

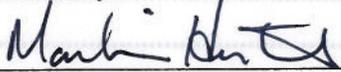
**Five-Year Review Report**  
**Fourth Five-Year Review Report**  
**for**  
**Eagle Mine Superfund Site**  
EPA ID COD081961518

**Minturn**  
**Eagle County, Colorado**

September 2013

Prepared By:  
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\_\_\_\_\_

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9/27/13

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## List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CBS	CBS Operations, Inc.
CD	Consent Decree
CDH	Colorado Department of Health
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CMP	Compliance Monitoring Plan
COC	Contaminant of Concern
CTP	Consolidated Tailings Pile
EMWTP	Eagle Mine Water Treatment Plant
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
GPM	Gallons per Minute
IC	Institutional Control
MCL	Maximum Contaminant Level
MDD	Mine Drawdown
mg/kg	Milligrams per Kilogram
MMI	Multi-Metric Index
MW	Monitoring Well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTP	New Tailings Pile
O&M	Operations and Maintenance
OTP	Old Tailings Pile
OU	Operable Unit
PCB	Polychlorinated Biphenyl
POC	Points of Compliance
ppm	Parts per Million
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RP	Responsible Party
RAP	Remedial Action Plan
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SCADA	Supervisory Control and Data Acquisition
SOW	Statement of Work
TBC	To-Be-Considered

TVS	Table Value Standards
UAO	Unilateral Administrative Order
WQCC	Water Quality Control Commission
WRP	Waste Rock Pile
WTP	Water Treatment Plant
µg/L	Micrograms per Liter

# Executive Summary

## Introduction

The Eagle Mine Superfund Site (the Site) is located in a rural area of Eagle County, Colorado, approximately 2 miles southeast of Minturn and comprises approximately 235 acres. Historic mining operations at the Site resulted in contamination of surface water, groundwater and soil with heavy metals including zinc, cadmium, copper, lead, mercury and silver. In 1986, the United States Environmental Protection Agency placed the Site on the National Priorities List.

This is the fourth statutory Five-Year Review (FYR) for the Site. This FYR report addresses Operable Units (OUs) 1 and 2. OU3 consists of a remediation and redevelopment project at a portion of the Site commonly referred to as the “North Property.” Battle North LLC, a “bona fide prospective purchaser” is currently preparing a feasibility study pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) that proposes to remediate portions of the North Property to allow for residential reuse. A final remedy has not yet been selected for OU3.

## Technical Assessment

Metals concentrations in the Site’s surface water have decreased greatly since 1990. However, the recovery of the brown trout population in some segments of the Eagle River is still hampered by metals loading.

Despite warning signs, fences and gates, trespassing continues to be a problem at the Site. In order to ensure long-term protectiveness, additional efforts may be needed to further discourage trespassing at the historic town of Gilman. Recent installation of security cameras and increased communication with local law enforcement may assist in addressing the problem. The responsible party (RP) and property owners should consider additional warning signs that more explicitly convey the potential risks, additional security cameras, or other appropriate measures.

Some components of the mine water conveyance system and water treatment plant (WTP) are outdated and require frequent repair. Operations and maintenance (O&M) is a challenge at the Site, with the aging of the WTP and frequent maintenance required to keep the mine water conveyance system functioning properly. Numerous releases of contaminated mine water have been reported over the last five years and significant O&M issues needing attention were observed during the site inspection.

## Conclusion

The remedy at OU1 currently protects human health and the environment because the collection and treatment of contaminated surface water and groundwater is occurring, access restrictions and capped areas are in place to prevent contact with contaminated subsurface soil, and the brown trout population is recovering. However, in order for the remedy to be protective in the long term, the following actions need to be taken:

- Develop a compliance monitoring plan, an updated sampling and analysis plan, and an updated Quality Assurance Project Plan (QAPP).
- Issue a decision document to update the surface water and groundwater cleanup levels.
- Implement institutional controls.
- Complete the feasibility study for updating the surface water and groundwater cleanup levels.
- Consider possible upgrades for the WTP and conveyance system and continue to implement recommendations from the prior WTP and conveyance system audits.
- Secure all wells currently in use and properly abandon any wells that are no longer functional.

