositories at the complex. Work also included a bulkhead assessment at the Koehler Tunnel. A Time-Critical Removal Action was conducted to stabilize the Koehler Tunnel and prevent further impoundment of water outside of the bulkhead in July 2024.

- Brooklyn Mine (USFS/EPA/DRMS)

  The Brooklyn Mine adit is on the east side of Mineral Creek along a steep-walled portion of Brown's Gulch (Figure C-1).

  The IRA at the Brooklyn Mine is in progress. Work to date has included the construction of stormwater diversions. Remaining work on the mine portal ponds and MIW discharge is planned to begin in spring 2025.

- Bandora Mine (EPA)

  The Bandora Mine is on the northwest side of the south fork of Mineral Creek, about eight miles west of Silverton (Figure C-1). MIW flows from two collapsed adits – Bandora Little Todd (BLT) level 4 and Bandora level 5. MIW discharges from the top of the BLT level 4 portal through mine timbers.

  The IRA began in June 2021. Activities in support of the 2019 IROD included completing run-on controls, constructing two detention ponds for managing site water during drilling, and creating or improving existing access roads. These activities were conducted concurrently with work to investigate the volume of pooled MIW present from portal obstruction at the BLT level 4 adit.

[3] "Operational and functional" is described in the NCP, 40 CFR 300.435(f)(2): "A remedy becomes 'operational and functional' either one year after construction is complete, or when the remedy is determined concurrently by EPA and the state to be functioning properly and is performing as designed, whichever is earlier. EPA may grant extensions to the one-year period, as appropriate."

Pond and channel construction took place from August 2021 to June 2022. The two lined detention ponds serve as a settling pond (upper) and polishing pond (lower) for the MIW discharging from the BLT level 4 adit. A drainage channel was also constructed to convey MIW from the BLT level 4 adit through the two detention ponds and into the south fork of Mineral Creek. The drainage channel is lined with high density polyethylene (HDPE) poly fabric and geofabric for most of its length. However, in several locations where the channel does not cross waste rock, the drainage channel is only lined with geofabric: a 20-foot section 20 feet above the upper detention pond and from 20 feet below the lower detention pond to the south fork of Mineral Creek, except for 8 feet on either side of the culvert under County Road 585. The culvert below County Road 585 and extending 8 feet from either side is lined with HDPE liner and geofabric. A joint inspection of the work is planned for 2024 or 2025 to determine O&F status.

Drilling attempts to intercept the BLT level 4 adit were unsuccessful. As a result, the water level inside the adit was not assessed or pumped. After drilling, more maps of the mine were discovered that showed a different alignment for the adit. The EPA plans to conduct more work at the Bandora Mine in the future as part of the RI and feasibility study (FS).

Cement Creek Drainage Basin IRAs

Six of the 23 mining-related sources addressed in the 2019 IROD are in the Cement Creek Drainage Basin (Table 5 and Figure C-2, Appendix C).

Table 5: Mining-Related Sources within Cement Creek Drainage Basin and IRA Status

Mining Related-Source	IRA Status	Mine Portal MIW Discharges	Mining-Related Source/ Stormwater Interactions	Mine Portal Pond Sediments	In-Stream Mine Wastes	Mining-Impacted Recreational Staging Areas
Grand Mogul Mine	Complete		X		X	
Natalie/Occidental Mine	Complete	X				
Henrietta Mine	Complete	X				
Mammoth Tunnel	Complete	X		X		
Anglo Saxon Mine	Complete	X		X		
Yukon Tunnel	Complete	X	X			

Notes:
X = mining-related issue addressed in the 2019 IROD.
Light gray cells = not a mining-related issue for the area.

- Grand Mogul Mine (EPA/CDPHE)

  The IRA at the Grand Mogul Mine was completed on September 13, 2024.

  The work included sloping approximately 700 feet of the county road, so the road drainage is held along the upgradient side of the road and installation of two rolling dips in the road so that surface water flows downgradient into areas free of mine waste. Approximately 500 cubic yards of waste rock were present in the semi-braided channel of Queen Anne Creek and was consolidated outside of the braided channel and armored with local non-acid-generating materials and revegetated using locally-harvested topsoil from the location where the waste rock is consolidated.

  EPA and the CDPHE will inspect the site to ensure performance of the remedy.

- Natalie/Occidental Mine (EPA)

  The Natalie/Occidental Mine is located one mile southeast of the Gladstone IWTP on the north side of the South Fork of Cement Creek, directly across from the Big Colorado Mine (Figure C-2). It consists of a discharging adit covered with a grate. Before the IRA, the adit discharge flowed southwest over soil and waste rock for about 240 feet before entering the South Fork of Cement Creek. Heavy orange precipitate buildup behind the adit grate partially blocked adit flow and still regularly clogs with mine debris such as fallen timbers and sludge.

  The IRA for the Natalie/Occidental Mine took place in August 2020 to create a new channel to route the adit discharge to the north around the waste rock and to modify the mine closure grate to allow for the cleaning of precipitates and debris. Rerouting the water entailed constructing a new channel along the north of the waste-rock pile, which was lined with a geotextile fabric and riprap, and abandoning and reclaiming the old channel. Native soils were excavated during the construction of the new channel and alignment outside the portal. Soils excavated from the new upper alignment were used to cover the old channel alignment.

  The grate was modified to be a hinged hatch to allow for cleaning and removal of the grate. To prevent water infiltration into the waste rock, an HDPE liner was installed from the portal to below the point of potential waste rock/water interaction. On the flat area of the east side of the road and next to the adit, hydroxide sludge in the former channel was buried in place. Native topsoil was placed over the disturbed/excavated area.

  The EPA and the CDPHE conducted a site inspection on August 24, 2021. The agencies determined the IRA at the Natalie/Occidental Mine was operational and functional. The MIW channel was functioning as intended with minimal buildup of sediments.

- Henrietta Mine (EPA)

  The Henrietta Mine is on the south side of Prospect Gulch (Figure C-2). There are at least six levels in the mine. The 700 level adit flows only during high-flow conditions and is diverted into a drainage channel that flows on the southeast side of waste rock. Before the IRA, the grate on the 700 level portal was observed to be partially buried by material eroding from the surrounding slope. The mine was included in the 2019 IROD to address the partial blockage of the 700 level portal grate so that MIW discharge can flow freely.

  The IRA for the Henrietta Mine took place in October 2019. Work included removal of about two cubic yards of soil from the front of the grated adit access door, temporary removal of the access door and removal of about 0.5 cubic yards of soil from the culvert blockage. The soil in front of the adit and blocking the grated access door was moved out and deposited nearby, as it was determined to be clean soil eroded from the hillside above. After the soil removal, the closure gate, frame and door were reinstalled and secured with large rocks.

  The EPA and the CDPHE inspected the area on April 3, 2021. The agencies determined that the IRA conducted at the Henrietta Mine was operational and functional. The adit remained unobstructed as intended by the IROD work.

- Mammoth Tunnel (EPA)

  The Mammoth Tunnel is adjacent to County Road 110 on the west side of Cement Creek approximately four miles north of Silverton and one mile north of the Anglo Saxon Mine (Figure C-2). Prior to the IRA, MIW discharged from a pipe coming out of a collapsed adit flowed generally southeast over the waste-rock pile in a concrete-lined channel. The pipe from the collapsed adit discharged MIW into a small settling pond before it was routed into a culvert and then to a concrete fabric channel into a lower settling

pond. The upper conveyance area in front of the adit was overflowing with sludge causing some water (approximately 10%) to overtop the berm and flow across the county road and the waste-rock pile.

The IRA for the Mammoth Tunnel began in September 2021. Work included stabilizing and removing sediment from the lower settling pond, consolidating sediments in an interim management area, and installing a channel to direct flow away from waste-rock piles to a scour basin within the upper pond. The section of the new channel was constructed with geotextile and riprap while the other two reaches were constructed out of geosynthetic cementitious composite mat. Figure C-5 in Appendix C shows the location of the ponds, interim management area and other site features after the IRA.

More work took place in August 2023. It included the expansion of the lower pond to double its capacity in an effort to accommodate high flow conditions, cleaning of the drainage ditch next to the upper pond and placement of a reinforced polypropylene liner in the drainage ditch next to the upper pond. A small pond present where water drains from the Mammoth adit was mucked out (with muck buried on the hill slope above the pond) and lined with a liner. A 3-foot berm was placed around the pond and rock placed on top of the berm. The culvert conveying water from the pond was replaced with a 24-inch diameter culvert.

In 2024, the BLM in collaboration with DRMS removed the remains of the upper Mammoth pond through a Time-Critical Removal Action. A final inspection of the site is anticipated in late 2024.

- Anglo Saxon Mine (EPA)

The Anglo Saxon Mine was discharging MIW from a partially collapsed portal that flows east, across a waste-rock pile that was supported by a crib wall that recently collapsed in August 2024. MIW would then partially flow through the crib wall and partially downhill along the north side of the crib wall and through a culvert under County Road 110. Two ponds are east of County Road 110 at the site, within a wetland area along Cement Creek. MIW was flowing into the upper pond shortly after discharging from the culvert, then through an erosional channel within the wetland area to the lower pond. Overflow from the lower pond would then enter Cement Creek.

The IRA for the Anglo Saxon Mine took place in August and September 2021. The goal of the IRA was to divert MIW around the waste-rock pile to minimize the transport of heavy metals. Work included construction of a lined MIW drainage channel in Reach 1, scouring a path for MIW drainage in Reach 2, stabilizing and removing accumulated sediment from the upper pond, placing the sediment in an interim management area and capping, and stormwater management adjustments. Figure C-6 in Appendix C shows the interim management area and other site features.

The original discharge channel was undersized for the rate of sediment accumulation and was significantly expanded in the same alignment in 2022.

The EPA and the CDPHE inspected the Anglo Saxon Mine on June 2, 2023. The agencies determined that the IRA for the Anglo Saxon Mine was operational and functional. The MIW channel and portal ponds were functioning as intended without excessive sediment buildup in either portion.

- Yukon Tunnel (EPA)

The Yukon Mine is an abandoned mine about 3.5 miles north/northwest of Silverton (Figure C-2). It includes a mostly intact mill and a collapsed portal leading into the Yukon Tunnel, a circa 1900 tunnel that extends about 7,000 feet into the mine. The mine drains through a buried pipeline that surfaces about 300 feet northwest of the portal and drains into Illinois Gulch.

The IRA for the Yukon Mine took place from June to September 2022. The objective of the work was to stabilize the mine portal and identify and secure the drainage pipe. The work consisted of a preliminary site visit to document conditions at the portal, excavation of the portal, and construction of a new portal

structure with the drainage pipe secured (Figure C-7). The EPA performed an inspection of the Yukon Mine on September 21, 2022. A joint inspection with CDPHE and the EPA is anticipated for late 2024.

Upper Animas River Drainage Basin

Twelve of the 23 mining-related sources addressed in the 2019 IROD are in the Upper Animas River Drainage Basin (Table 6 and Figure C-3, Appendix C).

Table 6: Mining-Related Sources within Upper Animas River Drainage Basin and IRA Status

Mining Related-Source	IRA Status	Mine Portal MIW Discharges	Mining-Related Source/ Stormwater Interactions	Mine Portal Pond Sediments	In-Stream Mine Wastes	Mining-Impacted Recreational Staging Areas
Ben Butler Mine	Complete		X			
Mountain Queen Mine	Complete	X	X			
Vermillion Mine	Complete	X	X			
Sunbank Group Mine	Complete	X	X	X		
Frisco/Bagley Mine	Complete	X		X		
Columbus Mine	Complete	X	X			
Campground 7	Complete					X
Silver Wing Mine	Complete	X	X	X		
Tom Moore Mine	Complete	X				
Terry Tunnel	Complete	X				
Pride of the West Mine	Complete	X				
Campground 4	Complete					X

Notes:
X = mining-related issue addressed in the 2019 IROD.
Light gray cells = not a mining-related issue for the area.

- Ben Butler Mine (EPA)

  The Ben Butler Mine is on the north side of Burrows Creek on the south slope of Denver Hill about 1,200 feet north of the London Mine (Figure C-3). There are no direct roads to the mine. The Ben Butler Mine consisted of an open shaft, an open cut, a collapsed adit and an adjacent smaller collapsed shaft. The open shaft was reported to be 200 feet deep, and there was standing water 20 feet below the collar of the shaft. It had a failing mine safety closure grate, which showed signs of warping and sagging. Before the IRA, there were an estimated 500 cubic yards of waste rock on site. A 200-yard-long vegetation kill zone extended downslope from the waste rock toward Burrows Creek.

  The IRA at the Ben Butler Mine took place in 2020. It included backfilling the mine openings with the on-site waste rock amended with limestone crusher fines. The failing grated shaft was removed. During construction, it was discovered that the volume of waste rock remaining on site was insufficient to completely backfill the shaft and other mine openings. Therefore, a new grated shaft closure was reinstalled over the partially backfilled open shaft but at a location higher in the collar of the shaft with a beam for load spanning. Waste rock was excavated to bedrock or visually to the original underlying soil. The waste-rock-removal area and kill zone below the mine were revegetated with a mixture of compost, limestone and biochar.

  The EPA and the CDPHE inspected the Ben Butler Mine on August 5, 2021. The agencies determined that the IRA at the Ben Butler Mine was operational and functional. All of the stormwater interaction mitigating measures were functioning as intended. Some vegetation was already growing over the amended waste rock.

- Mountain Queen Mine (CDPHE)

  The Mountain Queen Mine is on the east side of Hurricane Peak at the headwaters of California Gulch, with a draining adit and a waste-rock pile (Figure C-3). The mine is located on County Road 19, but there is no direct driving access to the mine site because the California Gulch stream channel creates a natural barrier for vehicles. Before the IRA, mine drainage was flowing across the top of the waste-rock pile and infiltrating, and stormwater was coming into contact with the waste rock from the slopes above the area and from California Gulch high water flows.

  The IRA at the Mountain Queen Mine took place in August and September 2023. Mine drainage water was routed into a 12-inch smooth wall HDPE pipe, starting at the adit outside the grated mine safety closure, through a small coffer dam. The pipe is buried about two feet deep. The end of the pipe exits into a natural gulley from the slopes above, which then connects with the upland and western stormwater channel.

  Two different stormwater mitigation measures were taken at the Mountain Queen Mine. First, the upland and western stormwater channel was installed to capture stormwater and snow melt from the slopes above the site. The channel was installed eight feet from the base of the waste-rock pile's western edge by excavating a two-feet-deep channel into native materials. The stormwater channel excavation ends at the northern toe of the waste-rock pile into a pre-existing channel that is next to and eventually enters California Gulch. The second stormwater measure taken was to armor the eastern edge of the waste-rock pile with riprap. About 120 feet of the waste-rock pile toe was lined with riprap up to 2.5 feet to prevent the migration of waste rock into California Gulch. Boulders were placed along County Road 19 (California Pass) along the area's margins to prevent unauthorized vehicle traffic into the area. Figure C-8 in Appendix C shows the IRA's features.

  The EPA and the CDPHE inspected the Mountain Queen Mine site on July 16, 2024. The agencies determined the IRA at the Mountain Queen Mine was operational and functional. A summary of the findings of the inspection are included in the Site Inspection section under Part IV, Five-Year Review Process, of this report.

