

U.S. ENVIRONMENTAL PROTECTION AGENCY  
POLLUTION/SITUATION REPORT  
Red and Bonita Mine Site - Removal Polrep  
Initial Removal Polrep



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
Region VIII

**Subject:** POLREP #1  
Initial  
Red and Bonita Mine Site  
08UP  
Silverton, CO  
Latitude: 34.4931328 Longitude: -101.2987467

**To:**  
**From:** Steven Way, OSC  
**Date:** 12/1/2014  
**Reporting Period:** October - November 2014

## 1. Introduction

### 1.1 Background

<b>Site Number:</b>	08UP	<b>Contract Number:</b>	
<b>D.O. Number:</b>		<b>Action Memo Date:</b>	9/24/2014
<b>Response Authority:</b>	CERCLA	<b>Response Type:</b>	Time-Critical
<b>Response Lead:</b>	EPA	<b>Incident Category:</b>	Removal Action
<b>NPL Status:</b>	Non NPL	<b>Operable Unit:</b>	
<b>Mobilization Date:</b>	10/1/2014	<b>Start Date:</b>	10/1/2014
<b>Demob Date:</b>		<b>Completion Date:</b>	
<b>CERCLIS ID:</b>	CON000802811	<b>RCRIS ID:</b>	
<b>ERNS No.:</b>		<b>State Notification:</b>	
<b>FPN#:</b>		<b>Reimbursable Account #:</b>	

#### 1.1.1 Incident Category

CERCLA Time-Critical Removal Action

#### 1.1.2 Site Description

The Red and Bonita Mine Site (Site) is located within the Cement Creek watershed, a component of the Upper Animas River watershed in San Juan County, Colorado. These watersheds within the volcanic terrain of the San Juan Mountains were the focus of both large and small-scale mining operations that flourished from 1871 until as late as 1991. Historic mapping of the Red and Bonita Mine indicated that the predominance of activities occurred prior to 1899. Mining operations lasted a short period, but no activity occurred after the initial operations.

Several other mines in the Cement Creek basin also have draining adits. The discharge from Red and Bonita Mine, Gold King (Level 7) Mine, and Mogul Mine all experienced significant increases in flow following the plugging of the Sunnyside Gold Mine workings, including the American Tunnel, that occurred between 1998 and 2002. The Red and Bonita Mine was essentially dry during the period when the Sunnyside Gold Mine operated with an estimated flow of five gpm. Flow from the American Tunnel was reported to be approximately 1,700 gpm when it was treated, prior to the final bulkhead installation. Active water treatment also was discontinued. Water quality in the Animas River has degraded progressively since that time.

The Animas River and many of its tributaries, including Cement Creek, carry high concentrations of metals from both acid mine drainage and from natural sources not impacted by mining. Water quality studies have indicated that the Red and Bonita Mine is one of the major sources of metals to the Animas River near Silverton. The Environmental Protection Agency (EPA), Bureau of Land Management (BLM) and U.S. Geological Survey (USGS) have quantified the various mine site sources and diffuse metals sources within the mining district that contribute to metals loading in the Animas River. These actions contribute to the information needed to identify potential remedies and to reduce or prevent the on-going hazardous substance (metals) releases from the mine sites.

The Red and Bonita Mine consists of approximately 1.25 acres of waste rock and suspected tailings material, and an estimated 3,500 feet of underground workings. The mine adit drains approximately 300 gallons per minute throughout the year. The mine water discharge occurred for an unknown number of years through a collapsed rock debris blockage; the EPA installed a new portal structure in October 2011 after removing 30 feet of blockage at the adit entrance.

Adit discharge flows approximately 200 feet down a mine dump face before channelizing at the toe of the dump. The channel directs flow into an iron bog en route to Cement Creek, approximately 500 feet down gradient of the toe of the dump. The Site lies on a west-facing mountainside slope with an average 44 percent grade, east of Cement Creek. The mine is accessible during non-snow months of the year, typically late June through early October. The mining claims associated with Red and Bonita are on steep terrain and create limiting conditions for operations.

