



Work Plan—Orphan Boy Removal Action
July 15, 2024

1.0 Purpose

Aligning with the CERCLA requirements to attain a Good Samaritan Comfort Letter, Trout Unlimited (TU) is supplying the following Work Plan to describe reclamation activities, proposed objectives, and estimated quantities and cost associated with the Orphan Boy removal action. This Work Plan should be included as part of the Administrative Record and act as a summary of the proposed removal action at the Orphan Boy Mine (site) (GPS Coordinates: 39.278097, -106.101781). The future removal action and Comfort Letter will proceed under Sections 104, 106(a), 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 42 USC § 9604, 9606(a), 9607, and 9622. The reclamation that TU is proposing to implement as part of this Work Plan shall be consistent with the National Contingency Plan (NCP), 40 CFR 300 et seq., and will be at the direction of an Environmental Protection Agency (EPA) on-scene coordinator (OSC). A project summary, description of site ownership, and removal action tasks are included as part of this Work Plan.

2.0 Site Access

The site is located approximately 2.6 miles west of Alma in Park County, CO, at ~10,800 feet in elevation, in the Alma Mining District and the Middle Fork of the South Platte River watershed and Mosquito Creek sub-watershed. From Alma, CO, travel west on CR-12 for 3.1 miles, turn right onto Orphan Boy Mine Rd., after 0.3 miles, continue on FSR 449 Narrow Gauge for 0.1 miles and arrive at the site. The site is upslope of and adjacent to FSR 449 Narrow Gauge and west of FSR 192. (Figure 1)

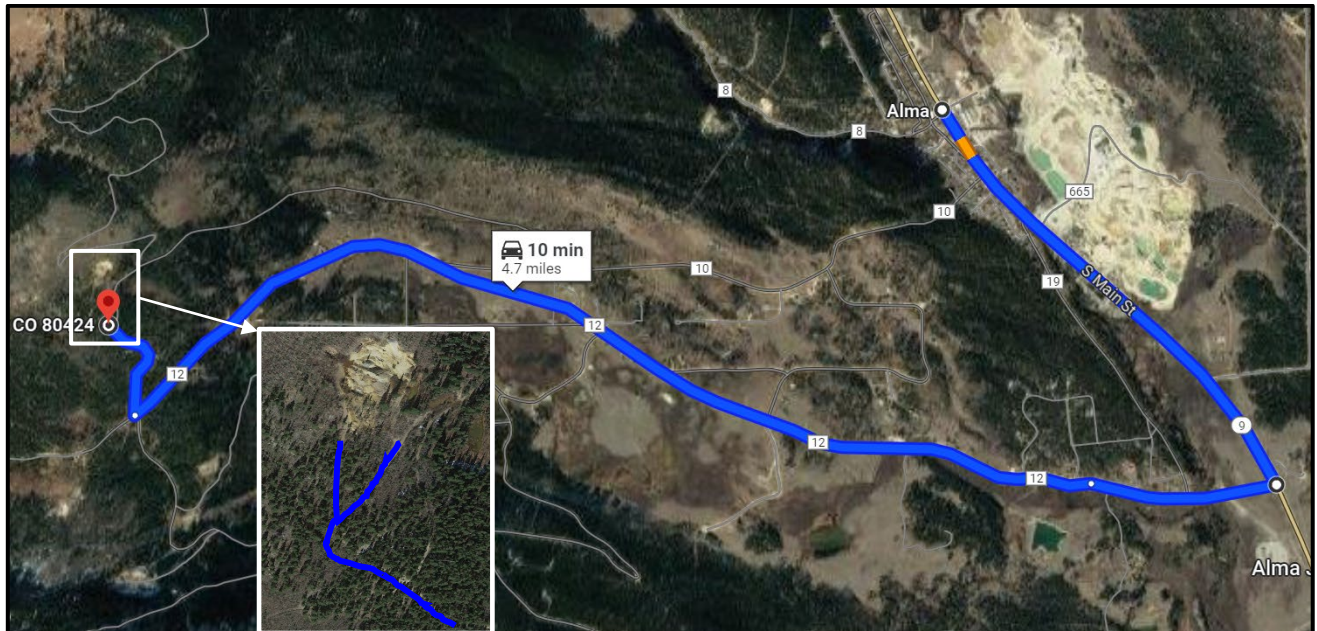


Figure 1. Site Access – Directions from Alma, CO, on CR-12, Orphan Boy Mine Rd., and FSR 449 Narrow Gauge

3.0 History of Project Development and Problem Description

There is a collapsed mine portal/adit that drains water perennially. The adit effluent flows across, infiltrates, and percolates through a large mine waste pile (Figures 2, 3, and 4) and discharges into a ~2.7-acre Freshwater Emergent Wetland, which then flows southeast into a ~1.5-acre Freshwater Forested/Shrub Wetland at Mosquito Creek south of CR-12 and east of CR-698. The mainstem of Mosquito Creek from CR-698 to the confluence with the Middle Fork of the South Platte River (COSPUS02b_B) is listed in Colorado's List of Impaired Waters: Total Arsenic on the M&E List for Water Supply Use, Dissolved Lead and Zinc TMDL's for Aquatic Life Use, and Dissolved Cadmium on the 303(d) List (impaired without a TMDL completed) for Aquatic Life Use. (Table 1)