- Vermillion Mine (CDPHE)

  The Vermillion Mine is in a large gentle swale high on the north side of California Gulch near the southwest flank of Houghton Mountain, in a remote area 12 miles northeast of Silverton (Figure C-3). There is an upper and lower Vermillion with the former being included in the 2019 IROD. It includes a draining adit and a waste-rock pile. Before the IRA, the adit MIW discharge flowed south and infiltrated into the waste-rock pile. Stormwater was also coming in contact with the waste rock from the slopes above the area and from the drainage swale where the waste-rock pile is situated.

  The IRA at the Vermillion Mine took place in August and September 2023. The mine drainage was captured from near the adit and routed to the east around the waste rock in a one-foot-deep, hand-excavated ditch to a point in the hillside where the water would continue to flow away from waste rock before entering a natural drainage swale below the site. Figure C-9 in Appendix C shows the area's features.

  To route stormwater around the waste-rock pile, two ditches were installed. One ditch routes mine-drainage water east and also captures upland flow and diverts the water around the waste-rock pile. The second ditch, a two-foot-deep, stormwater-only ditch, was installed northwest of the long lobe of the waste-rock pile to capture the drainage swale flows and route them around the waste rock. Revegetation of the area was done by hand-transplanting grasses in sod clumps in areas of disturbance.

  The EPA and the CDPHE inspected the Vermillion Mine on July 16, 2024. The agencies determined the IRA at the Vermillion Mine was operable and functional. A summary of the findings of the inspection are included in the Site Inspection section under Part IV, Five-Year Review Process, of this report.

- Sunbank Group Mine (EPA)

  The Sunbank Group Mine is in Placer Gulch (Figure C-3). Before the IRA, MIW discharged over a concrete surface bulkhead that partially sealed the portal and was directed into a series of settling ponds next to Placer Gulch. Many of the drainpipes in the bulkhead were plugged or damaged. MIW flowed around the surface bulkhead in addition to coming through drainpipes in the top of the bulkhead. MIW then flowed east, around the southern edge of a waste-rock pile across an access road into Pond 1. However, some overflow was directed to Pond 2. Both ponds appeared to be no longer functional. Approximately three ancillary ponds were also intermittently used and mostly full prior to the IRA. These ponds were integrated into the IRA Ponds 1 and 2.

  An existing run-on control swale was present west of the area, diverting stormwater and snowmelt flows away from the ponds. The run-on swale showed evidence of sediment deposition and vegetation growth. In addition, a run-on structure at the road going to the ponds allowed surface water to flow into the pond system.

  The IRA at the Sunbank Group Mine took place in June and July 2022. Construction activities included:

    - Temporary capture of the MIW at the bulkhead for diversion to the adjacent stream.
    - Sediment stabilization and removal from both major ponds, including the pond area south and east of Pond 1 (former Reach 2) where sedimentation had occurred below the original design spillway.
    - Consolidation of sediments in an interim management area.
    - Reconstruction and installation of composite mat on the existing pond berms.
    - Reconstruction of Reach 1 and 2 to direct flow from the bulkhead through the pond system.
    - Installation of a stormwater control channel (Reach 3) to direct flow away from the bulkhead and pond system.
    - Regrading the run-on control channels to enhance stormwater shedding away from the waste-rock pile and around the pond system.

  The EPA and the CDPHE performed a final inspection of the Sunbank Group Mine on July 16, 2024. The agencies determined the IRA at the Sunbank Group Mine was operational and functional. A summary of the findings of the inspection are included in the Site Inspection section under Part IV, Five-Year Review Process, of this report.

- Frisco/Bagley Mine (EPA/CDPHE/DRMS)

  The IRA at the Frisco Bagley Mine took place in August 2024. The work included routing the MIW discharge around the waste-rock pile. The MIW routing will prevent infiltration of mine drainage into the waste rock, while also preventing mine drainage from saturating the foundation of the historic Frisco Bagley Mill building. The MIW channel starts at the Frisco Tunnel and travels to the west of the west rock pile in a four-foot-deep channel. The precipitates in the pre-existing channel were removed and incorporated into non-acid-forming Burns formation cross-cut waste rock. The western portion of the waste-rock pile was then re-graded to prevent ponding of water on top of the waste-rock pile. The total length of channel installed was 350 feet from the adit to County Road 9. At County Road 9 the culvert was replaced in July 2024 by San Juan County Road and Bridge, and the channel below the road was also extended. Three-foot diameter boulders were placed along the accessible portion of the channel to prevent vehicular access, and a swing arm style gate was placed on the road into the property. The area was revegetated by hand-broadcasting native seed mix.

  A joint inspection between the EPA and the CDPHE is planned for later in the fall of 2024.

- Columbus Mine (CDPHE)

  The Columbus Mine is near Animas Forks at the confluence of the West Fork (sometimes referred to as California Gulch) and North Fork of the Animas River (Figure C-3). It has a discharging adit from which mine portal MIW discharge infiltrated into a waste-rock pile and then emerged at the base and entered the West Fork of the Animas River. Stormwater and snowmelt from the slopes above the area were also infiltrating and flowing across the waste-rock pile.

  The IRA at the Columbus Mine took place in August and September 2023. The work included rerouting the MIW around the waste-rock pile. MIW was collected into a coffer dam and pipe system 20 feet outside the adit safety closure and routed into a 12-inch pipe to the east for eventual communication to the Animas River instead of California Gulch. The pipe is 180 feet long and buried 2 feet deep under a berm installed along the roadway to the top of the pile. At its end, the pipe enters a newly constructed stormwater channel, which was installed to capture water from the slopes above the site. Three-foot diameter boulders were also placed at all access points to the Columbus Mine to prevent vehicular access. The area was revegetated by hand-broadcasting a native seed mix.

  The EPA and the CDPHE inspected the Columbus Mine on July 16, 2024, and observed that water that disperses from the MIW channel downhill of the adit appeared to have a negative effect on vegetation in the new overland flow path. The agencies are working to determine the need for additional actions at the Columbus Mine to correct the drainage issue.

- Campground 7 (CDPHE)

  Campground 7 was identified as an area where contaminated sediments may be posing an unacceptable risk to human health through its use as an undesignated campsite. Campground 7 had high lead concentrations across a two-acre area; concentrations ranged up to 9,500 parts per million (ppm) lead. The source of this contamination was identified as a former smelter site adjacent to the Site.

  The goal of the Campground 7 IRA was to reduce the human-health risks associated with recreating and camping in the area due to high soil lead concentrations. The IRA took place in September 2021. The work included covering the areas with soil lead concentrations that exceeded the interim cleanup level of 2,100 ppm (rounded) with clean cover material and revegetating the disturbed areas.

  Initial activities included the installation of temporary sediment control fencing to prevent sediment migration off site during storm events. Willows were excavated with the root ball intact from the areas with high soil lead concentrations and stockpiled for later live transplantation back into the reclaimed area.

  The high lead areas on the downhill side of the road were excavated and tested for lead with an x-ray fluorescence (XRF) meter at depths ranging from one foot to six feet. During excavation and testing, it was discovered that the areas with high soil-lead concentrations had a thin surficial deposit (three inches to three feet) on the surface and there were clean soils/gravel and cobble river deposits underneath with lead levels well below the interim cleanup level. To minimize disturbance of the Campground 7, the EPA decided to turn over the low lead concentration deeper deposits to cover the high lead concentration surface soils. The high concentration lead soils have a minimum of eight inches of clean cover material (i.e., soils with concentrations below 2,100 ppm lead) over the top of them.

  Contractors placed boulders on both sides of the Animas Toll Road to prevent access to the smelter area with steep slopes not suitable for camping and near other areas where soils with lead concentrations above the lead interim cleanup level were buried under clean cover material. Boulders were also used to define the parking area on County Road 2 for the Grouse Gulch trailhead. The soil cover area was left with large hummocks, boulders and significant roughness to prevent tent camping and digging.

To restore the area, salvaged willows were transplanted back into low areas where the roots would be able to reach groundwater, along the riverbanks. The entire area was seeded. The disturbed area was mulched with wood straw mulch. Figure C-10 in Appendix C shows area features.

An XRF survey for lead and arsenic took place in October 2023 to obtain screening-level data in the removal and cover areas. More confirmation sampling is planned.

The EPA and the CDPHE performed a final inspection of Campground 7 on July 16, 2024. The agencies determined the IRA at Campground 7 was operational and functional. A summary of the findings of the inspection are included in the Site Inspection section under Part IV, Five-Year Review Process, of this report.

- Silver Wing Mine (EPA)

The Silver Wing Mine is on the east side of the Upper Animas River, south of Animas Forks (Figure C-3). Before the IRA, MIW from an adit discharged from an open portal and flowed west over a waste-rock pile toward a pond. Before reaching the pond, some MIW fanned out and flowed down the waste-rock pile to the Animas River. A corrugated plastic pipe extended from the adit across the surface toward the pond. However, MIW did not appear to flow through the pipe due to broken sections. The on-site pond was lined with HDPE and about five feet of accumulated sediment had reduced the freeboard to a few inches, allowing MIW entering the pond to flow over a failure in the west berm instead of the designated spillway. An existing run-on control uphill from the site diverted stormwater around the site.

The IRA at the Silver Wing Mine took place between July and August 2022. Activities included:

- Temporary diversion of MIW from the open portal to the Animas River.
- Stabilization and removal of sediment from the pond.
- Consolidation of sediments in an interim management area.
- Removal and replacement of the pond liner.
- Installation of a lined channel and scour basins to direct flow away from the waste-rock piles.
- Regrading of the run-on control channel to enhance stormwater shedding around the site.

The EPA and the CDPHE performed an inspection of the Silver Wing Mine on July 17, 2024. A summary of the findings of the inspection are included in the Site Inspection section under Part IV, Five-Year Review Process, of this report.

- Tom Moore Mine (CDPHE)

The Tom Moore Mine is about a half mile south of the Silver Wing Mine (Figure C-3). Before the IRA, mine adit MIW flowed over a waste-rock pile and into the Animas River.

The IRA at the Tom Moore Mine took place in late summer 2023. Work included clearing debris from the mine entrance and constructing a berm on the right side of the mine's drainage channel to direct flow into the historical discharge alignment, which is not in contact with the waste-rock pile.

The EPA and the CDPHE inspected the Tom Moore Mine on July 17, 2024. The agencies determined the IRA at the Tom Moore Mine was operational and functional. A summary of the findings of the inspection are included in the Site Inspection section under Part IV, Five-Year Review Process, of this report.

- Terry Tunnel (EPA)

  The Terry Tunnel portal is about a quarter mile southeast of the Ben Franklin Mine. The tunnel is an extension of the Sunnyside Mine. The Terry Tunnel was the location of the first Sunnyside bulkhead, constructed in August 1994, more than 3,700 feet from the portal at the southeast end of the tunnel. Sunnyside installed a second concrete bulkhead, Bulkhead #2, 300 feet in from the portal in September 2000. Before the IRA, the Terry Tunnel had a completely collapsed portal entrance. At some point after the construction of the second bulkhead, the portal was intentionally collapsed and backfilled with soil. The slope was revegetated, and a drainage ditch replaced a former temporary detention pond in the portal area. In recent years, seepage has been visible at the slope face and water has ponded in the swale.

  The IRA took place from June 2021 to October 2022. Initial work focused on evaluating and documenting the existing conditions of the outer bulkhead (Bulkhead #2), surveying the location of the bulkhead and obtaining water samples.

  Construction activities for the Terry Tunnel included:
    - A pre-construction survey and a geophysical survey to assist with locating the tunnel alignment, the extent of portal backfill and potential water volume in the tunnel.
    - Construction of a lined, temporary detention pond to temporarily store any MIW discharged during tunnel dewatering.
    - Installation of a monitoring and pumping well (TTPZ-1) to intercept the Terry Tunnel between the portal and Bulkhead #2.
    - Dewatering of the Terry Tunnel via a submersible pump installed in TTPZ-1 (and completed through the portal after excavation). Water was directed to the temporary detention pond.
    - Excavation of the tunnel portal. The material removed from the portal was stockpiled south of the portal, next to an existing soil pile.
    - Construction of the portal structure and rehabilitation of the tunnel. This work included the construction of a new, secured portal entrance.
    - Removal of the temporary detention pond and construction of a smaller, detention pond and drainage ditch to settle out MIW from the Terry Tunnel before it drained into Eureka Creek. The detention pond and drainage ditch were lined with a 60-mil HDPE liner that was covered in riprap.
    - Hydroseeding of disturbed areas around the Terry Tunnel and completion of a topographic survey to document final grading and the drainage ditch.
    - Environmental monitoring and sampling during dewatering and construction activities.

  The EPA and the CDPHE conducted a joint inspection of the Terry Tunnel on July 17, 2024. The agencies determined the IRA at the Terry Tunnel is operational and functional. A summary of the findings of the inspection are included in the Site Inspection section under Part IV, Five-Year Review Process, of this report.

- Pride of the West Mine (CDPHE)

  The Pride of the West Mine is on the east side of Cunningham Creek off County Road 4 (Figure C-3). The source area is characterized by channelized MIW discharge flowing northwest from the Pride of the West adit to a culvert under the mine access road. Flows discharged from the culvert to the west, down a steep gully to a second culvert under County Road 4, and then down a second steep gully embankment before flowing into Cunningham Creek.

  Previous work at the mine addressed mine portal MIW discharges, including the construction of a diversion channel to route MIW around remaining mine waste. The diversion channel routed MIW discharge from the mine portal for about 40 feet before entering an 80-foot-long corrugated 6-inch-diameter metal pipe culvert under the mine access road. However, the 6-inch-diameter pipe was no longer functioning properly.

The IRA finished in August 2022. It included the replacement of the 6-inch-diameter pipe with a new double-wall HDPE 24-inch-diameter pipe to restore the functionality of the existing diversion channel.

The EPA and the CDPHE/DRMS conducted an inspection of the Pride of the West Mine on August 28, 2024, and found that the remedy was operational and functional. Flow through the newly installed culvert was unobstructed and capturing all MIW as intended.

- Campground 4 (CDPHE)

Campground 4 is near the confluence of Cunningham Creek and the Animas River near the historic townsite of Howardsville (Figure C-3). Campground 4 was identified as an area where contaminated sediments may be posing an unacceptable risk to human health through its use as an undesignated campsite.

Prior to the IRA, Campground 4 had high lead concentrations across an area of about 2.5 acres, with concentrations ranging from 3,000 ppm lead to 100,000 ppm lead. The goals of the IRA for Campground 4 were to contain and isolate mine-waste soil using cover to reduce disturbance and migration of contaminants. The goal of the cover is to eliminate surface exposure to mine waste and contaminated soils that exceed the interim cleanup levels.

The IRA took place from September to October 2022. Tailings and high-lead-concentration soils above the interim cleanup levels were consolidated in two locations: (1) over the mill foundation area (eastern area) and (2) the area on the other side of the water wheel ditch (western area). The consolidation areas were covered with 6 inches of limestone crusher fines and 18 inches of clean cover material derived from cobble and gravel soils on site. The remaining limestone crusher fines were spread over the access roads at the lower area and across portions of the consolidation area for growth media. Boulders were placed along the access to the site near County Road 2 and near the construction access to the area above the mill. A gate was installed at the road access north of the area. The area was severely scarified and large hummocks were installed to provide microclimates for revegetation. The area was then revegetated and hydromulched.

The mill site was covered with clean cover materials and revegetated. The covered areas were revegetated with native plant species, including salvageable willows. Access to the area was blocked off with boulders and a new fence to prevent disturbance of the area, per the landowner's request, and to protect the revegetation efforts. Work was conducted in a manner to preserve historic features of the site, including the wooden foundations of the mill, the standing water wheel structure and ditch and other mill features. Figure C-11 in Appendix C shows area features after the construction work.