### 1.1.2.1 Location

The Red and Bonita Mine Site is located in San Juan County, Colorado. The portal is approximately seven miles north of the Town of Silverton, Colorado, at 10,893 feet above mean sea level (AMSL) at 37 degrees 53'49.95"N and 107 degrees 38'38.70"W. Road access is via County Road (CR) 110 from the Town of Silverton to CR53 at the abandoned Town of Gladstone. CR53 continues northward up the Cement Creek valley to the Site, approximately 0.5 mile north of Gladstone

### 1.1.2.2 Description of Threat

Following the installation of bulkheads in the American Tunnel, Red and Bonita Mine adit discharge rates increased to approximately 300 gpm. The pH of discharge water typically ranges from five to six standard units (su). The adit discharge water contains high concentrations of several metals that include (and their approximate concentrations measured over many years): total aluminum (4,000 parts per billion (ppb)), cadmium (35 ppb), iron (90,000 ppb), lead (60 ppb), manganese (34,000 ppb), and zinc (16,000 ppb). The discharge from the adit represents a significant release of heavy metals, including zinc, to the Animas River. The Red and Bonita Mine discharge accounts for approximately 18 percent of the zinc load in the Animas River during low flow periods at a point (sample station A72) one mile below Silverton (USGS presentation, 2013).

The results of a Screening Level Ecological Risk Assessment (February 2013) strongly suggested that the fish community in the Animas River at and below Silverton is experiencing high stress under current conditions. For example, the surface water hazard quotient for zinc in the Animas River below its confluence with Cement Creek is approximately four, which is four times the expected no-effects level. In addition, the study identified aluminum, copper, lead and zinc as major risk drivers for insectivorous birds ingesting surface water, sediment, and aquatic invertebrates from the Animas River at and below Silverton. Also, metal concentrations highly toxic to benthic invertebrates were measured in the substrate of the Animas River at and below Silverton. Recent fish population studies conducted by Colorado Parks and Wildlife found no fish in the Animas River below Cement Creek for approximately two miles.

Effects on benthic communities are most notable immediately below Cement Creek but are pronounced at least 30 miles downstream. Fish population surveys (2010), conducted by Colorado Parks and Wildlife (formerly Division of Wildlife), found no fish in the Animas River below Cement Creek for approximately two miles and observed precipitous declines in fish populations since 2005 as far as 20 miles downstream.

Surface water toxicity tests were performed by the EPA in 2012 and 2013 on Animas River surface water. The tests involved exposing commercially reared juvenile rainbow trout (*Oncorhynchus mykiss*) to water collected from the Animas River under controlled laboratory conditions. Exposures lasted for 96 hours and in both 2012 and 2013, Animas River water collected one mile below Cement Creek, resulted in 100% mortality of fish.

Sediment toxicity tests using the standard test organism *Hyalella azteca*, a freshwater amphipod, were conducted in 2012. Following a 10 day exposure to Animas River sediments collected downstream of Cement Creek, mortality ranged from 24% at Bakers Bridge (about 30 miles downstream) to 95% at Elk Creek (about seven miles downstream). Mortality was about 64% one mile downstream from Cement Creek at station A72.

### 1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results

Initial removal assessment investigations of the Red and Bonita Mine in 2010 were focused on both the discharge from the collapsed adit and the contribution of metals to the discharge that occurred as water flowed over and through the waste dump. The investigation findings showed that there was relatively little addition of metals to the adit discharge water from the waste dump. Mine water drainage flows from the adit over the mine dump face at a typical rate of approximately 300 gpm into Cement Creek. The Cement Creek confluence with the Animas River is approximately seven miles downstream at the Town of Silverton.

In October 2012, sampling results and related modeling showed that the Red and Bonita Mine discharge accounted for an estimated 18 percent of the zinc load in the Animas River, approximately one mile below Silverton. The relative contribution from the individual mines varies seasonally, depending on flow conditions.

**Mine Adit Discharge 2005 to 2011**

Mine	Elevation (feet AMSL)	Bulkhead Install	Flow Rate (gpm)				
			July 2005	September 2005	October 2006	Average 2010	Average 2011
Red and Bonita	10,893	None	210	224	233	216	319

gpm – Gallons per minute. AMSL – Above mean sea level.

The mine adit contains yellowboy accumulations varying in thickness from 0.5 to 3 feet to at least 900 feet in by, which was the maximum extent of the investigation on the main adit cross-cut. Investigations of the

mine allowed access to approximately 2,000 feet of workings. Collapsed ground within the tunnels prevented further investigation. However, based on historic information and the estimated waste dump volumes, it is estimated that there are only approximately 3,500 feet of underground workings and that the adit does not connect to other mines. The extent and depth of the precipitate, contributes to waist-deep mine drainage water in some areas, rendering mine entry very difficult. Air inside the adit was oxygen depleted in 2011 and 2012 and required active ventilation to allow for safe entry in subsequent entries in 2013. Ventilation in the mine was accomplished by installing "lay-flat" flexible vent bags and using a fan to blow outside ambient air into the mine. Following the initial ventilation for each entry, the oxygen levels were found to be acceptable without continuous fan powered ventilation. Lay-flat vent bags were left intact in the mine adit from the portal to 200 feet inby.