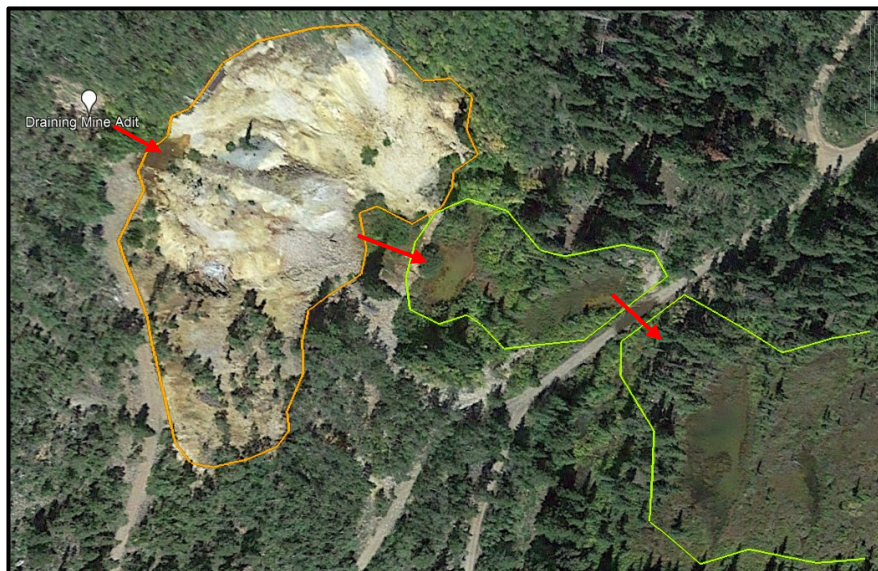


Figure 2. Site Features – The draining adit flows through a large waste rock/tailings pile (red line, orange polygon) and discharges into a wetland complex above and below FSR 449 Narrow Gauge (red lines, green polygons).



Figure 3. Site Features – The collapsed, perennially draining adit and flow across the top of the waste pile.



Figure 4. Mine waste pile, with adit effluent surface flow downslope across the waste rock and tailings (left), and 3D image of draining adit, waste pile, and downstream wetland complex (right).

Table 1. Regulation #93 – Colorado’s Section 303(d) List of Impaired Waters and Monitoring and Evaluation List (5 CCR 1002-93)

COSPUS02b

2b. Mainstem of Mosquito Creek from Road #698 (39.270971, -106.098846) to its confluence with the Middle Fork of the South Platte River.

Listed portion: **COSPUS02b_B** Mainstem of Mosquito Creek from Road #698 (39.270971, -106.098846) to its confluence with the Middle Fork of the South Platte River.

Affected Use	Analyte	Category / List	Priority
Water Supply Use	Arsenic (Total)	3b. - M&E List	N/A
Aquatic Life Use	Lead (Dissolved)	4a. - TMDL	N/A
Aquatic Life Use	Zinc (Dissolved)	4a. - TMDL	N/A
Aquatic Life Use	Cadmium (Dissolved)	5. - 303(d) List	H

In June 2013, the EPA and partners (e.g., USFS, CUSP, USFWS, and ESAT) collected surface water samples from the adit effluent and Mosquito Creek. In July 2014, the EPA and the same partners conducted XRF field screening and collected waste rock pile and surface water samples from the adit effluent, Mosquito Creek, and the Middle Fork of the South Platte. A Final Site Inspection Report was prepared by Weston Solutions, Inc. for EPA in June 2017.

In June 2015, the EPA and partners collected surface water samples from the adit effluent, Mosquito Creek, and the Middle Fork of the South Platte. These results served as the basis for CUSP incorporating the Orphan Boy Mine in the January 2020 Middle Fork of the South Platte – 9 Element Watershed Based Plan. This plan highlighted the 2015 sampling event, which showed 0.125 lbs/day of zinc discharging from the adit, with an ~12x increase to 1.484 lbs/day upon exiting the waste pile and a decrease to 0.038 lbs/day after leaving the downstream wetland, indicating leaching and mobilization of metals from the waste pile.

In September 2021, the EPA and partners (e.g., USFS, CUSP, USFWS, TU, and ESAT) conducted a Pre-CERCLA Screening (PCS) at the Orphan Boy Mine. A Sampling Activities Report (SAR) was prepared by TechLaw for EPA in March 2022. (See Figures 5 and 6)