An XRF survey took place in September 2023 to map levels of lead and arsenic in soil after the reclamation. Confirmation sampling is ongoing.

The EPA and the CDPHE performed a final inspection of Campground 4 on July 16, 2024. The agencies determined the IRA at Campground 4 was operational and functional. A summary of the findings of the inspection are included in the Site Inspection section under Part IV, Five-Year Review Process, of this report.

2021 IROD Remedial Actions (Bonita Peak Repository/BPR)

The Final (100%) Remedial Design Analysis Report for the BPR was completed in May 2022. The construction of the BPR began on May 26, 2023, and is ongoing on top of Mayflower tailings impoundment 4 (Figure 1). The BPR will be a newly constructed mine-waste repository designated for disposal of mine wastes and treatment-generated solids on Site.

The major features of the facility include:

- A disposal cell for disposal of mining-related wastes (Cell 1).
- An MIW leachate collection system for the repository cells (Cells 1-3).
- A staging and processing area in the future footprint of Cell 2.
- Associated stormwater controls on and around Mayflower tailings impoundment 4.
- Improvement and/or construction of access roads on Mayflower tailings impoundment 4.
- An avalanche block wall to protect the leachate pond from avalanche impacts.

The final construction of the repository will include three disposal cells. These cells roughly split the site into thirds from west to east with Cell 1 being the westernmost cell. In Phase I construction, Cell 1 will be completed to be used for immediate disposal of unamended wastes from the IWTP and other IRAs taking place on the Site.

Earthen berms surround the facility's outer cell walls and the entirety of Cell 1. A network of stormwater management channels encircles the facility and directs stormwater generated on the facility to the Animas River.

The capacity of Cell 1 is approximately 35,000 cubic yards. Future capacities in Cells 2 and 3 are yet to be determined through constructability testing to stack mine waste. Cell 1 is constructed to drain to the northwest at a grade of 1%. A leachate collection system runs throughout to transport leachate to the leachate pond. Cell 1 has a composite liner system consisting of a geosynthetic clay liner and HDPE membranes. Leak detection sumps are installed around the cell. The staging and processing area has been paved on the footprint of future Cell 2. Constructability testing will also take place in this footprint to inform the design of future Cells 2 and 3.

The EPA expects to begin filling Cell 1 in 2025 with treatment-generated solids from the IWTP.

Recent Removal Actions

In addition to the IRAs implemented under the 2019 and 2021 IRODs and the removal actions discussed in the Early Cleanup Actions section of this FYR Report, additional removal actions are being implemented at OU4 and OU5, as described further below. The remaining work at both OUs listed below includes water quality and effectiveness monitoring for five years following completion of each project.

OU4 (Ben Franklin Mine): The EPA issued an Administrative Settlement Agreement and Order on Consent for Removal Action to two potentially responsible parties in August 2019. The removal action at Ben Franklin Mine began in September 2019 and includes the following:

- Securing the mine portal to prevent public access to the mine workings.
- Installation of pH buffering for the remaining adit discharge following DRMS's closure of the Ben Franklin stope.
- Channelization and diversion of the adit discharge to minimize interaction with any remnant anthropogenically-derived mineralized material.
- Evaluation of the need for, and as necessary, implementation of measures to prevent any seeps originating from Eureka Creek passing through the embankment above the stope or passing through the road adjacent to the stope.
- Monitoring of adit discharge for five years to assess change in flow and chemistry.

OU5 (London Mine): The EPA issued an Administrative Settlement Agreement and Order on Consent for Removal Action to three potentially responsible parties in August 2021. The removal action at the London Mine began in September 2021 and includes the following:

- Addressing drainage from an adit and open cut that was flowing across a county road and into an adjacent wetland.
- Securing the mine portal.
- Installation of a pII buffering system.
- Diversion of the adit discharge away from a waste-rock pile.

Removal actions have supported the cleanup activities on site since the listing of the Site. More information about these activities can be found in the site record for OU1.

Institutional Control (IC) Review

The 2019 IROD required ICs to protect engineered remedial features likely to be permanent and to restrict land use at the mine-impacted recreation staging areas. It stated that the ICs would be implemented in accordance with the Colorado EC Statute (C.R.S. § 25-15-317 *et seq.*). The 2019 IROD also indicated that final ICs will be selected in a final Record of Decision (ROD).

In December 2020, the Board of County Commissioners of San Juan County, Colorado, enacted Ordinance No. 2020-01 as an IC to restrict land use in mine-waste-source areas with residual mine wastes and remediation components. The ordinance is also known to the county as the San Juan County and Bonita Peak Mining District Environmental Regulations. The ordinance prohibits the excavation, drilling, grading, digging, tilling or any other soil-disturbing activity in remediated mine-waste source areas, except as authorized by the CDPHE. It also requires a county permit for any development activity planned where residual mine wastes and remediation components exist. The Office of the San Juan County Clerk and Record maintains an inventory of the remediated mine-waste source areas. The county ordinance was implemented in accordance with the Colorado EC Statute (C.R.S. § 25-15-320).

The 2021 IROD for the BPR also required implementation of ICs at the repository. The 2021 IROD states that the ICs are assumed to consist of governmental controls in the form of a San Juan County ordinance, proprietary controls and associated informational devices, although enforcement tools with IC components could also be used. The ICs would be in addition to any current or future ICs implemented for OU2. ICs implemented for the BPR include the ordinance noted above. More ICs will be considered in the future.

Table 7: Summary of Planned and/or Implemented Institutional Controls (ICs)

Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date
Contaminated soil, mine waste and remedial components	Yes	Yes	Remediated mine-waste source areas are defined as any portion of real property upon which mine waste and any remediation components designed to contain, treat, divert, avoid, or otherwise address any aspect of such mine waste, are located, either partially or wholly.	• Prohibit excavation, drilling, grading, digging, tilling or other soil-disturbing activities. • Protect remedial components.	San Juan County Ordinance 2020-01, December 15, 2020
Notes: Ordinance 2020-01 is available at sanjuancounty.colorado.gov/sites/sanjuancounty/files/ordinance_2020-01_environmental_remediation.pdf.					

Systems Operations/Operation and Maintenance (O&M)

The IRAs at all 23 mining-related source areas in the 2019 IROD are not yet complete. Once complete, performance monitoring will be necessary to evaluate the effectiveness of the IRAs in achieving the RAOs from the 2019 IROD at each mining-related source area.

In October 2021, EPA contractors prepared the Final Interim Remedial Action Effectiveness Monitoring Framework Memorandum (IRA Monitoring Framework Memo), which provided a suggested framework for monitoring and evaluating the effectiveness of the IRA components at the Site, as defined in the 2019 IROD.

Table 8 summarizes considerations for monitoring effectiveness of the implemented actions as presented in the IRA Monitoring Framework Memo. The federal and state agencies responsible for designing and implementing the IRAs at each mining-related source area should develop the effectiveness monitoring programs tailored to the specific mining-related source being addressed. The monitoring programs are expected to be finalized in 2025, except for the USFS-managed site (Brooklyn Mine), which may extend past 2025. Details of the frequency of inspections and sampling to be performed by the CDPHE are to be determined.

A separate O&M Plan will also be prepared for the BPR for use after completion of remedial actions.

Table 8: Performance Monitoring Framework for IRAs at 23 Mining-Related Source Areas

Source Area Type	Recommended Performance Monitoring Components
Mine Portal MIW Discharges	Visual inspections of diversion and isolation components to document the changes, improvements and performance of IRAs at source areas, including inspections of: • Flow paths to confirm the diversion and/or isolation components are intact and functioning properly. • Sediment/precipitate accumulation in the diversion and isolation components to assess maintenance needs. • IRA components after large storm events or high-snowfall years to evaluate whether the IRA performs as designed. • The mine portal water conveyance to confirm the removal of obstructions and evaluate ongoing maintenance needs. • The integrity of any interim waste-management location. Surface-water-flow measurements and/or sample collection and analysis pre- and post-construction at source areas to quantitatively assess the reduction of COPC concentrations and loading based on the IRA. The surface-water measurements can include collocated flow measurements and sample collection to calculate the COPC loading.
Mining-Related Source/Stormwater Interactions	Visual inspections of diversion and isolation components to document the changes, improvements and performance of IRAs at source areas, including inspections of: • Flow paths to confirm the diversion and/or isolation components are intact and functioning properly. • Sediment accumulation in the diversion and isolation components to assess maintenance needs. • IRA components following large-storm events or high-snowfall years to evaluate whether the IRA performs as designed. • The integrity of any interim waste-management location. Stormwater runoff sample collection and analysis of runoff routed through the newly constructed IRAs at source areas.
Mine Portal Pond Sediments	Visual inspections of mine portal sediment pond pre- and post-construction, including monitoring of: • Sediment level in ponds. • The outlet structure to determine whether it is performing as designed and is not blocked or breached. • Flow paths to ensure the mine portal discharges are routed properly through the ponds. • Pond integrity after higher-flow-rate events to ensure proper function of inlet and outlet structures. • The integrity of any interim waste management location. Surface water and sediment measurements or sample collection and analysis pre- and post-construction at source areas to quantitatively assess the reduction of COPC concentrations and/or loading.

Source Area Type	Recommended Performance Monitoring Components
In-Stream Mine Wastes	Visual inspections of in-stream mine waste pre- and post-construction, including inspections of: • The removal area to verify mine waste was removed from the stream channel. • Flow paths to ensure stream channels are routed properly around the mine wastes. • The stream channels following higher flow rate events to confirm the integrity of the channel is maintained. • The integrity of any interim waste-management location. Determining metals concentrations in remaining solid media to confirm adequate mine-waste-material removal was achieved. Determining surface water quality and flow rate in the receiving stream immediately upstream and downstream of the mining-related source, both pre- and post-construction.
Mining-Impacted Recreation Staging Areas	Visual inspections of mine-waste materials pre- and post-construction to document the changes and improvements of IRAs at source areas. The inspections can include: • Comparing the preconstruction horizontal extent of contaminated material to the post-construction horizontal extent of the cover material at source areas. • Monitoring the cover to assess its integrity and to determine whether maintenance or repair is required. Sampling exposed contaminated soils or mine waste if the cover is damaged or if the horizontal extent of the cover appears inadequate compared to the intended IRA design.

III. PROGRESS SINCE THE PREVIOUS REVIEW

This is the Site's first FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was made available by a posting in the *Silverton Standard* newspaper on April 11, 2024, (Appendix D). It stated that the FYR was underway and invited the public to submit any comments to the EPA. The same announcement was made on the EPA's site profile page. The results of the review and the report will be made available at the Site's information repositories, located at:

- Silverton Public Library, 1117 Reese Street, Silverton, Colorado.
- Durango Public Library, 1900 East Third Avenue, Durango, Colorado.
- Farmington Public Library, 2101 Farmington Avenue, Farmington, New Mexico.
- Diné College Shiprock Campus Library, 1228 Yucca Street, Shiprock, New Mexico.

In addition, the FYR Report will be available online at the EPA's site profile page at www.epa.gov/superfund/bonita-peak.

During the period of March 21, 2024, to June 29, 2024, the EPA CIC conducted seven interviews for the FYR. Three residents, two federal agencies (USFS and BLM) and two state agencies (CDPHE and DRMS) were interviewed. These interviews focused on knowledge and perceptions of the EPA's activities at the Site in the last five years, including any perceived issues or successes with the remedy implemented to date. The interviews are summarized below. Sample questions asked during the interviews can be found in Appendix E.

All respondents were familiar with the Site and the cleanup activities that have taken place to date. The three residents interviewed are all currently involved with the Site's community advisory group (CAG) or Silverton planning group and interact with the EPA on a regular basis. Resident respondents had a favorable impression of

the 2019 IROD projects, although a lack of water quality benefits from the cleanup activities so far was noted. All residents also mentioned issues with vandalism and trespassing by recreators. When questioned about impacts to the surrounding community, one resident reported that the 2019 IROD activities helped to bolster the relationship between the EPA and the community by demonstrating action. Two residents also reported that the impacts to the Silverton community and the Durango community are hardly noticed, having little impact on water quality.

Both state agencies responded positively about the current performance of the remedy and were comfortable with the ICs in place. Neither state agency was aware of new state laws that could potentially impact the remedy in place. State and federal agencies reported hearing some complaints from the community about the overall cost of the cleanup, and in the past, complaints about underutilization of local contractors. When questioned about potential changes in land use, state and federal agencies responded that there has been an increase in housing development in San Juan County, noting that the Anglo Saxon may be a site for future redevelopment.

Data Review

Data collected prior to the IRAs were summarized in the 2019 IROD. Data collected during pre-design investigations or implementation of the IRAs were summarized in the Status of Implementation section of this FYR. Post-IRA sampling activities are currently being conducted, or are planned, to assess the effectiveness of the IRAs in achieving RAOs. In addition, sampling data collected for the sitewide RI will be used to further assess contaminant reductions in metals loading to surface water as a result of the IRAs. The EPA will evaluate these results, once available.

IRAs were conducted at the Koehler/Junction/Longfellow complex, Campground 4 and Campground 7 due to the potential for unacceptable human-health risks from exposure to lead in soil. Post-IRA confirmation sampling is planned to determine whether the IRAs achieved the human-health interim cleanup levels. In the interim, access to the soils/waste with lead concentrations that may be above the interim cleanup levels is limited due to the placement of soil caps over the contaminated materials and placement of boulders along access points to prevent vehicular access.

Site Inspection

The site inspection took place on July 16 and July 17, 2024. Participants for one or both days of the inspection included EPA RPMs Joy Jenkins, Athena Jones and Jessica Duggan and EPA CIC Meg Broughton. Also in attendance were Mark Rudolph from the CDPHE, Kirstin Brown from DRMS, Rory Cowie and Kylie Krivis from state contractor Alpine Water Resources, Treat Suomi and Peri Bowser from EPA contractor Skeo, and four members from the Site's CAG (two community members each day). Appendix F includes the site inspection checklist. Site inspection photos are in Appendix G.

Site inspection participants met at the EPA's field office in Silverton, Colorado, at the beginning of each day. Rory Cowie provided a health and safety briefing on July 16, 2024. On the first day of the inspection, participants visited several sites in the Upper Animas River Drainage Basin, including the Vermillion Mine, the Mountain Queen Mine, the Sunbank Group Mine, the Columbus Mine, Campground 7 and Campground 4. The second day included inspections of Terry Tunnel, the Silver Wing Mine and the Tom Moore Mine. Site inspection participants also visited Lake Emma and the Ben Franklin Mine, although IRAs for these sites were not included in the 2019 or 2021 IRODs. The site inspection focused on sites where interim actions were recently completed. Other sites were observed as convenient, based on proximity to priority sites.

The site inspection included visual inspection of each mining-related source or campsite and its surrounding area, as well as remedy components including stormwater, groundwater and MIW diversion mechanisms, mine portal conditions, ponds, gates/fencing, signs of trespassing, vegetation, integrity of interim waste management locations, and flow paths. Observations from the site inspection are described further below, by site.

The Vermillion Mine remedy components include separate MIW and stormwater/groundwater drainage swales. The visual inspection found them to be in good condition and both showed they were functioning as intended with active water flow. EPA RPMs noted there would be very little chance of recreation occurring near the mine site

due to the steep terrain and lack of hiking trails. Archeological artifacts on-site limit construction possibilities. No issues of concern related to protectiveness of the remedy were identified at the Vermillion Mine.