The remedy at OU2 currently protects human health and the environment because access restrictions currently exist to deter trespassers. However, in order for the remedy to be protective in the long term, the following actions need to be taken:

- Implement institutional controls.
- Consider appropriate measures to further deter trespassers.

Because the remedial actions at OU1 and OU2 are currently protective, the Site is currently protective of human health and the environment.

## Five-Year Review Summary Form

SITE IDENTIFICATION		
<b>Site Name:</b> Eagle Mine		
<b>EPA ID:</b> COD081961518		
<b>Region:</b> 8	<b>State:</b> CO	<b>City/County:</b> Minturn/Eagle County
SITE STATUS		
<b>NPL Status:</b> Final		
<b>Multiple OUs?</b> Yes	<b>Has the site achieved construction completion?</b> Yes	
REVIEW STATUS		
<b>Lead agency:</b> EPA <b>If "Other Federal Agency" selected above, enter Agency name:</b>		
<b>Author name:</b> Leslie Sims and Treat Suomi		
<b>Author affiliation:</b> EPA Region 8 and Skeo Solutions		
<b>Review period:</b> 02/01/2013 – 09/30/2013		
<b>Date of site inspection:</b> 02/12/2013 and 05/10/2013		
<b>Type of review:</b> Statutory		
<b>Review number:</b> 4		
<b>Triggering action date:</b> 09/30/2008		
<b>Due date (five years after triggering action date):</b> 09/30/2013		

## Five-Year Review Summary Form (continued)

### Issues/Recommendations

**Issues and Recommendations Identified in the Five-Year Review:**

<b>OU(s): 1</b>	<b>Issue Category: Site Access/Security</b>			
	<b>Issue:</b> Trespassing continues to occur at OU1.			
	<b>Recommendation:</b> The RP and property owners should post additional warning signs that more explicitly convey the potential risks, provide additional security patrols, and utilize additional security cameras.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	12/30/2013

<b>OU(s): 1</b>	<b>Issue Category: Operations and Maintenance</b>			
	<b>Issue:</b> A Compliance Monitoring Plan has not been developed.			
	<b>Recommendation:</b> Develop a Compliance Monitoring Plan that includes an updated sampling and analysis plan, an updated QAPP, establishes performance standards, points of compliance, applicable or relevant and appropriate requirement (ARAR) compliance schedule, current/future activities, reporting requirements and schedules.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	9/30/2014

<b>OU(s): 1</b>	<b>Issue Category: Remedy Performance</b>			
	<b>Issue:</b> Colorado's surface water and groundwater standards have changed since the Site's cleanup levels were established in the 1993 ROD.			
	<b>Recommendation:</b> Issue a decision document to update the surface water and groundwater cleanup levels. If needed, execute a consent decree (CD) to outline additional response actions required to comply with the new cleanup levels.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	EPA	EPA/State	9/30/2014

**Five-Year Review Summary Form (continued)**

<b>OU(s): 1</b>	<b>Issue Category: Institutional Controls</b>			
	<b>Issue:</b> Institutional controls are not in place for OU1.			
	<b>Recommendation:</b> Implement institutional controls for OU1.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	9/30/2015

<b>OU(s): 1</b>	<b>Issue Category: Changed Site Conditions</b>			
	<b>Issue:</b> A proposed change in land use will require that additional actions be taken at the Site to ensure that the remedy is protective consistent with the intended land use.			
	<b>Recommendation:</b> Complete the feasibility study currently underway and issue any required decision documents.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	Other	EPA/State	9/30/2014

<b>OU(s): 1</b>	<b>Issue Category: Changed Site Conditions</b>			
	<b>Issue:</b> Zinc concentrations have increased at wells near the consolidated tailings pile.			
	<b>Recommendation:</b> Update the sampling and analysis plan and QAPP to include additional monitoring and analysis.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	9/30/2014

<b>OU(s): 1</b>	<b>Issue Category: Operations and Maintenance</b>			
	<b>Issue:</b> Numerous releases of contaminated mine water have been reported over the last five years and significant O&M issues related to the conveyance system were observed during the site inspections.			
	<b>Recommendation:</b> Consider upgrades for the WTP and conveyance system and continue to implement recommendations from the prior WTP and conveyance system audits.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	9/30/2014