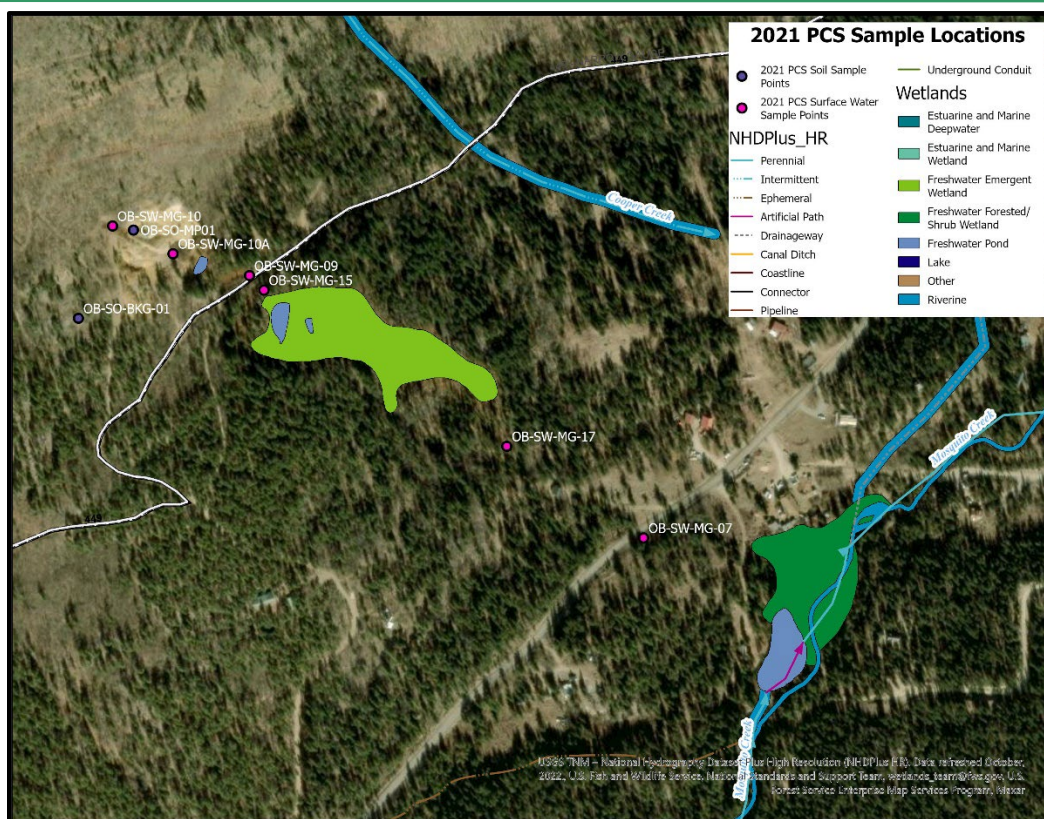


Figure 5. 2021 PCS – Surface water sample sites from the adit portal to ~0.16 mi upstream of the confluence with Mosquito Creek and soil sample sites at the waste pile and background location.

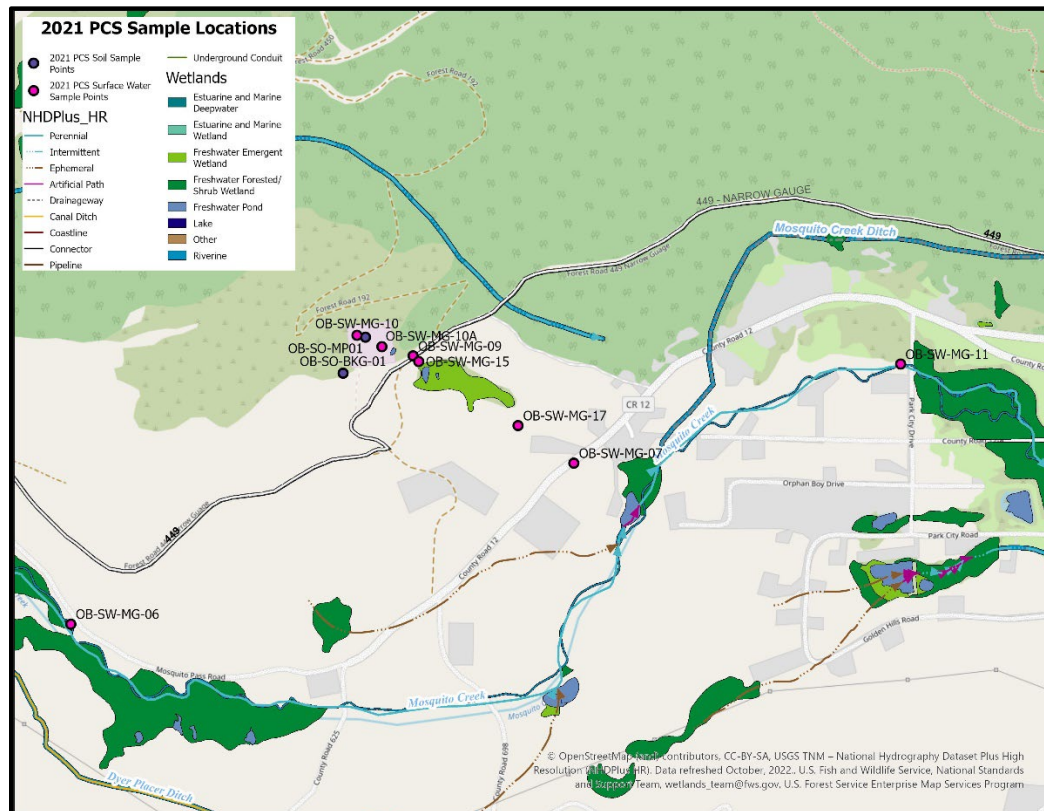


Figure 6. 2021 PCS – Surface water sample sites along the adit effluent and on Mosquito Creek bracketing the adit discharge and soil sample sites at the waste pile and background location.

The most recent sampling event in 2021 indicated soil exceedances of ecological screening values (ESVs) and human health-based soil screening levels (SSLs), specifically, the EPA Residential & Industrial Regional Screening Levels (RSLs) and the BLM Recreational Screening Level (SL), and water quality exceedances of CDPHE Regulation No. 31 – The Basic Standards and Methodologies for Surface Water (5 CCR 1002-31) – Table III Metal Parameters, Aquatic Health, Acute and Chronic Standards.

The soil characterization of the mine waste pile indicates elevated concentrations of *arsenic (below background)*, *iron*, and *lead* above one or more human-health based SSLs and *cadmium*, *copper*, *lead*, *manganese*, *mercury*, *molybdenum*, *selenium*, *silver*, and *zinc* above one or more ESVs. (See Table 2)

Table 2. 2021 PCS Results (Soil) - Total Metals Summary (mg/kg) and SSL Exceedances

Sample ID	Date	Al	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	Ag	Tl	U	V	Zn
OB-SO-MP01	9/7/2021	799 D	< 0.247 U	4.27 D	60.7 D	< 0.988 U	19.6 D	1.0 JD	7.34 D	262.0 D	79000 D	2820.0 D	448 D	0.43 D	4.21 D	3.31 D	1.02 JD	33.7 D	< 0.494 U	0.402 D	3.16 D	5030 D
OB-SO-BKG-01	9/7/2021	14100 D	0.281 JD	7.21 D	262 D	1.23 JD	3.48 D	13.0 D	8.03 D	21.3 D	22800 D	251.0 D	1900 D	0.06 JD	1.57 D	10.9 JD	< 0.755 U	1.02 D	0.796 JD	1.48 D	26.1 D	327 D
Human Health-Based Soil Screening Level (SSL)	EPA Lowest ESV ¹	--	0.27 M	6.8 SI	110 P	2.5 P	0.36 M	34 M	13 P	28 B	--	11 B	220 P	0.013 B	2.0 P	38 P	0.52 P	4.2 B	0.05 P	--	7.8 B	46 B
	EPA Residential RSL	77000	31	0.68	15000	1600	71	120000	23	3100	55000	200	1800	11	390	1500	390	390	0.78	--	390	23000
	EPA Industrial RSL	1100000	470	3	220000	2300	980	1800000	350	47000	820000	800	26000	46	5800	22000	5800	5800	12	--	5800	350000
	BLM Recreational SL	>1,000,000	782	30.6	390000	3910	1780	>1,000,000	586	78200	>1,000,000	800	46700	271	9780	39000	9780	9780	19.6	391	9850	587000