The Mountain Queen Mine remedy includes a 12-inch HDPE double-walled pipe that directs MIW from an adit to an unlined stormwater channel. No precipitates were noted in the drainage. The side of the waste-rock pile, along which the stormwater channels, were armored with rock. A seep was identified below the adit along with the presence of moss, but no issues of concern related to the protectiveness of the remedy were found at the Mountain Queen Mine.

The Sunbank Group Mine consists of a concrete bulkhead, two ponds with berms, and lined drainage swales that direct MIW to the ponds and eventually to Placer Gulch. A run-on control swale directs stormwater/snowmelt around the mine. As part of the remedial action, the EPA removed sediments from the ponds and placed geosynthetic cementitious composite mat (GCCM) on the berms of the ponds and two of the drains. A portion of the waste-rock pile on site was excavated to allow for the storage of lime-treated pond sediments/sludge. The repository was backfilled with waste rock, graded and seeded, but there was no vegetation present at the time of the site inspection. The areas between the ponds, gulch, berms and the waste-rock pile were seeded and lightly raked, but the vegetation in these areas was sparse. This site has not had active grazing since 2023. The ground between the ponds was saturated, and there was a seep from Pond 1, but no issues of concern related to the protectiveness of the remedy were noted.

The Columbus Mine remedy includes a combined MIW and stormwater drainage ditch and boulders to prevent vehicle access to the site. Historical buildings, artifacts and equipment were observed on site. Very little precipitate was observed in the drainage; however, the water that disperses from the ditch downhill appeared to have a negative effect on vegetation as it appeared impacted from too much water in this area of the site. The EPA discussed recommendations to address the issue, including possible installation of an unlined ditch to convey water directly to the upper Animas River.

Campground 7 is considered a dispersed campsite that is near the former location of the Eclipse Smelter. As part of the remedy, areas with high lead concentrations in surface soil were covered with clean soil from deeper depths that had been turned over. This area is vegetated and also covered with imported gravel. Fire rings were removed and “no camping” signs were installed to discourage camping; however, site inspection participants noted that there has been camping on the parking lot adjacent to Campground 7. Boulders are placed between the parking lot and camp location, as well as along the road next to Eclipse Smelter. Site inspection participants also noted that the Hardrock 100 ultramarathon racecourse comes through this area and has brought additional recreational activity. Campers were actively located across the stream from Campground 7. The EPA noted that incremental sampling will be required at the site to determine the effectiveness of the IRA. The camping in the parking lot was identified as a concern.

Campground 4 is also considered a dispersed campsite. The remedy included installation of gates and fencing to prevent access to the site, placement of a soil cover over areas with high concentrations of lead, revegetation and a hummocky surface design to further prevent camping. There was no evidence of trespassing or other activity on site and the remedy appeared to be functioning as intended. The EPA noted that incremental sampling will be required at the site to determine the effectiveness of the IRA.

The Terry Tunnel site consists of a cap (constructed prior to the IRA), bulkhead and blocking of the tunnel. As part of the remedy, the EPA drilled into the tunnel, drained the tunnel water, cleared debris and rehabilitated the tunnel portal entrance. The bulkhead is inspected annually. Ridges above the portal were constructed to divert stormwater runoff. A small pond was installed to collect material that may be dislodged during the bulkhead inspection. Site inspection participants discussed that people come to this area before hunting season to sight their rifles; there is also recreational vehicle traffic from off-highway vehicles. There were no signs of trespassing at the portal. No issues relating to the protectiveness of the remedy were observed, but it was noted that attempts at revegetating this site have mostly failed, apart from the section of the site which is blocked off from vehicle access. Site inspection participants discussed the possibility of preventing vehicle access from more of the site to allow for successful revegetation. It was also speculated that lack of nutrition in the site soil was not allowing for revegetation. The capped parking area is functioning as a needed vehicle access parking area and will need to remain as such and be maintained for future maintenance of the site remedy.

The remedy at Silver Wing Mine included removal of accumulated sediment from an existing pond, consolidation of the sediment in a capped interim management area, replacement of the pond liner, installation of a lined drainage channel to direct MIW from the adit to the pond and installation of other drainage features. During the inspection it was noted that additional sediment accumulated in the pond since the completion of the IRA two years ago, and the pond appeared nearly full. The EPA indicated the pond was about four feet deep. It now only contained a few inches of standing water; the rest was sediment/precipitate. Evidence of bear activity was also observed at the site, including bear tracks inside the opening to the adit and bear tracks on the pond berm. Sludge accumulation was also observed at the adit. Debris, mostly brush and branches, were observed in the drainage channel below the pond; the debris did not appear to impede flow. Site inspection participants discussed O&M concerns associated with the appearance of the full pond. Future discussions will include an assessment of the functionality of the pond and required maintenance frequency of the IRA.

The remedy at the Tom Moore Mine included removal of waste rock from an existing drainage channel. The channel diverts water from the adit around waste rock and debris. The remedy was functioning as intended, but there was discussion of stabilizing the head cut with a shed or other structure to keep future debris from falling in front of the portal.

The Lake Emma and Ben Franklin sites, which are mine sites not included in the 2019 or 2021 IRODs, were also visited. While it is not a listed source area, Lake Emma overlies the Bonita Peak Groundwater System, designated as OU3. The former Lake Emma area is under active investigation as evidenced by the drilling equipment seen during the site inspection. The Ben Franklin Mine site had removal work implemented under an Administrative Settlement Agreement and Order on Consent and does not yet have a ROD. Work at the Ben Franklin Mine included a lined diversion ditch from the adit and vegetation of the site. The diversion ditch appeared to be functioning as intended and the vegetation efforts were successful.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

The EPA selected interim remedies for 23 mining-related source areas in OU1 in a 2019 IROD. The IRAs are intended to provide adequate protection of human health and the environment until a final remedy is selected. Specifically, they are intended to provide stabilization of the mining-related sources, prevent further environmental degradation and, at the recreation staging area sites, achieve human-health-risk reduction quickly. In 2021, the EPA issued a second IROD that selected the BPR as a permanent disposal location for the Gladstone IWTP sludge and selected mine wastes generated across the Site (including those generated in the 2019 IROD actions), as well as a temporary solution for management of MIW leachate generated from operation of the repository. The BPR is under construction. Sludge from the Gladstone IWTP is currently managed at an interim sludge-management location at the Kittimac Tailings area and on site at Gladstone. Currently, there are no plans to move treatment-generated solids from the Kittimac area as they are treated and revegetated in place.

The IRAs at the 23 mining-related source areas addressed in the 2019 IROD were implemented beginning in 2019. IRAs at 20 source areas are now complete. Based on the site inspections and review of site documents, the completed IRAs are functioning as intended by site decision documents, as summarized in Table 9. They were constructed in accordance with the requirements of the 2019 IROD and design specifications. IRAs at the remaining source areas are ongoing and expected to be completed in 2025. As shown in Table 9, the IRAs address five contaminant migration issues for mining-related sources throughout the Site.

Table 9: Answer to FYR Question A, by Source Area and IRA

Mining-Related Source	Mine Portal MIW Discharges	Mining-Related Source/ Stormwater Interactions	Mine Portal Pond Sediments	In-Stream Mine Wastes	Mining-Impacted Recreation Staging Areas
Mineral Creek Drainage Basin					
Longfellow Mine					Yes
Junction Mine	Yes		Yes		Yes
Koehler Tunnel	Yes		Yes		Yes
Brooklyn Mine	In progress	Yes	In progress		
Bandora Mine	Yes	Yes			
Cement Creek Drainage Basin					
Grand Mogul Mine		Yes		Yes	
Natalie/Occidental Mine	Yes				
Henrietta Mine	Yes				
Mammoth Tunnel	Yes		Yes		
Anglo Saxon Mine	Yes		Yes		
Yukon Tunnel	Yes	Yes			
Upper Animas River Drainage Basin					
Ben Butler Mine		Yes			
Mountain Queen Mine	Yes	Yes			
Vermillion Mine	Yes	Yes			
Sunbank Group Mine	Yes	Yes	Yes		
Frisco/Bagley Mine	Yes		Yes		
Columbus Mine	Yes	Yes			
Campground 7					Yes

Mining-Related Source	Mine Portal MIW Discharges	Mining-Related Source/ Stormwater Interactions	Mine Portal Pond Sediments	In-Stream Mine Wastes	Mining-Impacted Recreation Staging Areas
Silver Wing Mine	Yes	Yes	Yes		
Tom Moore Mine	Yes				
Terry Tunnel	Yes				
Pride of the West Mine	Yes				
Campground 4					Yes

Notes:
Yes = Yes, the IRA is functioning as intended by the decision documents.
In Progress = The IRA is not yet complete.
Light gray cells = not a mining-related issue for the area.

The interim actions implemented to date have eliminated or reduced the interaction of MIW or stormwater with mine wastes by diverting the MIW or stormwater around mine portals and/or contaminated mine waste using constructed open channels, berms or other diversion features. Without the interaction of MIW and stormwater with mine wastes, the loading of COPCs is expected to decrease and, over time, reduce unacceptable ecological risks in the streams receiving the MIW or stormwater affected by mine wastes.

The actions at the mine portal ponds included excavation of existing sediment and repair of berms to allow continued pond function. By removing sediments in the ponds and repairing pond berms, storage space was increased, allowing more time for particulate settling at a given flow rate. These measures are expected to reduce the concentrations of COPCs and volume of MIW released over a given time from the ponds, resulting in a reduction of contaminant mass loading. At the Silver Wing Mine, the pond that was mucked out as part of the IRA was again full of sediment two years after completion. The EPA and the CDPHE will determine an appropriate maintenance schedule for removal of accumulated sediments as part of long-term O&M.

During the FYR site inspection, all of the sites visited had surface water diversion features to divert MIW around waste rock. At sites with completed IRAs, all appeared to be operating as intended. At the Columbus Mine, where the IRA is still in progress, water that disperses from the ditch downhill appears to be having a negative effect on vegetation. Additional work may be needed to address the potential issue.

All of the sites visited that were indicated for stormwater diversion IRAs had functioning run-off controls. Many of these are simple improvements upon existing run-on controls while some had to be installed as a part of the IRA. Sites not included in the stormwater IRA were also assessed for stormwater interactions and in some cases, improvements were made to existing drainage to further achieve metals reduction in the watershed.

At recreation staging areas, soils with lead and/or arsenic concentrations above the human-health-based interim cleanup levels were covered with combinations of aggregate and soil covers. The covers provide an exposure barrier and eliminate surface exposure to mine waste and contaminated soils. Post-IRA confirmation sampling is needed at Campground 4, Campground 7 and the Koehler/Junction/Longfellow complex to confirm that the IRAs achieved the human-health interim cleanup levels established in the 2019 IROD.

Once the IRAs are complete, performance monitoring will be used to evaluate the effectiveness of the IRAs in achieving the RAOs from the 2019 IROD. The federal and state agencies responsible for designing and implementing the IRAs at each mining-related source area will need to develop effective monitoring programs tailored to the specific mining-related source being addressed. In addition, an O&M Plan specific to the BPR will be prepared and implemented once repository construction is complete.

The 2019 IROD required ICs to protect engineered remedial features likely to be permanent and to restrict land use at the mine-impacted recreation staging areas. A local ordinance (the "San Juan County and Bonita Peak Mining District Environmental Regulations" [Ordinance 2020-01]) was enacted in 2020. It prohibits excavation, drilling, grading, digging, tilling or other soil-disturbing activities in mine-waste source areas where residual mine

wastes and remediation components exist and protects remedial components. In addition, engineering controls such as soil covers, adit gates and boulders restrict access to areas with remaining contamination that will be further evaluated in the sitewide RI/FS.

The ICs and engineering controls in place are proving to be effective in preventing short-term exposures to contaminated media. The need for additional ICs will be evaluated during the sitewide RI/FS.

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

Question B Summary:

The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection are still valid.

The assumption in the 2019 IROD was that recreation is the predominant current and future land use for public property and private property with mining-related sources addressed by the IRAs. Land-use assumptions have not changed. The human-health-based interim cleanup levels for arsenic and lead in soil and waste rock at mining-related recreation use areas are site-specific levels protective of a camper receptor in dispersed campsites. The interim cleanup levels remain valid because the site-specific parameters used to calculate the risk-based levels have not changed.

On January 17, 2024, the EPA's Office of Land and Emergency Management released the *Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (2024 Lead Memo), which updates the residential soil lead screening level for the CERCLA and RCRA programs. The 2024 Lead Memo recommends that EPA regions use a residential soil lead screening level of 200 ppm. However, the 2024 Lead Memo also provides that it may be appropriate to use a screening level of 100 ppm if more sources of lead (e.g., lead water service lines, lead-based paint, non-attainment areas where the air lead concentrations exceed national ambient air quality standards) are identified that warrant lowering the screening level. The new guidance was issued due to mounting scientific evidence of cognitive function decrements and other adverse health effects at blood lead levels below 10 µg/dL. In addition, children can be exposed to multiple sources of lead other than contaminated soil/dust at Superfund sites.

In addition, the site-specific interim cleanup level for lead selected in the 2019 IROD is based on a target blood lead level of 5 µg/dL, which is consistent with the blood lead levels outlined in the 2024 Lead Memo (5 µg/dL or 3.5 µg/dL 95th percentile target blood lead level).

The 2019 IROD did not select interim cleanup levels for surface water or other media at the Site. The 2019 IROD indicated that chemical-specific ARARs are pertinent to the IRAs. However, state water quality standards for COPCs will likely not be met for the streams receiving mine portal MIW or stormwater discharges, due to other contributing mining-related sources. In addition, the IRAs are interim in scope and do not address all contaminated media posing unacceptable human-health and ecological risks. Therefore, the EPA invoked use of the CERCLA interim measures waiver for all 2019 IROD actions. The ARARs that fall under the waiver include:

Federal

- Clean Water Act 33 U.S.C. §§ 1342, *et seq*., Point Source Discharges Requirements, Section 402.

State of Colorado

- Colorado Basic Standards for Groundwater, 5 CCR 1002-41, pursuant to C.R.S. §§ 25-8-101-703.
- Colorado Surface Water Quality Classifications and Numeric Standards, 5 CCR 1002-34, pursuant to C.R.S.§§ 25-8-203 and 204.
- CDPS Regulations, 5 CCR 1002-61, Regulation No. 61, pursuant to C.R.S.§ 25-8- 501 -509.
- Colorado Effluent Limitations, 5 CCR 1002-62, pursuant to C.R.S.§ 25-8-205.

The ARAR waiver remains in effect for the IRAs addressed in the 2019 IROD.

Other action and location-specific ARARs in the 2019 IROD and 2021 IROD were also reviewed. No changes that bear on the protectiveness of the remedy were identified.

The IRAs are progressing as expected toward meeting the RAOs for OU1 in the 2019 IROD and 2021 IROD.