**Five-Year Review Summary Form (continued)**

<b>OU(s): 1</b>	<b>Issue Category: Operations and Maintenance</b>			
	<b>Issue:</b> There is a leaking sludge compressor at the WTP.			
	<b>Recommendation:</b> Repair or replace the compressor.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	9/30/2014

<b>OU(s): 1</b>	<b>Issue Category: Operations and Maintenance</b>			
	<b>Issue:</b> A trail of staining across the road from the Adit 143 pipe was observed.			
	<b>Recommendation:</b> Determine the cause of the staining and take appropriate action.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	10/30/2013

<b>OU(s): 1</b>	<b>Issue Category: Operations and Maintenance</b>			
	<b>Issue:</b> Significant water flow was observed from the Ben Butler drainage to the Ben Butler culvert near Belden, which was draining directly into the Eagle River without being treated. In addition, the culvert was filled in when the crib walls were built.			
	<b>Recommendation:</b> Determine how to correct the flow issue and take appropriate action.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	10/30/2013

<b>OU(s): 1</b>	<b>Issue Category: Operations and Maintenance</b>			
	<b>Issue:</b> Staining was observed in the old tailings pile south trench.			
	<b>Recommendation:</b> Use the remedy selection process to determine if additional remediation is required.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	9/30/2014

**Five-Year Review Summary Form (continued)**

<b>OU(s): 1</b>	<b>Issue Category: Operations and Maintenance</b>			
	<b>Issue:</b> The bypass line had a temporary repair of a leak at Rex Flats.			
	<b>Recommendation:</b> Complete planned valve replacement.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	10/30/2013

<b>OU(s): 1</b>	<b>Issue Category: Site Access/Security</b>			
	<b>Issue:</b> A number of wells on the Site are unlocked.			
	<b>Recommendation:</b> Secure all wells currently in use and properly abandon any wells that are no longer functional.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	12/30/2014

<b>OU(s): 2</b>	<b>Issue Category: Site Access/Security</b>			
	<b>Issue:</b> Trespassing continues to occur at Gilman (OU2).			
	<b>Recommendation:</b> The RP and property owners should post additional warning signs that more explicitly convey the potential risks, provide additional security patrols, and utilize additional security cameras.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	12/30/2013

<b>OU(s): 2</b>	<b>Issue Category: Institutional Controls</b>			
	<b>Issue:</b> Institutional controls are not in place for OU2.			
	<b>Recommendation:</b> Implement institutional controls for OU2.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	PRP	EPA/State	9/30/2015

**Five-Year Review Summary Form (continued)**

**Protectiveness Statement(s)**

<i>Operable Unit:</i> 1	<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
<i>Protectiveness Statement:</i> The remedy at OU1 currently protects human health and the environment because the collection and treatment of contaminated surface water and groundwater is occurring, access restrictions and capped areas are in place to prevent contact with contaminated subsurface soil, and the brown trout population is recovering. However, in order for the remedy to be protective in the long term, the following actions need to be taken: Develop a compliance monitoring plan, an updated sampling and analysis plan, and an updated QAPP; Issue a decision document to update the surface water and groundwater cleanup levels; Implement institutional controls; Complete the feasibility study for updating the surface water and groundwater cleanup levels; Consider possible upgrades for the WTP and conveyance system and continue to implement recommendations from the prior WTP and conveyance system audits; Secure all wells currently in use and properly abandon any wells that are no longer functional.		

<i>Operable Unit:</i> 2	<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
<i>Protectiveness Statement:</i> The remedy at OU2 currently protects human health and the environment because access restrictions currently exist to deter trespassers. However, in order for the remedy to be protective in the long term, the following actions need to be taken: Implement institutional controls; Consider appropriate measures to further deter trespassers.		

<b>Sitewide Protectiveness Statement (if applicable)</b>	
<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
<i>Protectiveness Statement:</i> Because the remedial actions at OU1 and OU2 are currently protective, the Site is currently protective of human health and the environment.	