Exceeds EPA Lowest ESV

Exceeds EPA Lowest ESV and/or EPA Residential RSL

Exceeds EPA Lowest ESV and/or EPA Residential RSL, & EPA Industrial RSL

Exceeds EPA Lowest ESV, EPA Residential RSL, EPA Industrial RSL, & BLM Recreational SL

¹ P = Plants, SI = Soil Invertebrates, M = Mammals, B = Birds

< Symbol = Result was not detected at the concentration indicated

* Symbol = Potential exceedance; detection limit is > the SSL, but the result could be < the SSL

D = Sample diluted prior to analysis; reported result is for undiluted sample

J = Laboratory quality control review indicates that this result is considered estimated

U = Laboratory analysis indicates that the analyte was undetected at the concentration shown

BKG = Background sample

MP = Mine waste pile sample

The water quality characterization of the adit effluent indicates elevated concentrations of *iron* (at the base of the waste pile) and *cadmium* and *zinc* (from the top of the waste pile to below the wetland complex) above the CDPHE Reg. 31 acute and/or chronic aquatic health standard. (See Table 3)

- Leaching and non-point source loading of metals from the waste pile is evidenced by increases of cadmium, copper, iron, manganese, and zinc in surface water sampling locations between the top of the waste pile to the base of the waste pile, and continued increases of cadmium, copper, and zinc through the upper ponded, wetland area above FSR 449.
- The concentrations of cadmium, copper, manganese, and zinc begin to decrease at the inlet of the lower ponded, wetland area below FS 449 and downstream, ~0.16 miles below the outlet of the wetland complex at CR-12. However, cadmium and zinc continue to exceed in-stream aquatic standards at CR-12.

- The water quality data demonstrates that the interaction of surface water (from the adit portal and precipitation events) with the waste pile becomes a non-point source load of metals contamination downstream in the receiving wetlands and below the wetlands upstream of Mosquito Creek. There may be a loss of assimilative capacity in the upper ponded, wetland area, while the lower ponded, wetland does appear to provide some buffering capacity. However, continued deposition of metals could lead to a loss of assimilative capacity and ecological degradation in the lower ponded, wetland. If a flood event were to occur, it's possible that the existing accumulation of metals throughout the wetland complex could mobilize to Mosquito Creek and the Middle Fork of the South Platte.
- Based on the sample locations bracketing the adit effluent confluence on Mosquito Creek: despite there being no in-stream aquatic standard exceedances downstream, the data does indicate zinc loading from the Orphan Boy Mine to Mosquito Creek, which could increase over time if the wetland buffering capacity decreases.

Table 3. 2021 PCS Results (Surface Water) - Total Metals & Dissolved Metals Summary (mg/L) and CDPHE Reg. 31 Aquatic Health Exceedances

Sample ID	Surface Water	Sample Site Description	Lat/Long	Date	Al (total)	As (dissolved)	Cd (dissolved)	Cu (dissolved)	Fe (total)	Pb (dissolved)	Mn (dissolved)	Zn (dissolved)	pH	Hardness	Flow
OB-SW-MG-06	Mosquito Creek	Upstream Bracket; ~1 mile upstream from adit drainage	39.27245498, -106.1096616	9/7/2021	< 50	< 0.6	< 0.1	1.7	134 J	0.123 J	36.7	42.1	8.15	140	6.779
OB-SW-MG-10	Adit Drainage	Top of waste pile; at the collapsed adit	39.2782953, - 106.1021679	9/7/2021	< 50	< 0.6	1.59	0.898 J	749	< 0.1	26.6	300	7.63	152	0.0376
OB-SW-MG-10A	Adit Drainage	Base of waste pile; inlet of the upper ponded / wetland area	39.27806562, -106.1015204	9/7/2021	< 50	< 0.6	2.72	1.77	1840	< 0.1	59.1	395	7.41	183	na
OB-SW-MG-09	Wetland	Outlet of upper ponded / wetland area above FS 449	39.27788483, -106.100704	9/7/2021	< 50	< 0.6	4.77	2.27	114 J	< 0.1	33.2	821	7.45	224	0.0594
OB-SW-MG-15	Wetland	Inlet of lower ponded / wetland area below FS 449	39.27776478, -106.1005481	9/7/2021	57.6	< 0.6	4.66	2.11	352	< 0.1	30.9	817	7.73	225	0.0601
OB-SW-MG-17	Wetland	Outlet of lower ponded / wetland area ~400 feet upstream of CR-12	39.27647167, -106.0979507	9/7/2021	< 50	< 0.6	3.46	1.21	< 100	< 0.1	15.5	671	7.3	240	0.0495
OB-SW-MG-07	Wetland	Outlet of lower ponded / wetland area at CR-12 (south side)	39.27571227, -106.0964879	9/7/2021	245	< 0.6	2.67	1.09	449	< 0.1	< 7.5	613	7.25	242	na
OB-SW-MG-11	Mosquito Creek	Downstream Bracket; ~2,300 feet downstream of the wetland confluence & upstream from Park City Dr.	39.27771335, -106.0879381	9/7/2021	< 50	< 0.6	< 0.1	0.996 J	112 J	< 0.1	20.1	49	8.21	140	8.1507