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

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None

Issues and Recommendations Identified in the FYR:

OU(s): 1	Issue Category: Remedy Performance			
	Issue: At mining-impacted recreation staging areas, soils with lead and/or arsenic concentrations above the human-health-based interim cleanup levels were covered with combinations of aggregate and soil covers. However, post-IRA confirmation sampling has not yet been conducted to confirm that the IRAs achieved the human-health interim cleanup levels established in the 2019 IROD.			
	Recommendation: Conduct confirmation soil sampling at the mining-impacted recreation staging areas (Campground 4, Campground 7 and the Koehler/Junction/Longfellow complex).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA/State	10/9/2025

OTHER FINDINGS

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

- At the Columbus Mine, redirect MIW flow into a more established channel to avoid further damage to vegetation.
- Develop O&M Plans for each of the mining-related source areas in OU1 addressed in the 2019 IROD prior to transition of the sites from the EPA to the CDPHE for O&M. The CDPHE should submit to the EPA a comprehensive annual report of the O&M inspections and activities conducted at each of the sites during the previous year. Based on observations from the FYR site inspections and other site visits during the IRAs, site-specific considerations for O&M include:
    - At the Bandora Mine and the Mammoth Tunnel sites, conduct biannual or annual maintenance, as needed, to remove accumulated sediments by hand tools in the drainage channels at the sites.

- At sites with mine portal pond sediments, including the Silver Wing Mine, determine an appropriate maintenance schedule for removal of accumulated sediments to maintain pond functionality.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement	
Operable Unit: OU1	*Protectiveness Determination:* Will be Protective
Protectiveness Statement: The interim remedies addressed in the 2019 IROD and the 2021 IROD will be protective once complete. In the interim, exposure pathways that could result in unacceptable human-health risks are being controlled. Institutional controls that restrict land use in mine-waste source areas are in place. Engineering controls such as soil covers and boulders that limit access to mine waste are also in place. These controls limit exposures to contamination above risk-based levels. The IRAs implemented to date are stabilizing the mining-related sources, preventing further environmental degradation and, at the recreation staging area sites, reducing human-health risks.	

VIII. NEXT REVIEW

The next FYR Report for the Bonita Peak Mining District Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Board of County Commissioners of San Juan County, Colorado. 2020. Ordinance No. 2020-01. sanjuancounty.colorado.gov/sites/sanjuancounty/files/ordinance_2020-01_environmental_remediation.pdf. SEMS# 100015212

CDM Federal Programs Corporation. 2019. Bonita Peak Mining District Human Health Risk Assessment Revision 0. Prepared for EPA Region 8. June. SEMS# 100006501.

CDM Federal Programs Corporation. 2022. Final (100%) Design Analysis Report. Remedial Design Bonita Peak Repository Interim Remedial Action Phase 1, Bonita Peak Mining District Superfund Site, San Juan County, Colorado. May. SEMS# 2181680.

CDM Smith. 2021. Memorandum: Final Interim Remedial Action (IRA) Effectiveness Monitoring Framework, Bonita Peak Mining District (BPMD) Superfund Site, San Juan County, Colorado. October 7. Prepared for the EPA and the U.S. Army Corps of Engineers. SEMS# 100015390

CDM Smith. 2022. Bonita Peak Mining District Superfund Site, San Juan County, Colorado, Draft Summary Report for 2019 and 2020 BPMD Interim Remedial Actions. March. SEMS# 100015391

CDPHE. 2023. Campground 4 + Sunbank Shaft Closure IROD Project Closeout Report. SEMS# 100015392

CDPHE. 2023. Campground 7 IROD Project Closeout Report. SEMS# 100015393

CDPHE. 2023. Pride of the West IROD Project Closeout Report. SEMS# 100015404

CDPHE. 2023. Tom Moore Mine IROD Project Closeout Report. SEMS# 100015394

Colorado Division of Reclamation, Mining and Safety (DRMS). 2021. Brooklyn Run-On, Highwall and Trash Project 2020 & 2021 Final Closeout Report. SEMS# 100015403

Colorado DRMS, 2024. Mountain Queen, Columbus and Vermillion IROD Project Closeout Report. SEMS# 100015395

EA. 2022. Annual Construction Summary Report – 2021, Interim Remedial Action, Bonita Peak Mining District. January. SEMS# 1983176

EA Engineering, Science, and Technology, Inc., PBC. 2022. Construction Summary Report – 2022, Interim Remedial Action. November. SEMS# 1985534

EPA. 2014. Action Memorandum: Approval and Funding for a Removal Action at the Red and Bonita Mine Site in San Juan County, Approximately Seven Miles North of Silverton, Colorado. September 24. SEMS# 1289901

EPA. 2016. Action Memorandum: Documentation of Emergency Removal Action at the Gold King Mine Release Site, San Juan County, Colorado. January 13. SEMS# 1766119

EPA. 2017. Action Memorandum: Gladstone IWTP for Gold King Mine Discharge and Request for Exemptions from the 12-month and $2 Million Statutory Limits on Removal Actions. January 12. SEMS# 1834188.

EPA. 2019. Interim Record of Decision for Bonita Peak Mining District Superfund Site, Operable Unit 1, San Juan County, Colorado. May 20. SEMS# 100006405

EPA. 2021. Interim Record of Decision for Bonita Peak Repository, Bonita Peak Mining District Superfund Site, San Juan County, Colorado. April 30. SEMS# 100010443

EPA. 2024. Memorandum: Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. Office of Land and Emergency Management. January 17. SEMS# 100003435.

TechLaw, Inc. 2019. Final Aquatic Baseline Ecological Risk Assessment, Bonita Peak Mining District Superfund Site, San Juan County, Colorado. Prepared for EPA Region 8. February. SEMS# 1915915

TechLaw, Inc. 2020. Final Terrestrial Baseline Ecological Risk Assessment, Bonita Peak Mining District Superfund Site, San Juan County, Colorado. Prepared for EPA Region 8. December. SEMS# 100009162

Tetra Tech. 2023. Bonita Peak Mining District. Koehler Junction Construction Completion Report, San Juan County, Colorado. Revision 0. April. SEMS# 100015407

Tetra Tech, Inc., 2023. Bonita Peak Mining District, Terry Tunnel Construction Completion Report, San Juan County, Colorado. January. SEMS# 2205286

Tetra Tech. 2023. Bonita Peak Mining District, Yukon Mine Construction Report, San Juan County, Colorado. March. SEMS# 100015408

Tetra Tech. 2023. Draft Bandora Construction Report, Revision 0, Bonita Peak IRODs, San Juan County, Colorado. April. SEMS# 2205287

Tetra Tech. 2023. Memo: Daily Activities Reports 8/02/2023 to 8/16/2023. Mammoth Tunnel. SEMS#

Tetra Tech. 2024. Bonita Peak Mining District. Koehler Junction 2023 Construction Report, San Juan County, Colorado. Revision 0. April. SEMS# 100015406

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
Sitewide	
Mining operations were active on-site	1870s to 1990s
The EPA and the CDPHE conducted a Superfund site assessment	1990s
The EPA began investigations in upper Cement Creek	2008
The EPA installed an engineered concrete bulkhead in the adit of the Red & Bonita Mine as a removal action	Summer 2015
Three million gallons of MIW were accidentally discharged from the Gold King Mine	August 2015
The EPA installed the IWTP at Gladstone as an emergency removal action to treat discharge from the Gold King Mine; more actions were also taken to stabilize the Gold King Mine	October 2015
The EPA proposed the Site for listing on the NPL	April 2016
The EPA began the Site's RI	May 2016
The EPA finalized the Site's listing on the NPL	September 2016
The USFS and the EPA completed an early action at the Brooklyn Mine	October 2016
The EPA, the USFS, the BLM and the CDPHE (the site team) began a sitewide RI/FS	2017
The EPA finalized the Adaptive Management Site Plan, which provides a framework for decision-making, documentation, planning and prioritizing activities at the Site.	November 2020
OU1: Sitewide – Remedial	
The EPA issued an IROD that addresses 23 mining-related sources (OU1)	May 2019
The EPA began the OU1 remedial action to address the 23 mining-related sources	October 2019
The EPA issued the IROD for the BPR (OU1) and began the remedial design	April 2021
The EPA completed the remedial design for the BPR	May 2022
The EPA began construction for the BPR	May 2023
OU2: Mayflower	
The EPA entered into an Administrative Settlement Agreement and Order on Consent for an RI to Sunnyside Gold Corporation; the OU2 RI began	May 2017
The EPA issued an Administrative Order of Consent	September 2020
The EPA entered into a Consent Decree with Sunnyside Gold Corporation and Kinross Gold Corporation	April 2022
OU3: Bonita Peak Groundwater System	
The EPA issued a Unilateral Administrative Order for an RI to Sunnyside Gold Corporation	March 2018
The EPA issued a first modification to the Unilateral Administrative Order; Sunnyside ultimately declined to perform the work ordered in the modified order; the OU3 RI began and is ongoing	April 2018
OU4: Ben Franklin Mine	
The EPA issued an Administrative Settlement Agreement and Order on Consent for a removal action to two potentially responsible parties	August 2019
A removal action began; earthwork is completed and monitoring required by the Administrative Settlement Agreement and Order on Consent is ongoing	September 2019
OU5: London Mine	
The EPA issued an Administrative Settlement Agreement and Order on Consent for a removal action to three potentially responsible parties	August 2021
A removal action began; earthwork is completed and monitoring required by the Administrative Settlement Agreement and Order on Consent is ongoing	September 2021