# **Fourth Five-Year Review Report for Eagle Mine Superfund Site**

## **1.0 Introduction**

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to CERCLA Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

Skeo Solutions, an EPA Region 8 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Eagle Mine Superfund site (the Site) in Minturn, Eagle County, Colorado. The EPA's contractor conducted this FYR from February to August 2013. The Colorado Department of Public Health and Environment (CDPHE) is the lead agency for developing and implementing the remedy for the responsible party (RP)-financed cleanup at the Site. CDPHE reviewed all supporting documentation and provided input to the EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this statutory review is the previous FYR. The FYR is required due to the fact that hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of three operable units (OUs). This FYR report addresses OUs 1 and 2. A final remedy has not yet been selected for OU3.

## 2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

**Table 1: Chronology of Site Events**

Event	Date
Gold and silver deposits discovered on Battle Mountain	Late 1870s
Mining of lead-zinc deposits began, using roasting and magnetic separation to process ore	1905
Underground mill constructed that used froth-flotation to generate lead-zinc concentrate	1929
Old Tailings Pile abandoned; New Tailings Pile (now called Consolidated Tailings Pile) opened	1942-1946
State of Colorado filed suit under CERCLA for damages to natural resources	1983
Site property was abandoned and mine began to fill with water	1984
The EPA issued a Unilateral Administrative Order (UAO)	June 7, 1984
The EPA performed emergency removal of transformers containing polychlorinated biphenyls (PCBs) from within the mine workings. Transformers were threatened by rising water levels in the mine after dewatering pumps were turned off.	June 15, 1984
Mine workings flooded	1984
The EPA proposed the Site for listing on the National Priorities List (NPL)	October 15, 1984
RP began remedial investigation/feasibility study (RI/FS) under state oversight	November 1, 1984
The EPA listed the Site on the NPL	June 10, 1986
RP completed RI/FS	May 20, 1988
State of Colorado settled with RP, Consent Decree/Remedial Action Plan finalized (CD/RAP)	1988
RP conducted remedial design	May 20, 1988 to July 1, 1999
State of Colorado completed an RI/FS	June 1988
RP conducted remedial action under state oversight	September 1, 1988 to September 30, 1999
As water levels in the mine rose, seepage began to reach the Eagle River; RP installed a package water treatment plant (WTP) to treat water from the mine pool and seepage from the mine	1990
The EPA conducted a removal action	June 1, 1990 to November 25, 1991
RP upgraded to a customized WTP	1991
The EPA issued a Notice of Violation to the Colorado Department of Health for Clean Water Act violations by the RP	April 4, 1991
The EPA conducted an RI/FS	December 31, 1991 to March 29, 1993
RP completed a removal action	September 1, 1992
The EPA conducted a FS for OU2 (soil)	September 1, 1992 to June 9, 1997
The EPA issued OU1 Record of Decision (ROD)	March 29, 1993
The State of Colorado and RP signed and the court entered Amendment No. 3 to Remedial Action Plan, Appendix IV of the Consent Decree, Order, Judgment and Reference to Special Master of June 24, 1988	July 23, 1993
The EPA issued a UAO	July 7, 1994

Event	Date
The EPA, State of Colorado and RP lodged with the court the Three Party Consent Decree/Statement of Work (CD/SOW) (Eagle Mine OU1 Partial Consent Decree)	June 12, 1996
The EPA issued ROD for OU2 (soil)	September 3, 1998
The EPA issued an Explanation of Significant Differences (ESD) for Liberty Well (OU1)	August 31, 1999
The EPA signed the first FYR report	September 21, 2000
Preliminary Site Closeout Inspection conducted	June 2001
The EPA issued Preliminary Site Closeout Report; Construction Complete declared	September 17, 2001
Portions of the Site purchased by Ginn entities	December 2004
The EPA signed the second FYR report	September 27, 2005
RP installed three groundwater extraction wells in Belden with gravity conveyance to the WTP	June 2006
RP removed Belden Roaster Waste (Waste Rock Pile 14) and disposed of it in the Consolidated Tailings Pile temporary cell	August to September 2006
Ginn Battle North began RI/FS for OU3 (North Property redevelopment)	February 16, 2007
RP constructed groundwater extraction trench in Belden with gravity conveyance to the WTP	October 2007
The EPA signed the third FYR report	September 30, 2008
Battle North, LLC took over development of the North Property from Ginn Battle North	2009