Red BOLD font indicates an exceedance of both an acute and chronic CDPHE Regulation 31 Water Quality Standard

Orange BOLD font indicates an exceedance of only the chronic CDPHE Regulation 31 Water Quality Standard

J = Laboratory quality control review indicates that this result is considered estimated

Given the amount of potential historic features on-site, TU decided to proceed with consultation under Section 106 of the National Historic Preservation Act (NHPA). On September 16, 2022, Histria Cultural Resource Consulting LLC (Histria), subcontracted by Mountain States Historical (MSH), documented the Orphan Boy Mine tunnel site (SPA69), comprised of 15 historical archaeological features (F1-F15), and newly recorded an adjacent segment of the Denver, South Park & Pacific (DSP&P) Railroad London Mine Service Spur Segment (SPA398.1). MSH and Histria evaluated the resources for significance in terms of the National Register of Historic Places (NRHP), the Colorado State Register of Historic Properties (SRHP), the area's historic landscape, and historic district potential. (See Figure 7)

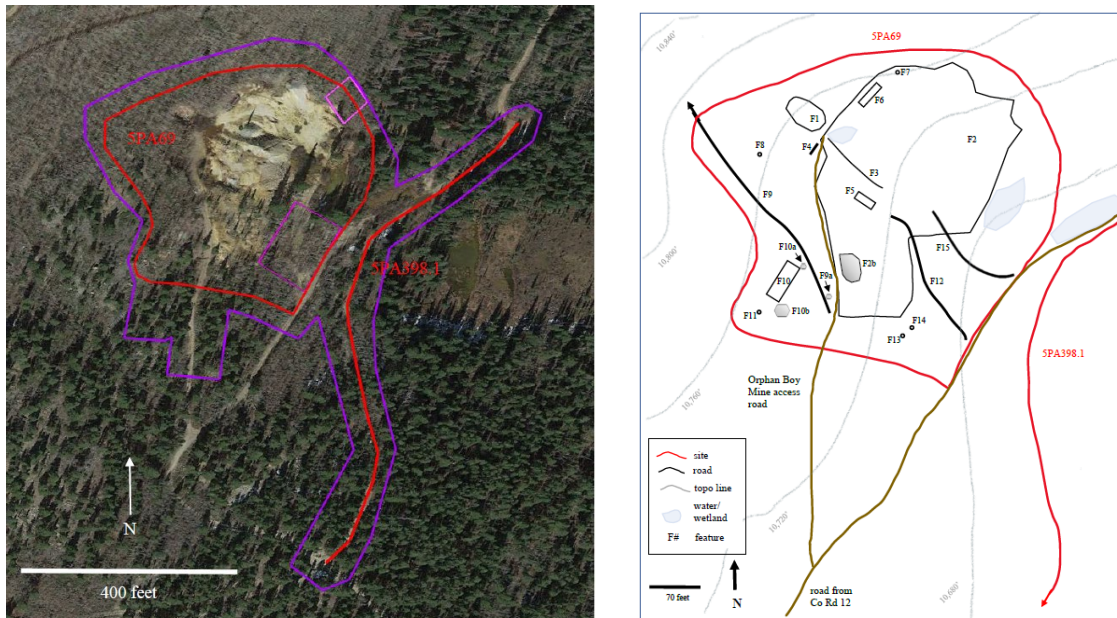


Figure 7. Section 106 Review, on left, location of the survey area (purple), recorded sites SPA69 (tunnel site) and SPA398.1 (service spur segment) (red), and likely staging areas (pink), and on right, a sketch map of recorded site SPA69.

In October 2022, TU was awarded a Park County Government Land and Water Trust Fund (LWTF) grant to complete the historical review, as well as a 30% engineering design outlining specifications for future reclamation work, both of which were finalized in July 2023.

MSH and Histria provided an initial draft cultural report and site forms in April 2023 (Orphan Boy Mine Tunnel Site Water Quality Improvement Project, Park County, Colorado), which included site condition and integrity and recommendations for NRHP and SRHP eligibility and management. Based on the eligibility recommendations, the project and its proposed actions were found to have no effect on historic properties because none are present within the area of potential effects (APE), and no further cultural resource work is recommended before reclamation work commences. TU and EPA provided comments to MSH and Histria and the cultural report and site forms were finalized thereafter and then provided to EPA in July 2023. The project was referred to EPA's Removal Program and an on-scene coordinator (OSC) was assigned to the Site. The OSC visited the Site in June 2024, reviewed TU's Work Plan and project funding, and determined that this work would be a CERCLA time-critical removal action under the direction of the OSC. The OSC informed TU that EPA would coordinate the work with SHPO.

TU contracted WaterVation PLLC to develop the 30% engineering design. WaterVation provided the initial draft 30% design in February 2023. The engineering design specifications aim to reduce the mobilization of metals and mine-impacted material from the site by rerouting the adit channel, constructing a run-on channel, and recontouring the mine waste pile, which will reduce surface water interaction with mine waste, infiltration rates, and sediment transport through the natural weathering of mine waste. Ultimately, the reclamation project aims to remediate site conditions to reduce non-point source loading in downstream wetlands and Mosquito Creek. (See Figure 8)



Following completion of the historical review and engineering design, TU submitted an application in February 2024 and received an award notice in April 2024 from the Colorado Water Conservation Board (CWCB) Wildfire Ready Watersheds (WRW) grant program for implementation of the engineering design with an estimated construction start date in the fall of 2024. TU also executed an Access and Project Participation Agreement with the landowner as of April 2024. The RFP process will take place concurrently with the Comfort Letter request timeline to ensure a contractor is under contract by August or September 2024. The RFP will align with the Final 30% Design (outlines the waste pile grading and channel layouts) and the EPA-approved Work Plan. Once a contractor is selected through the competitive bidding process, TU will oversee the construction work with input and oversight from the EPA OSC. To supplement the CWCB funds, TU also submitted an application in May 2024 and received an award notice in June 2024 from the Park County Government Land & Water Trust Fund (LWTF).