APPENDIX C – SITE MAPS

Figure C-1: Mining-Related Sources – Mineral Creek Drainage Basin

Figure C-2: Mining-Related Sources – Cement Creek Drainage Basin

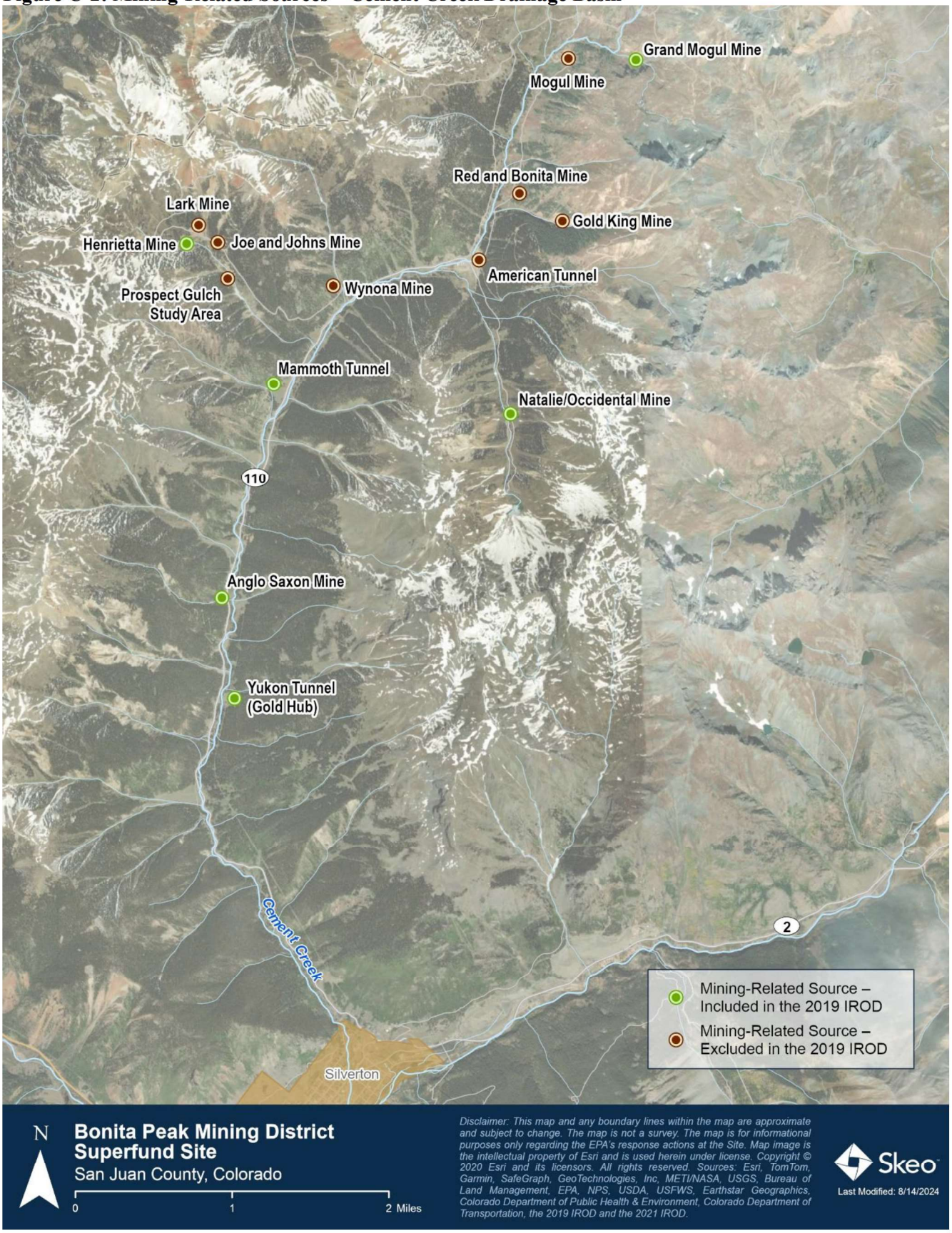


Figure C-3: Mining-Related Sources – Upper Animas Creek Drainage Basin

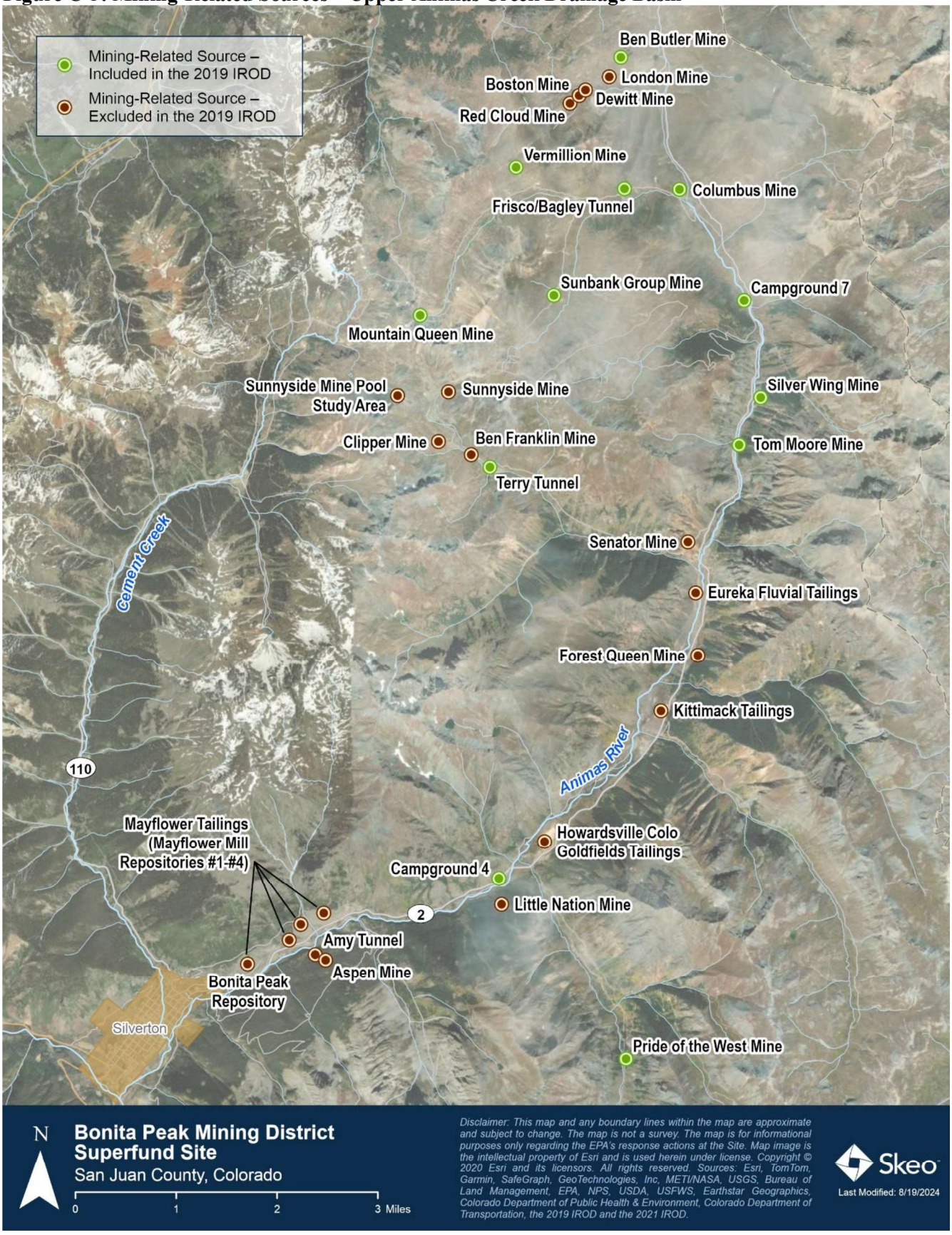
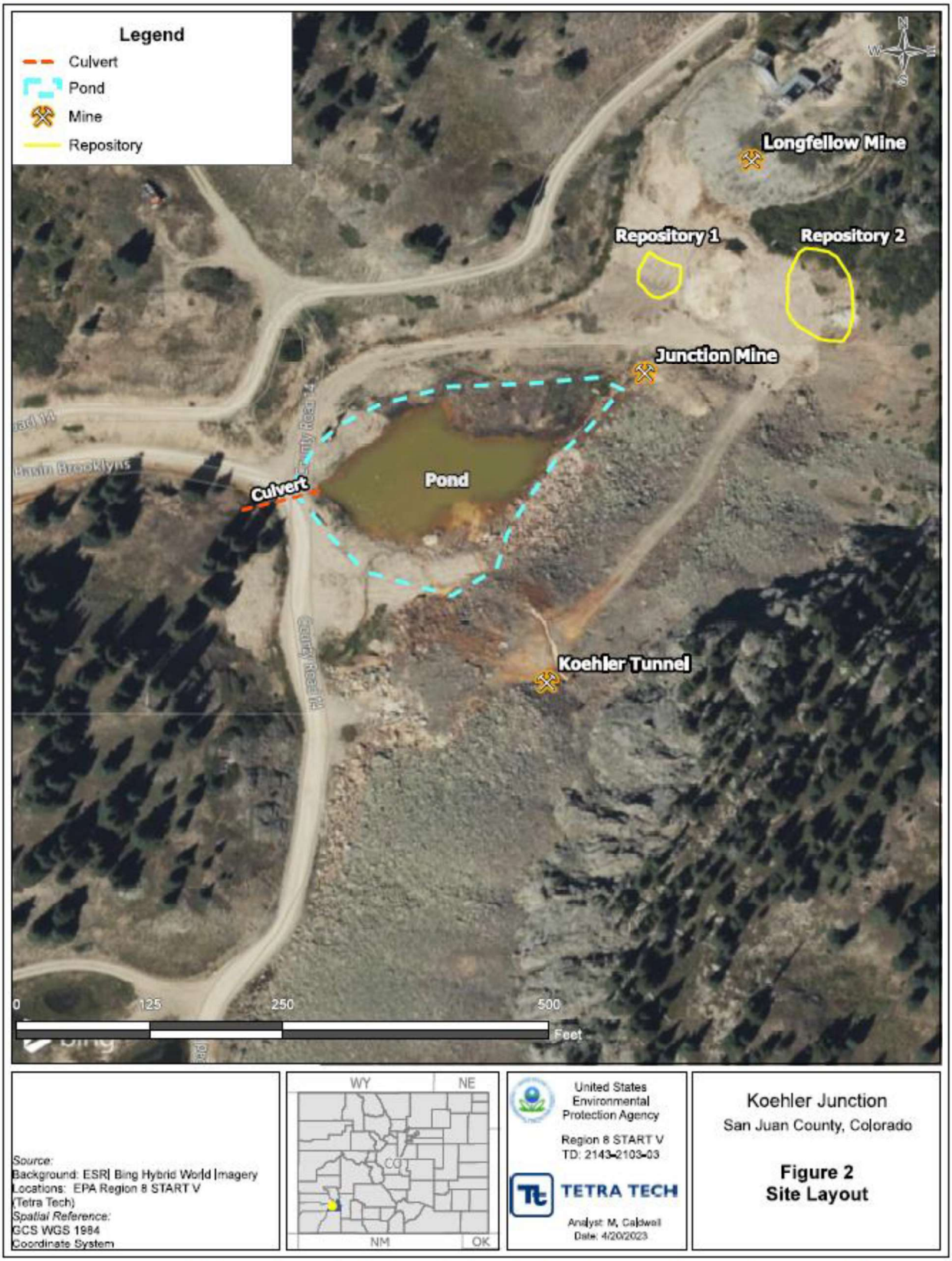
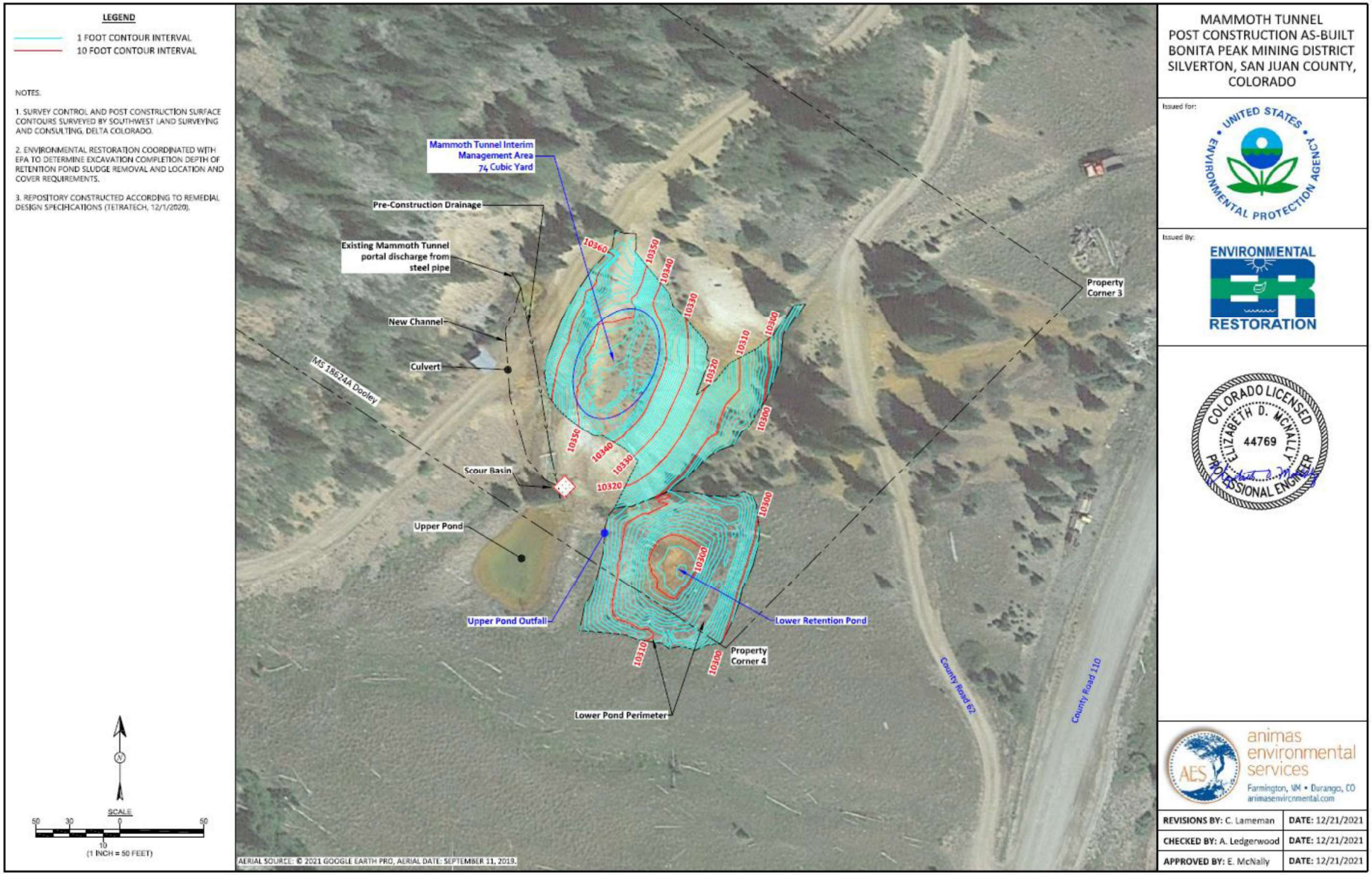


Figure C-4: Koehler/Junction/Longfellow Complex



Source: Tetra Tech. 2023. Bonita Peak Mining District. Koehler Junction Construction Completion Report, San Juan County, Colorado. Revision 0. April.

Figure C-5: Mammoth Tunnel

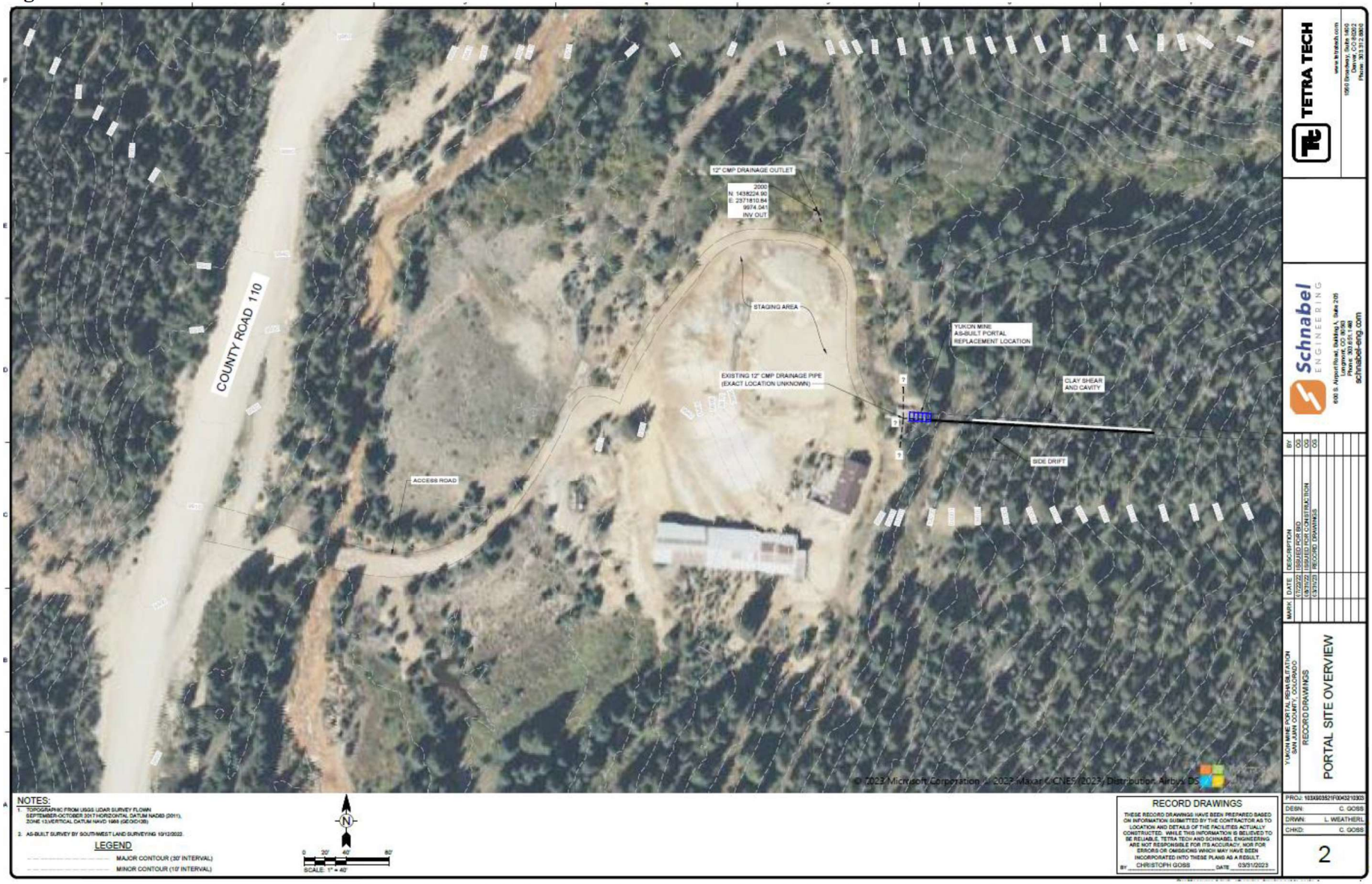


Source: EA. 2022. Annual Construction Summary Report – 2021, Interim Remedial Action, Bonita Peak Mining District. January. Note that the lower pond was expanded since this survey was completed.

Figure C-6: Anglo Saxon Mine

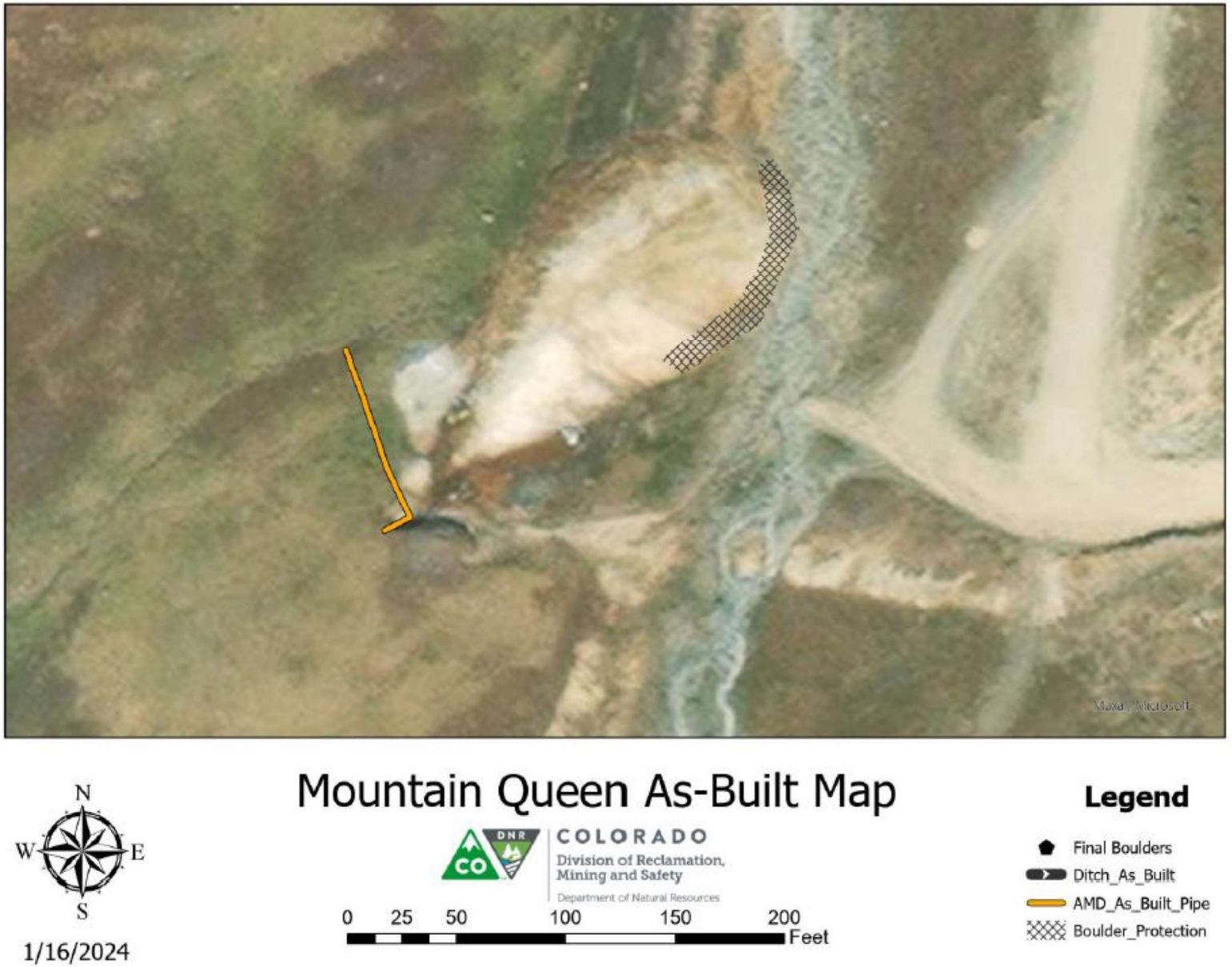
Source: EA. 2022. Annual Construction Summary Report – 2021, Interim Remedial Action, Bonita Peak Mining District. January.