### 3.0 Background

#### 3.1 Physical Characteristics

The Site is located in a rural area of Eagle County, Colorado, approximately 2 miles southeast of Minturn and 7 miles south of Vail (see Figure 1). The Site is defined as the area impacted by past mining activity along and including the Eagle River between the towns of Red Cliff and Minturn in Eagle County, Colorado. The Site comprises 235 acres including the Eagle Mine workings, former Town of Gilman, former Roaster Pile areas, waste rock piles (WRPs), Rex Flats, Old Tailings Pile (OTP), Consolidated Tailings Pile (CTP), Maloit Park, water diversion components around the CTP, water treatment plant (WTP), a tailings slurry line and trestle, mine seepage and associated collection systems, and the Belden mill and load out area (see Figure 2). The Site is bordered on the south and west by the White River National Forest. Access to the wilderness area runs through portions of the Site and next to the historic location of the OTP.

##### *Geology*

Groundwater flows through the unconsolidated stream and glacial deposits, mine workings and fractured bedrock. Most of the tailings at the CTP and OTP were placed on glacial deposits and alluvium while most of the tailings placed at Rex Flats are underlain by alluvium. The glacial deposits include: 1) unsorted glacial till consisting of gravelly silt and sand with cobbles and occasional boulders, 2) glacial outwash comprised of sand and gravel, and 3) occasional beds of silt and clay. The alluvium deposits include glacial sand and gravel with few fines. Unconsolidated stream alluvium was deposited along all

the major streams and occurs as lenses and discontinuous layers of fine sandy silts, silty clays, sandy gravels with silt and boulders and other various mixtures.

Groundwater elevations in the OTP and Rex Flats areas generally increase between April and June, when snow melt increases. The dominant groundwater flow direction in the Rex Flats surficial aquifer, is to the north. This flow direction parallels the Eagle River flow direction until the river bends to the east along the north end of Rex Flats. At the northern portion of Rex Flats, the groundwater table is intercepted by the Eagle River, as evidenced by seeps on the river bank. Groundwater gradients in Rex Flats are generally steeper in the southern portion of Rex Flats and become less steep from the central portion north, to the Eagle River.

The dominant groundwater flow direction in the surficial aquifer at the OTP follows the surface topography to the east towards the Eagle River. Groundwater flow direction in the surficial aquifer near the Sump #3 area is to the southeast towards the Eagle River. The surficial groundwater flow in this area is directed to the southeast due to the presence of bedrock outcrops on a large ridge and the surface topography which slopes towards the Eagle River to the southeast in this area.

Groundwater elevations in the surficial aquifer near the Eagle River to the east of the CTP, indicate that the flow direction is generally to the north and parallels the Eagle River. North of the CTP, the groundwater flows to the northeast towards the Eagle River. However, surficial groundwater flow can be affected by the eastern groundwater extraction trench located near the toe of the CTP slope while flow directions north of the CTP are probably affected by the northern groundwater extraction trench.

### *Hydrology*

The Eagle River is the major surface water resource affected by the metals contamination from the Site. The headwaters of the Eagle River originate about 15 miles above Red Cliff. The Eagle River flows north-northwest through the Site to the town of Avon where it turns generally westward until it joins the Colorado River at Dotsero. The Eagle Mine workings were developed in the lower levels of Battle Mountain to the east of the Eagle River and just south of Rock Creek. Several wetland and former wetland areas border the Eagle River between Red Cliff and Minturn. Rex Flats, a low lying area which was once a wetland, is located on the east side of the Eagle River across from the OTP area about three miles north of the mine. The OTP area was a hay meadow prior to the advent of mining operations. The CTP is located about a mile north of the OTP just west of the Eagle River and south of Cross Creek, a tributary to the Eagle River originating in the Holy Cross Wilderness Area. Maloit Park covers approximately 27 acres and lies immediately north of the CTP and northeast of Minturn Middle School. The Maloit Park wetlands along Cross Creek have been affected by surface water and groundwater flowing from the CTP.