4.0 Ownership

The site footprint resides on private lands with a single willing and cooperative property owner. The site is surrounded by a mixture of other private parcels and USFS lands. While this site is privately-owned, it is frequently accessed by the public via the historic DSP&P narrow gauge road/trail or FS 192. Per the Park County Assessor's Office GIS data, the following parcels reside within the site footprint (Parcel Number, Mineral Survey Number - Mine Name - Ownership Interest) (See Figure 9):

- R0090789, MS #5275 - GOLDEN CHARIOT - 100%
- R0090788, MS #5275 - GOLDEN BLADE - 100%
- R0090787, MS #5275 - NAPOLEON THE GREAT - 100%



Figure 9. Parcels within the site footprint per the Park County Assessor's Office GIS data

5.0 Objectives

As is common with all Removal Actions, a need and subsequent action is determined based on eight factors listed in the National Contingency Plan under 40 CFR Subpart E 300.415 (b)(2). These factors specifically focus on controlling source areas of contamination at hazardous sites abating, preventing, minimizing,

stabilizing, mitigating, or eliminating the potential release of hazardous substances to the extent practicable. The specific removal factors that pertain to this project and scope of work are:

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
 - Site Visitors - Although the site is fully on private property, it is frequently accessed by the public via FSR 192 and 449, which intersect the site. The mine waste on-site contains metals at elevated concentrations (i.e., arsenic, iron, and lead). (See Table 2 for exceedances of human health-based SSLs).
 - Animals/Food Chain - Terrestrial and aquatic organisms utilize the wetlands within the site footprint and downstream at Mosquito Creek, both of which are impacted by metals loading from the adit effluent and waste pile (i.e., cadmium, iron, and zinc). Additionally, the mine waste on-site contains metals at elevated concentrations (i.e., cadmium, lead, manganese, mercury, molybdenum, selenium, silver, and zinc). (See Tables 2 for exceedances of soil-based ESVs and Table 3 for exceedances of CDPHE Reg. 31 aquatic health standards)
- (ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;
 - A ~2.7-acre Freshwater Emergent Wetland is located below the waste pile and a ~1.5-acre Freshwater Forested/Shrub Wetland is located at the confluence of the adit effluent and Mosquito Creek, both of which are impacted by metals loading from the adit effluent and waste pile (i.e., cadmium, iron, and zinc). (See Table 3 for exceedances of CDPHE Reg. 31 aquatic health standards)
- (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;
 - Exposed waste pile containing elevated concentrations of metals at the surface (i.e., arsenic, iron, and lead). (See Tables 2 for exceedances of human health-based SSLs). Migration of metals and associated fine-grained sediments are notable in receiving wetlands downstream of the site.
- (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;
 - Natural weathering from seasonal precipitation events and snowmelt, as evidenced by gully erosion along the steep slopes of the waste pile. Accumulated sediments in the wetlands could be discharged to larger surface waters in the event of flooding, monsoonal, or precipitation events.

The site consists of a perennially draining adit and large waste rock and tailings pile, which contribute metals and contaminated sediment to downstream wetlands and Mosquito Creek. By completing removal actions that focus on the above factors, partners anticipate the following added benefits while preventing and mitigating the release of hazardous substances or pollutants or contaminants to the extent practicable:

- Stabilization of contaminated material on-site while also reducing the ability of that material to migrate or be mobilized off-site;
- Reduce non-point source metals loading in downstream wetlands and Mosquito Creek;
- Reduce potential risks to humans and ecological receptors (including riparian-dependent plant communities) from exposure to the mine waste at the site; and,

- Control runoff from and minimize erosion of legacy mine waste

6.0 Required Tasks

The proposed removal action aims to improve watershed health and minimize the potential human health and ecological risks (i.e., water quality and riparian and wetland habitats) through AML cleanup techniques that will reduce erosion and off-site mobilization and transport of hazardous substances (i.e., non-point source loading) to downstream wetlands and receiving waters. The proposed removal action is divided into three main construction tasks that will be completed to the extent practicable considering the exigencies of the situation. The duration of construction should take approximately six weeks, with a possible completion date of no later than November 2024.

TU will ensure that proper best management practices (BMPs) are in place for stormwater during construction activities, specifically, silt fencing to prevent sediment migration to receiving waters during the mine waste grading and channel construction. Given that the proposed removal action included in this work plan will be completed as a time-critical removal action under the direction of an on-scene coordinator, permits are not necessary.

Mobilization/Demobilization

The contractor will mobilize heavy equipment to the site and establish a main staging area. The staging area will be cleared and grubbed. Any large diameter trees should be removed and delimbed (at the direction of a TU Project Manager). The contractor will use a screening bucket or Grizzly rock screen to source d50 8" riprap on-site. Native vegetation, woody material, rocks, and boulders will be stockpiled for use during subsequent tasks. The contractor will purchase and haul imported materials to the staging area (e.g., soil amendments, erosion control mats, wattles, and woodstraw). TU will oversee staking of the proposed centerlines for the run-on ditch and adit diversion channel. Prior to initiating construction work on-site, ~200 LF of silt fence should be installed along the downslope margin of the waste pile to minimize potential sediment loading to the adjacent wetlands during reclamation activities. The location of the silt fence will be flagged by a TU Project Manager. Prior to demobilization from the site, the staging area and any disturbed areas will be reclaimed (i.e., hummocked, amended, and seeded).