In addition, a water management system was constructed to control heavy-metal precipitate that became suspended in the mine discharge flow during mine entry activities. This did not include treatment to reduce dissolved metal concentrations normally present in the acid mine discharge, although concentrations were reduced during the process of removing suspended metal precipitates.

In August 2013, a second entry operation was performed to complete the investigations of the workings in an attempt to identify sources of water entering the mine and possible connections to other mine workings or significant faults or fracture systems. The results of the investigation revealed that the two primary sources of water included the main cross-cut flow and flow from a drift at 275 feet. Suitable rock for a potential bulkhead construction exists within the mine approximately 265 feet in from the portal and downstream of the two sources of flow.

In September 2014, additional evaluation was performed in the adit to determine if the proposed bulkhead location is suitable structurally and hydraulically. This assessment included performing pressurized, permeability testing of the fractures within the vicinity of the segment of the adit where a bulkhead could be placed. Packer testing demonstrated that the Red and Bonita adit at the proposed bulkhead location is composed of high-quality rock with very low permeability. Improvement of the rock through formation grouting is unnecessary based on the packer test results.

See attached photo: Water Management System and Settling Pond 2013

## 2. Current Activities

### 2.1 Operations Section

#### 2.1.1 Narrative

The objective of this removal action is to prevent continued releases of heavy metals into the environment from the mine adit by constructing a concrete bulkhead (plug). This will provide a hydraulic control to prevent and/or manage the ongoing discharge of approximately 300 gpm of acid mine drainage. The action includes the following elements: (1) Establishing temporary water treatment and settling pond(s); (2) Removing the precipitated solids from approximately 300 feet of the mine adit; (3) Constructing an onsite repository for the solids removed from the mine; (4) Preparing the section of the adit for the bulkhead; (4) Constructing the concrete bulkhead with piping and valves for future management flexibility.

#### 2.1.2 Response Actions to Date

During the week of October 11, 2014, the ERRS contractor mobilized and performed the following actions to prepare the Site for continued response actions in 2015:

- Removed mine waste (precipitation solids) from the settling pond and placed the solids in the onsite temporary repository cell. Covered the repository cell with geotextile fabric as a season cover pending additional work in 2015.
- Removed piping placed across the county road that was used to direct flow to the settling pond during the final removal assessment work in 2014.
- Initiated adit work pad preparations – including solid waste removal/disposal and grading to expand the work area, improving safety conditions and drainage controls.
- Delivered and stored piping supplies required for water management in 2015.

#### 2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)

#### 2.1.4 Progress Metrics

<i>Waste Stream</i>	<i>Medium</i>	<i>Quantity</i>	<i>Manifest #</i>	<i>Treatment</i>	<i>Disposal</i>
Precipitated metals	solids	15 cy	NA		onsite
	water		NA		

## 2.2 Planning Section

### 2.2.1 Anticipated Activities

The removal action will continue at the Red and Bonita Mine Site in the summer of 2015:

- Design work will be performed during the winter.
- The water management system will be installed at the time mine entry and solids removal is planned

during the summer of 2015. Installation of the temporary system will occur prior to entry, anticipated July 2015.

- Road improvements are planned to allow cement truck hauling operation to the adit level.
- Adit solids removal will begin when the water management system is prepared.
- Adit preparations and bulkhead construction are planned to begin in August.

#### **2.2.1.1 Planned Response Activities**

#### **2.2.1.2 Next Steps**

#### **2.2.2 Issues**

Additional area is needed to expand the water treatment capacity to muck out the solids and to treat water and settling solids. Property owner access is needed to expand north of the existing pond.

### **2.3 Logistics Section**

#### **2.4 Community Involvement**

The Animas River Stakeholders Group is actively involved with the work in the watershed and is routinely briefed on the work at the Red and Bonita Mine. Before approval, the proposed removal action was discussed with many stakeholders including the property owner, citizens, environmental organizations, other land owners, local governmental entities, and state and federal regulatory and land management agencies. Regular meetings are held with the participants.

#### **2.4 Finance Section**

No information available at this time.

#### **2.5 Other Command Staff**

No information available at this time.

### **3. Participating Entities**

No information available at this time.

### **4. Personnel On Site**

No information available at this time.

### **5. Definition of Terms**

No information available at this time.

### **6. Additional sources of information**

Animas River Stakeholder Group website: <http://www.animasriverstakeholdersgroup.org/>

EPA OSC website: [http://www.epaosc.org/site/region\\_list.aspx?region=8](http://www.epaosc.org/site/region_list.aspx?region=8)

### **7. Situational Reference Materials**

No information available at this time.