Figure C-7: Yukon Mine



Source: Tetra Tech. 2023. Bonita Peak Mining District, Yukon Mine Construction Report, San Juan County, Colorado. March.

Figure C-8: Mountain Queen Mine



Source: Colorado DRMS. 2024. Mountain Queen, Columbus and Vermillion IROD Project Closeout Report.

Figure C-9: Vermillion Mine

1/16/2024

Vermillion Mine As-Built Map

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

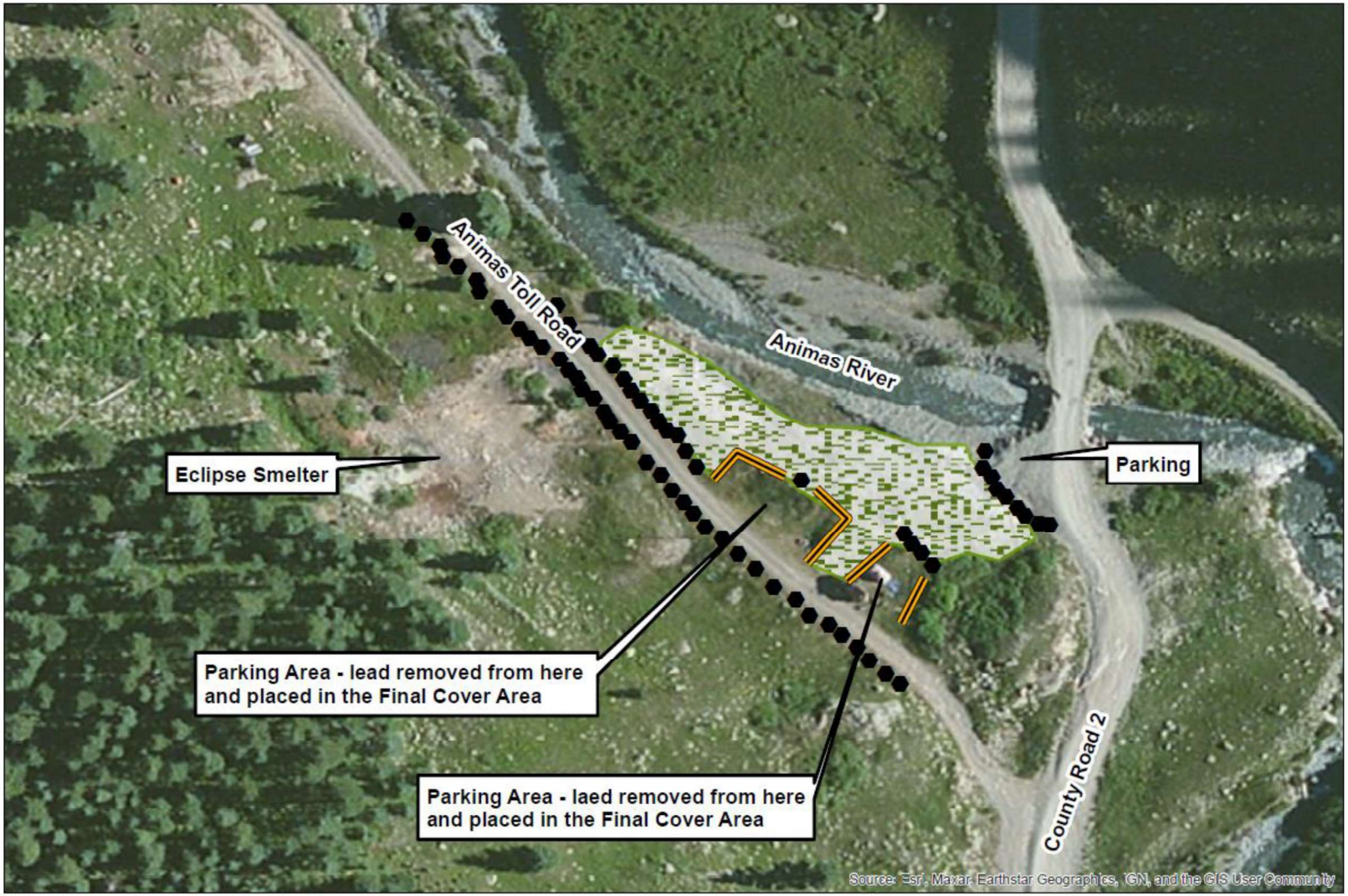
0 25 50 100 150 200
Feet

Legend

AMD_Channel
Stormwater_As_Built

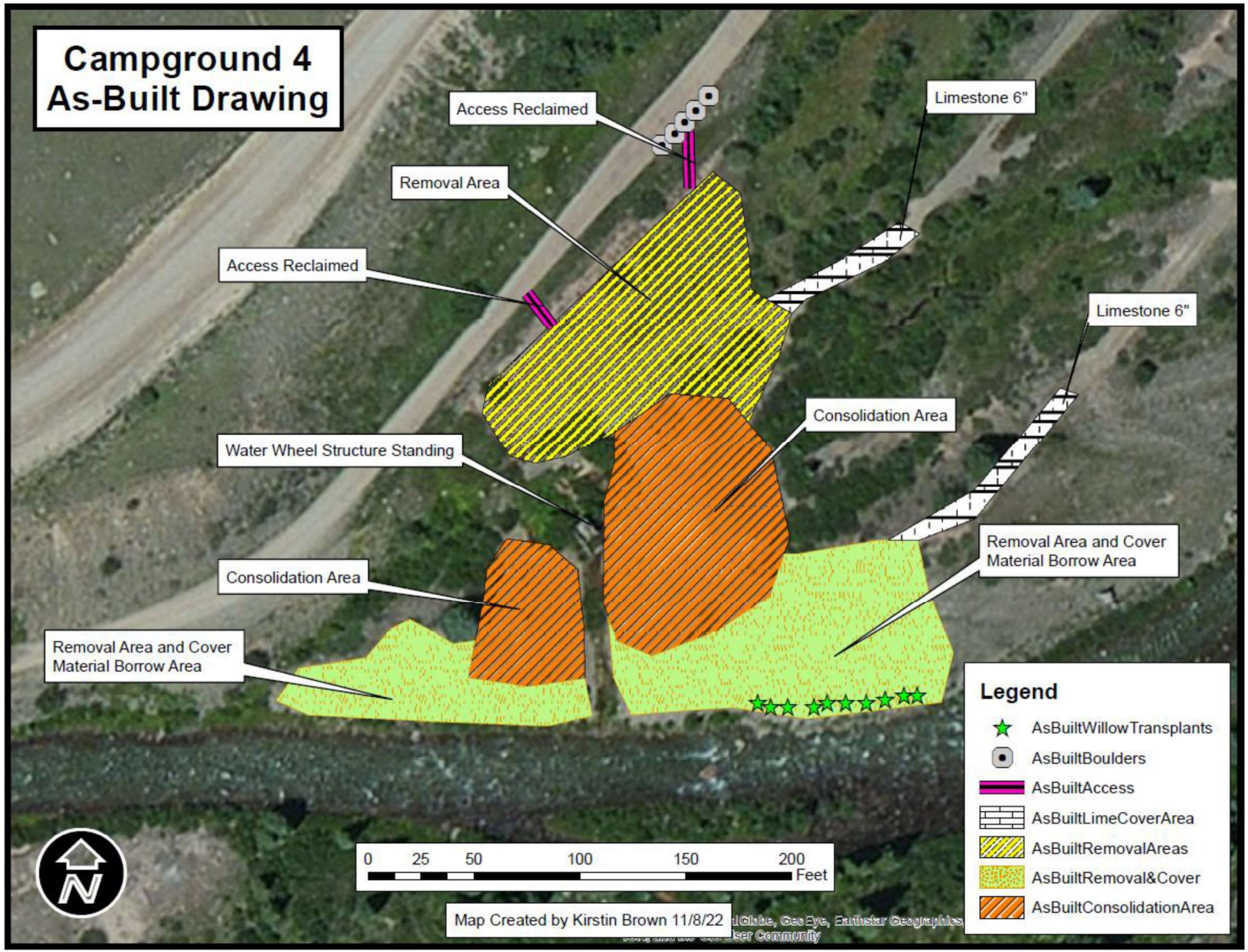
Source: Colorado DRMS. 2024. Mountain Queen, Columbus and Vermillion IROD Project Closeout Report.

Figure C-10: Campground 7



Source: CDPHE. 2023. Campground 7 IROD Project Closeout Report.

Figure C-11: Campground 4



Source: CDPHE. 2023. Campground 4 IROD Project Closeout Report.

APPENDIX D – PRESS NOTICE

Iron Horse Bicycle Classic Announces 2024 Hill Climb Challenge

IRON HORSE BICYCLE CLASSIC
SINCE 1972-DURANGO,COLORADO

Durango, CO – The Iron Horse Bicycle Classic (IHBC) is thrilled to unveil the schedule for the inaugural Hill Climb Challenge, to be run as the opener for a fantastic weekend of racing.

Set against the picturesque backdrop of Fort Lewis College's front hill, this event promises an exhilarating blend of competition, community spirit, and entertainment.

Scheduled for Friday, May 24, 2024, the Hill Climb Challenge invites cyclists from various disciplines to test their mettle and vie for top honours.

Event Highlights:

• Open to All: Cyclists participating in the Coke Road Race, Alpine Gravel, Morehart MTB, or KOM/QOM are eligible to compete. The qualifying rounds will run from 2:00 PM to 5:30 PM, with participants aiming to secure one of the top 16 times in either the women's or men's field. The fastest 16 will then battle it out in an electrifying head-to-head race starting at 6:00 PM, leading up to the finals at 6:45 PM.

• Community/Cruiser Challenge: At 5:30 PM, the challenge opens up to tour riders and those without chipped plates. We encourage unique bikes and costumes for this fun community event.

• Family Zone: Hosted by Durango Devo, the family zone offers an opportunity to create noise makers and cheer for the competitors. This family-friendly area ensures a fun experience for all ages.

• Beer Garden: Spectators can enjoy the race from the beer garden located after the second switchback. It's the perfect spot to support (and gently heckle) riders as they tackle the hill's most challenging segment.

• Cash Prizes: The top five finishers in both the men's and women's finals will be rewarded with cash prizes, adding an extra layer of excitement to the competition.

Detailed Schedule:

• 2:00-5:30 PM: Qualifying Rounds

• 5:30-6:00 PM: Community/Cruiser Challenge

• 6:00-6:15 PM: Round 1 of Top 16 Qualifiers

• 6:15-6:30 PM: Youth Races (U10, U14)

• 6:30-6:45 PM: High School Hill Climb Battle (U19)

• 6:45-7:00 PM: Open Race Finals- Top 8 (Men's and Women's)

The IHBC Hill Climb Challenge is more than just a race; it's a celebration of cycling, community, and competition. We invite everyone, from seasoned racers to cycling enthusiasts and spectators, to join us for this thrilling event.

About IHBC:

The Iron Horse Bicycle Classic is a cornerstone of the cycling community in Durango, Colorado, organising a ride and race from Durango to Silverton for over 50 years.

For more information about the IHBC Hill Climb Challenge and other IHBC events, please visit our website or contact our event coordinator.

Contact:
Ian Burnett
970-799-4703
director@ironhorsebicycle-Classic.com

Photo credit Katey Fetch

A lovely spring day.

EPA PUBLIC NOTICE

EPA REVIEWS CLEANUP

Bonita Peak Mining District Superfund Site

The U.S. Environmental Protection Agency (EPA) is conducting the first five-year review of the 2019 Interim Record of Decision (IROD) at the Bonita Peak Mining District Superfund site in San Juan County, Colorado. The 2019 IROD includes cleanup actions at 23 source areas within the mining district. The purpose of the five-year review is to ensure that cleanup actions completed to date continue to protect human health and the environment. The five-year review report will be available to the public in Fall 2024.

We want to hear from you!

Community members are always encouraged to share information that may help EPA make determinations regarding the protectiveness and effectiveness of cleanup actions. On Thursday, May 30, 2024, from 12:00 - 1:00pm, EPA staff will be hosting open in-person interviews at the Silverton Town Hall, located at 1360 Greene St, Silverton, CO 81433. EPA is also conducting interviews over the phone or via online meetings.

For questions or to provide site-related information for the review:

Meg Broughton, EPA Community Involvement Coordinator
Phone: 720-762-7444 Email: Broughton.Meg@epa.gov
Mailing Address: U.S. EPA Region 8 (EPR-SR)
1595 Wynkoop Street, Denver, CO 80202-1129

Or online at: https://www.epa.gov/superfund/bonita-peak

APPENDIX E – SAMPLE INTERVIEW FORM

BONITA PEAK MINING DISTRICT SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: Bonita Peak Mining District Superfund Site	
EPA ID:	
Interviewer name:	**Interviewer affiliation:**
Subject name:	**Subject affiliation:**
Subject contact information:	
Interview date:	**Interview time:**
Interview location:	
Interview format (circle one): In Person Phone Mail Email Other:	
Interview category: Resident	

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

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

3. Were you involved with or had an opinion concerning how the cleanup was decided and implemented?

4. What have been the effects of this Site on the surrounding community, if any?

5. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

6. Are you aware of any community concerns regarding the Site or its operation and administration? If so, please give details.

7. Do you feel well informed about the EPA's activities and progress? How can the EPA best provide site-related information in the future?

8. What extent of community involvement do you wish to have during the future work at the Site?

9. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

APPENDIX F – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Bonita Peak Mining District	**Date of Inspection:** 07/16/2024 and 07/17/2024
Location and Region: San Juan County, Colorado; EPA Region 8	**EPA ID:** CON000802497
Agency, Office or Company Leading the Five-Year Review: EPA Region 8	**Weather/Temperature:** Cloudy to partly sunny, rain in the late afternoon; ~ 60 degrees F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment*
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: Soil covers, interim waste management areas, drainage improvements

*Although several sites have soil covers or interim waste management areas, they are discussed under "Other" because they are not constructed landfills with the typical components included in this checklist.