Task 1 - Mine Waste Pile – Grading, Consolidation, Capping, and Revegetation

This task focuses on in-situ stabilization and treatment of the waste pile by grading ~0.9 acres of unstable mine waste followed by amending, capping, and seeding ~1.2 acres of graded mine waste. Removing the steep slopes and creating a more consistent slope across the mine waste pile, neutralizing soil pH, and reintroducing soil organics will promote vegetation growth and reduce erosion on-site.

The waste pile will be rough graded to achieve an average 3:1 slope by extending the slope and blending large erosion features. Large rills and gullies will be filled in using waste from the existing footprint. Approximately 1,600 CY of cut/fill earthwork will be performed as part of rough grading. (See Figure 10)

A dilapidated structure on the upper plateau of the waste pile shall be demolished and buried in the graded waste pile. The boiler will be set aside and preserved.

Once the surface water controls are constructed, the graded waste pile will be treated in-place. The first step requires evenly spreading and mechanically mixing to a depth of 12-18 inches, 100 tons of limestone crusher fines and 20 tons of pulverized limestone. Next, 12 CY of BioChar will be spread across the site and ripped into the top 2-6 inches of the slope followed by application of locally harvested clean fill at a minimum depth of 6 inches to cover/cap the roughly graded surface. It should be noted that clean fill is going to be generated through excavation of the adit diversion channel in Task 2. If that soil is volumetrically or chemically inadequate, TU will plan to excavate a soil borrow pit on-site, and supplement

with imported clean fill (as needed). Organic amendments such as, 2,000 pounds of 4-6-2 fertilizer, 50 tons of compost, and 2,000 pounds of Proganics Biotic Soil Media will then be mechanically mixed to a depth of 2-6 inches. The contractor will then complete final grading that blends with the natural topography and hummocking with an excavator to create roughness.

Erosion control blankets or wattles will be installed on steeper remediated slopes for supplemental stabilization. Locally harvested tree limbs and woody debris will also be scattered across the remediated and disturbed areas. Native seed and woodstraw will then be spread by hand. The seed mixture will be determined based on elevation, sun exposure, and moisture.

Task 2 – Surface Water Controls - Adit and Run-On Channels

After the waste pile has been set to an acceptable grade and prior to capping, amending, and seeding, the contractor will excavate an ~500 LF diversion channel to reroute the adit effluent around the reclaimed waste pile. During excavation, contaminated soils will be blended into the adjacent graded slope of the waste pile.

Given the mellow 1% slopes for the first 160 LF of the channel, a 45-mil impermeable liner will be installed to prevent surface water infiltration into the reclaimed waste pile, followed by ~55 CY of locally harvested or imported d50 8" riprap. The low gradient portion of the channel will be built to replicate a cascade-pool stream morphology. The remaining 300 LF of the channel will be a more natural planform with a mixture of in-stream structures and channel-bank treatments that mimic a step-pool pattern to accommodate steeper slopes (~10% -25%) (See Figures 11 and 12).

A combination of locally sourced logs and boulders, and ~95 CY of locally sourced or imported d50 8" riprap will be incorporated into the natural step-pool channel. The terminus of the channel will connect to the existing wetland complex. This approach will help restore the wetlands and native riparian vegetation that have been degraded by past mining activities. Various options have been provided in the 30% design plans for in-stream structures and channel-bank treatments to provide in-field flexibility depending on the types of material that can be locally harvested (e.g., step-boulder, step-log, bank treatment-toe wood, and bank treatment-brush layering).

After the adit diversion channel is complete, the contractor will construct an ~150 LF run-on channel upslope of the access road on the west side of the waste pile to reroute upslope surface water runoff around the reclaimed waste pile. ~35 CY of locally harvested or imported d50 8" riprap will be installed within the channel margins. (See Figure 12)

During channel excavation and grading, trees, native vegetation, woody material, d50 8" riprap, boulders, and clean fill will be stockpiled for use during subsequent tasks. If riprap cannot be sourced on-site, TU will work with the contractor to import materials.

Task 3 – Low-Water Crossing

After the waste pile reclamation and surface water controls are completed, the contractor will excavate and construct an armored low-water crossing on the road/trail between the upper and lower wetland areas. The crossing will be approximately 25 LF long by 10 LF wide, constructed using d50 8" riprap to a depth of 16", and armored at the inlet and outlet to stabilize the structure.

Site access controls will be constructed to limit unauthorized access by site users to the reclaimed site.






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Sub-Consultants

Horizontal Scale & Orientation



The diagram includes a horizontal scale bar at the bottom with markings for 0 and 20. Above the scale bar is a north arrow pointing towards the top right of the page.

Legend

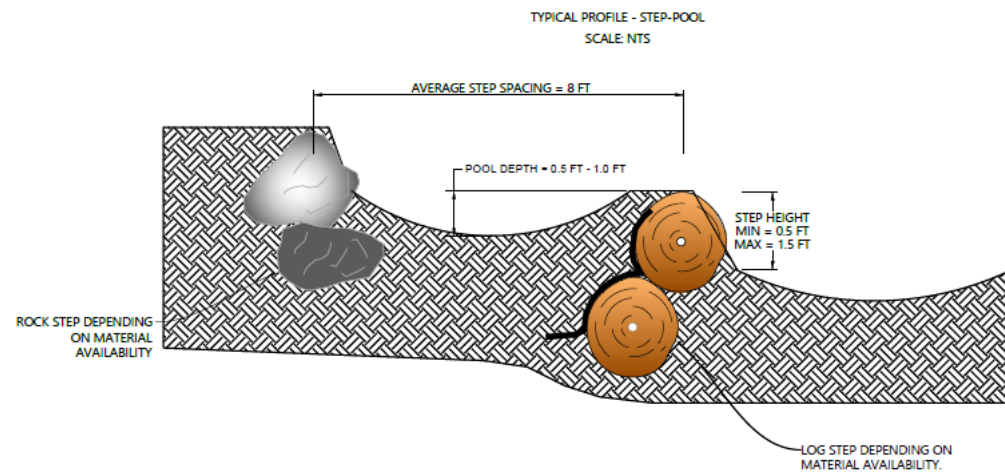


Figure 12. Run-on channel upslope of the western portion of the waste pile, adjacent to the unnamed access road off FSR 449 (left), and Final 30% Design; Sheet 13 (typical profile) – Step-pool structures for high gradient channel sections using logs or rocks/boulders (right)

7.0 Budget and Timeline

The estimated budget for the construction tasks associated with this removal action is \$244,842.25. TU obtained a notice of a portion of funding, \$135,031.55, through a CWCB WRW grant as of April 2024. Those funds will be matched with \$109,810.70 of other in-kind and cash match sources (e.g., Park County Government LWTF, Freeport McMoRan, Newmont Mining, Anglers All, the Local Cutthroat TU Chapter, and Colorado DRMS). The landowner will provide in-kind match from soil, rocks, and boulders generated on-site. TU received notice of the LWTF grant award in June 2024, which includes an additional ~\$65,000 to complete construction.

A budget sheet from the CWCB grant application outlining the construction tasks and estimated material quantities and costs for each line item is shown below. Construction is estimated to take place over approximately 6 weeks, with an estimated construction window between late August to early November 2024. It should be noted that these line items are based on construction costs that were seen during the 2023 field season. While a contingency is already built into this estimate, if bids come back high, the Park County Government LWTF funds will help ensure that the project is completed as proposed in this Work Plan.

Task 2 - Construction							
Sub-task	Unit	Quantity	Unit Cost	Total Cost	CWCB Funds	Matching Funds	
Mobilization/Demobilization	LS	1.0	\$65,000.00	\$65,000.00	\$37,700.00	\$27,300.00	
Install erosion control/silt fence	LF	200.0	\$6.00	\$1,200.00	\$696.00	\$504.00	
Clearing and Grubbing	LS	1.0	\$1,500.00	\$1,500.00	\$870.00	\$630.00	
Reclamation of staging areas	acre	1.0	\$5,975.00	\$5,975.00	\$3,465.50	\$2,509.50	
HASP development and reporting	LS	1.0	\$2,500.00	\$2,500.00	\$1,450.00	\$1,050.00	
Mine waste pile rough grading and revegetation (1,600 CY)	acre	0.8	\$36,000.00	\$28,800.00	\$14,400.00	\$14,400.00	
Purchase and haul limestone crusher fines	tons	50.0	\$100.00	\$5,000.00	\$2,900.00	\$2,100.00	
Purchase and haul pulverized limestone	tons	30.0	\$120.00	\$3,600.00	\$2,088.00	\$1,512.00	
Purchase and haul 4-6-2 Fertilizer	#	2000.0	\$2.25	\$4,500.00	\$2,610.00	\$1,890.00	
Purchase and haul Compost from Compost Technologies	Tons	50.0	\$60.80	\$3,040.00	\$1,763.20	\$1,276.80	
Purchase and haul Proganics Biotic Soil Amendment	#	2000.0	\$1.38	\$2,760.00	\$1,600.80	\$1,159.20	
Woodstraw	bales	200.0	\$46.25	\$9,250.00	\$5,365.00	\$3,885.00	
Native Seed from Western Native seed	acre	1.5	\$550.00	\$825.00	\$478.50	\$346.50	
Final grading and hummocking	acre	0.8	\$6,500.00	\$5,200.00	\$3,016.00	\$2,184.00	
Purchase, haul and install erosion blankets or wattles	rolls	6.0	\$400.00	\$2,400.00	\$1,392.00	\$1,008.00	
Adit Step-pool diversion channel construction (includes 40 structures)	LF	458.0	\$65.00	\$29,770.00	\$17,266.60	\$12,503.40	
Purchase, haul and install 200 LF of 45 mil liner	LF	200.0	\$23.00	\$4,600.00	\$2,668.00	\$1,932.00	
Locally harvest and install 40 trees into step-pool channel	unit	40.0	\$78.00	\$3,120.00	\$1,809.60	\$1,310.40	
Locally harvest or import riprap (d50 8")	CY	135.0	\$27.78	\$3,750.30	\$2,175.17	\$1,575.13	
Stockpile clean fill and place on graded pile	CY	600.0	\$8.50	\$5,100.00	\$2,958.00	\$2,142.00	
Construct run-on channel	LF	216.0	\$22.00	\$4,752.00	\$2,756.16	\$1,995.84	
Purchase and haul 250 LF of 45 mil liner	LF	250.0	\$23.00	\$5,750.00	\$3,335.00	\$2,415.00	
Local harvest or import riprap (d50 6")	CY	50.0	\$27.78	\$1,389.00	\$805.62	\$583.38	
Lower channel construction, culvert, and trail rehab							
Lower Channel construction and structure incorporation	LF	95.0	\$25.00	\$2,375.00	\$1,377.50	\$997.50	Note that all construction match associated with this Task is coming from a combination of cash match from LWTF, Freeport McMoRan, Newmont Mining, Anglers All, Division of Reclamation Mining and Safety, & Local Cutthroat Chapter.
New 6" arch culvert (includes removal of old and install) (6"x25")	LF	25.0	\$350.00	\$8,750.00	\$5,075.00	\$3,675.00	
Grading and construction of recreational trail	LF	200.0	\$10.00	\$2,000.00	\$0.00	\$2,000.00	
TASK 2 SUBTOTAL				\$212,906.30	\$120,021.65	\$92,884.65	
Contingency for Task 2 Construction at 15%	LS 15%			\$31,935.95	\$15,009.89	\$16,926.05	
Task 2 = TOTALS				\$244,842.25	\$135,031.55	\$109,810.70	