The following mine-related sources or areas were visited during the site inspection:

7/16/2024
Vermillion Mine, Mountain Queen Mine, Sunbank Group Mine, Columbus Mine, Campground 7, Campground 4

7/17/2024
Terry Tunnel, Silver Wing Mine, Tom Moore Mine, Lake Emma (non-IROD), Ben Franklin Mine (non-IROD)

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone_____
   Problems, suggestions ☐ Report attached: _____

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

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

   Agency CDPHE
   Contact Mark Rudolph (Name) Project Manager (Title) 5/3/2024 (Date) _____ (Phone)
   Problems/suggestions ☐ Report attached: _____

   Agency DRMS
   Contact Kirstin Brown Environmental 4/30/2024 _____

Name	Protection Specialist Title	Date	Phone
Problems/suggestions ☐ Report attached:_____			
Agency _____ Contact _____			
Name	Title	Date	Phone
Problems/suggestions ☐ Report attached:_____			
Agency _____ Contact _____			
Name	Title	Date	Phone
Problems/suggestions ☐ Report attached: _____			
Agency _____ Contact _____			
Name	Title	Date	Phone
Problems/suggestions ☐ Report attached:_____			

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

Allen McCaw, USFS; Melissa Smeins, BLM; Ty Churchwell, Resident/CAG; Parker Newby, Resident/CAG; Chara Ragland, Resident/CAG

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

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☒ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: IRAs are not fully complete at all sites addressed in the 2019 IROD. An O&M plan will be developed on their completion.

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A

☒ Contingency plan/emergency response plan ☒ Readily available ☐ Up to date ☐ N/A

Remarks: _____

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A

Remarks: _____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: Groundwater is not addressed in the 2019 IROD or 2021 IROD.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air ☐ Readily available ☐ Up to date ☒ N/A

☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

IV. O&M COSTS

The work under OU1 IRODs has not achieved RA completion. O&M has not begun.

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

A. Fencing

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

Remarks: Fence and gates installed at Campground 4 were in good condition.

B. Other Access Restrictions

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

Remarks: No camping signs at Campground 7 and Campground 4 were in good condition. Boulders to restrict vehicular access are in place at Mountain Queen Mine, Campground 7, Campground 4, Columbus Mine and some portions of the Terry Tunnel site.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

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

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

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

Frequency: To be determined as part of O&M plan

Responsible party/agency: _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

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

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

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

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

Other problems or suggestions: ☐ Report attached

Camping was observed near but not directly on the Campground 7 cap area. Out of an abundance of caution, additional boulders were added after the site inspection to prevent access to these areas and discourage camping around this site.

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

Remarks: *The IC requirements from the 2019 IROD have been met and the 2021 IROD remedial action is not yet complete. Additional ICs may be needed for the campground areas to further restrict land uses and prevent exposures to contamination.

D. General

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

Remarks: Areas adjacent to Campground 7 (parking area and areas higher on the former mine) are being used by recreators

2. **Land Use Changes On Site** ☐ N/A

Remarks: None

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

Remarks: None

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

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

Remarks: Road conditions are rugged; not all sites have road access and must be reached on foot

B. Other Site Conditions

Remarks: Rugged terrain

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

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

X. OTHER REMEDIES

Soil covers: Campground 4 and Campground 7 have soil covers over lead-contaminated soils that exceed the Site's interim human-health-based levels. The covers were intact with no signs of disturbance. However, camping was observed near Campground 7. Additional sampling will be required at the mining-impacted recreation staging area at the Koehler/Junction/Longfellow complex, Campground 4 and Campground 7 to confirm the effectiveness of the IRAs at reducing lead and arsenic concentrations below the interim levels.

Interim waste management areas: Sediments removed from ponds at the Sunbank Group Mine and Silver Wing Mine have capped interim waste management areas. Both appeared in good condition during the inspections. The Terry Tunnel site also has a repository (constructed prior to the IRA). There was very little vegetation on the capped repository in areas that did not have restricted vehicular access (i.e., boulders).

Drainage improvements: All of the sites visited had surface water diversion features to divert MIW around waste rock. All appeared to be operating as intended with the following exception:

- At the Columbus Mine, water that disperses from the ditch downhill appears to be having a negative effect on vegetation. Additional work may be needed to address the potential issue.

In addition, at the Silver Wing Mine, the pond which was mucked out as part of the IRA was again full of sediment two years after completion. It now only contained a few inches of standing water; the rest was sediment/precipitate. Site inspection participants discussed O&M concerns associated with the full pond. Debris, mostly brush and branches, were observed in the drainage channel below the pond; the debris did not appear to impede flow.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). The 2019 IROD addresses specific contaminant migration issues, including mine portal MIW discharges, mining-related source/stormwater interactions, mine portal pond sediments, in-stream mine wastes and mining-impacted recreation staging areas (e.g., established campgrounds or dispersed campsites) at 23 mining-related sources. The IRAs are intended to provide adequate protection of human health and the environment until a final remedy is selected. Specifically, they are intended to provide stabilization of the mining-related sources, prevent further environmental degradation and, at the recreation staging area sites, achieve human-health risk reduction quickly. The completed IRAs were constructed in accordance with the requirements of the 2019 IROD and design specifications, and are functioning as intended.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. An O&M program will begin after the IRAs are complete and meet the operational and functional milestone.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. Please see the potential drainage issues discussed in Section X, Other Remedies.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

Site inspection participants:

July 16, 2024
Joy Jenkins, EPA
Athena Jones, EPA
Jessica Duggan, EPA
Meg Broughton, EPA
Mark Rudolph, CDPHE
Kirstin Brown, DRMS
Rory Cowie, Alpine Water Resources (EPA/state contractor)
Kylie Krivis, Alpine Water Resources (EPA/state contractor)
Treat Suomi, Skeo (EPA contractor)
Peri Bowser, Skeo (EPA contractor)
Two community members from the Site's CAG

July 17, 2024
Joy Jenkins, EPA (morning portion only)
Athena Jones, EPA
Jessica Duggan, EPA
Mark Rudolph, CDPHE
Kirstin Brown, DRMS
Rory Cowie, Alpine Water Resources (state contractor)
Treat Suomi, Skeo (EPA contractor)
Peri Bowser, Skeo (EPA contractor)
Two different community members from the Site's CAG

APPENDIX G – FYR SITE INSPECTION PHOTOS

Vermillion Mine – July 16, 2024

The Vermillion Mine waste-rock pile

View of the Vermillion Mine stormwater drainage swale from the top of the waste-rock pile

Stormwater drainage swale at the Vermillion Mine

Stormwater drainage swale constructed at the Vermillion Mine to direct flow around the western side of the waste-rock pile

Draining adit at the Vermillion Mine

Drainage swale at the Vermillion Mine that directs MIW around the waste-rock pile

Mountain Queen Mine – July 16, 2024

The Mountain Queen Mine waste-rock pile

The Mountain Queen Mine adit

The 12-inch HDPE pipe installed to direct drainage from the adit

The eastern edge of the Mountain Queen Mine waste-rock pile armored with gray rock

Sunbank Group Mine – July 16, 2024

View of the Sunbank Group Mine site from County Road 9

On-site repository within the waste rock (left) and Ponds 1 and 2 (right and center, respectively) at the Sunbank Group Mine

GCCM-lined channel (Reach 1) directing MIW into Pond 1 and then Pond 2 at the Sunbank Group Mine

Concrete bulkhead at the Sunbank Group Mine

Pond 1 and constructed berm below the bulkhead at the Sunbank Group Mine

Safety grate over a mine stope at the Sunbank Group Mine

Discharge from Pond 2 into Placer Gulch

Run-on control channel at the Sunbank Group Mine

Columbus Mine – July 16, 2024

The Columbus Mine waste-rock pile and historical mining structures

Combined MIW and stormwater drainage at the Columbus Mine

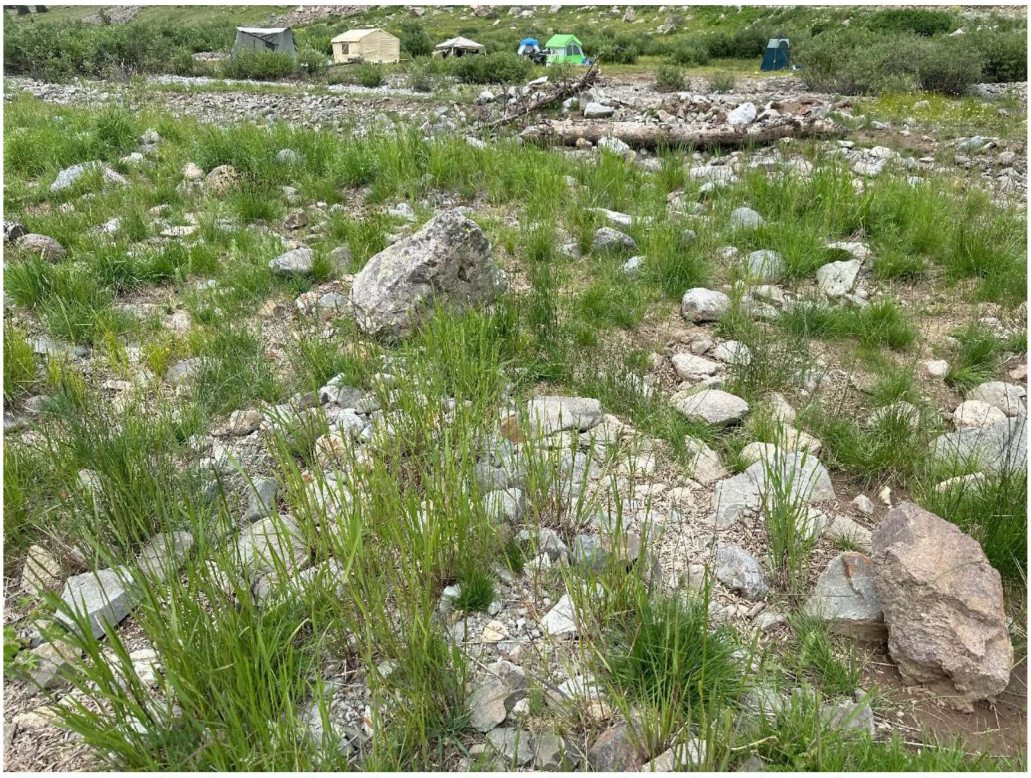
Drainage from the Columbus Mine potentially affecting vegetation

The Columbus Mine adit

Historical equipment at the Columbus Mine

Campground 7 – July 16, 2024

Warning sign at Campground 7



Revegetated IRA area where deeper clean soil was brought to the surface and placed on top of high concentration lead-contaminated soil; tents observed in the background

Location of the former Eclipse Smelter, from across the parking lot and campground; boulders line the parking lot

Campground 4 – July 16, 2024

Fencing and warning signs around Campground 4

IRA area with a clean soil cover, now revegetated

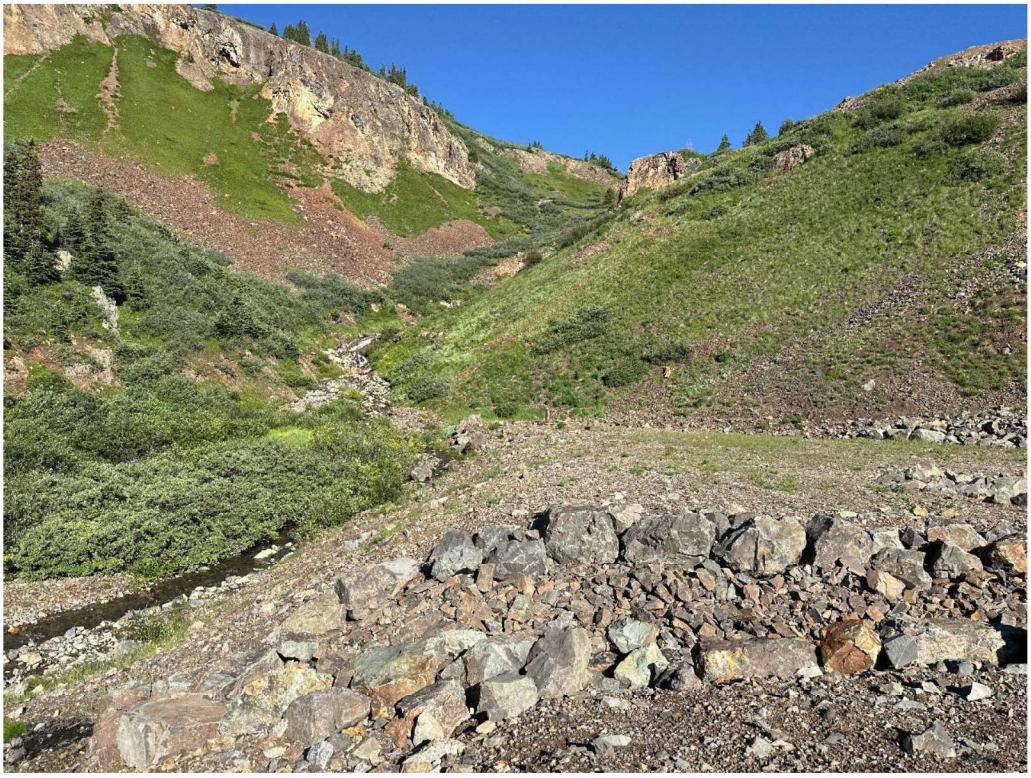
Terry Tunnel – July 17, 2024

Mine portal and pond; ridges above the portal divert run-off

Lack of vegetation on the reclaimed area at the Terry Tunnel site (capping occurred prior to the IRA)

Some vegetative growth noted in the areas that do not allow vehicular access

The confluence of Eureka Creek and the Terry Tunnel drainage



Area where the outfall from Terry Tunnel joins Eureka Creek

The toe of the Terry Tunnel site repository

Silver Wing Mine – July 17, 2024

View of the Silver Wing Mine from the road across the Animas River

The Silver Wing Mine adit with ventilation

Sludge buildup and broken fencing at the Silver Wing Mine adit


Drainage swale from the portal to the pond at the Silver Wing Mine

Lined pond at the Silver Wing Mine

Tanks (now empty) discovered during excavation for the repository; the contents (biochar and mine sediment) of the tanks were stabilized and placed in the repository

Historical structure on the Silver Wing Mine site

Some debris in the drainage from the pond

Tom Moore Mine – July 17, 2024

View of the Tom Moore Mine from the road across the Animas River

View of the Animas River from the Tom Moore Mine

The Tom Moore Mine adit

Waste and debris at the Tom Moore Mine site

Drainage from the adit at the Tom Moore Mine site

Remnants of historical structures on the Tom Moore Mine site

APPENDIX H – OTHER SITE INSPECTION PHOTOS

Koehler/Junction Pond on September 7, 2021

MIW diversion shortly after construction at the Natalie/Occidental site in August 2020

MIW diversion shortly after construction at the Natalie/Occidental site

Henrietta adit and closure during a site inspection in August 2021

Anglo Saxon MIW diversion and portal pond taken from above the collapsed adit on June 2, 2023

Ben Butler stope with amended waste rock backfill on August 5, 2021

Pride of the West culvert installed by the CDPHE as part of the MIW diversion IRA, inspected on August 28, 2024

Discharge from the opposite end of the same culvert, old undersized culvert shown