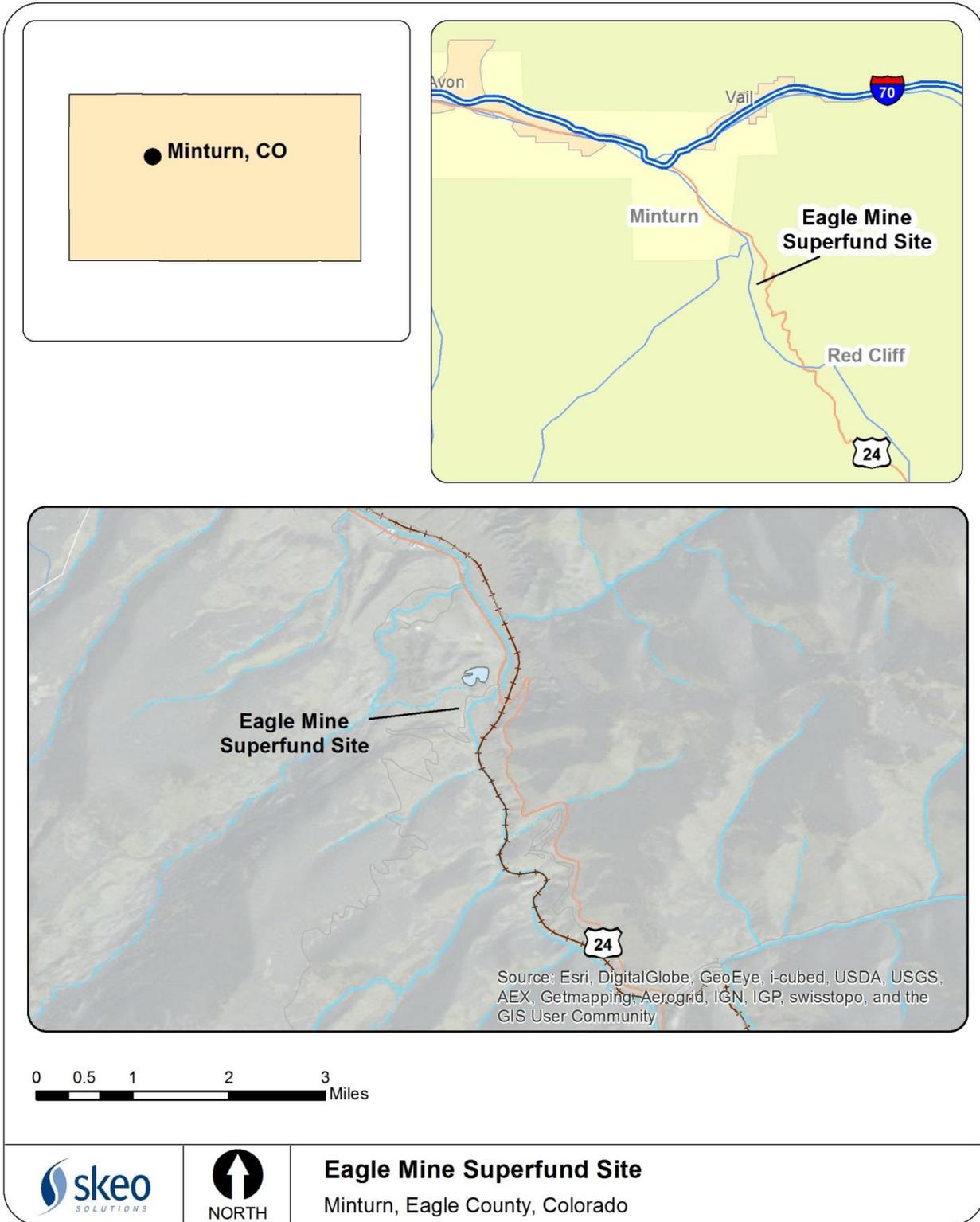
The Eagle River is generally a gaining stream across the Site with the exception of the segment associated with Rex Flats/OTP, which is generally a losing reach. Stream flow

in the Eagle River is characterized by high flow rates during late spring and summer runoff and a relatively stable baseflow period during the fall, winter and early spring.

Detailed property parcel information can be found in Appendix F.

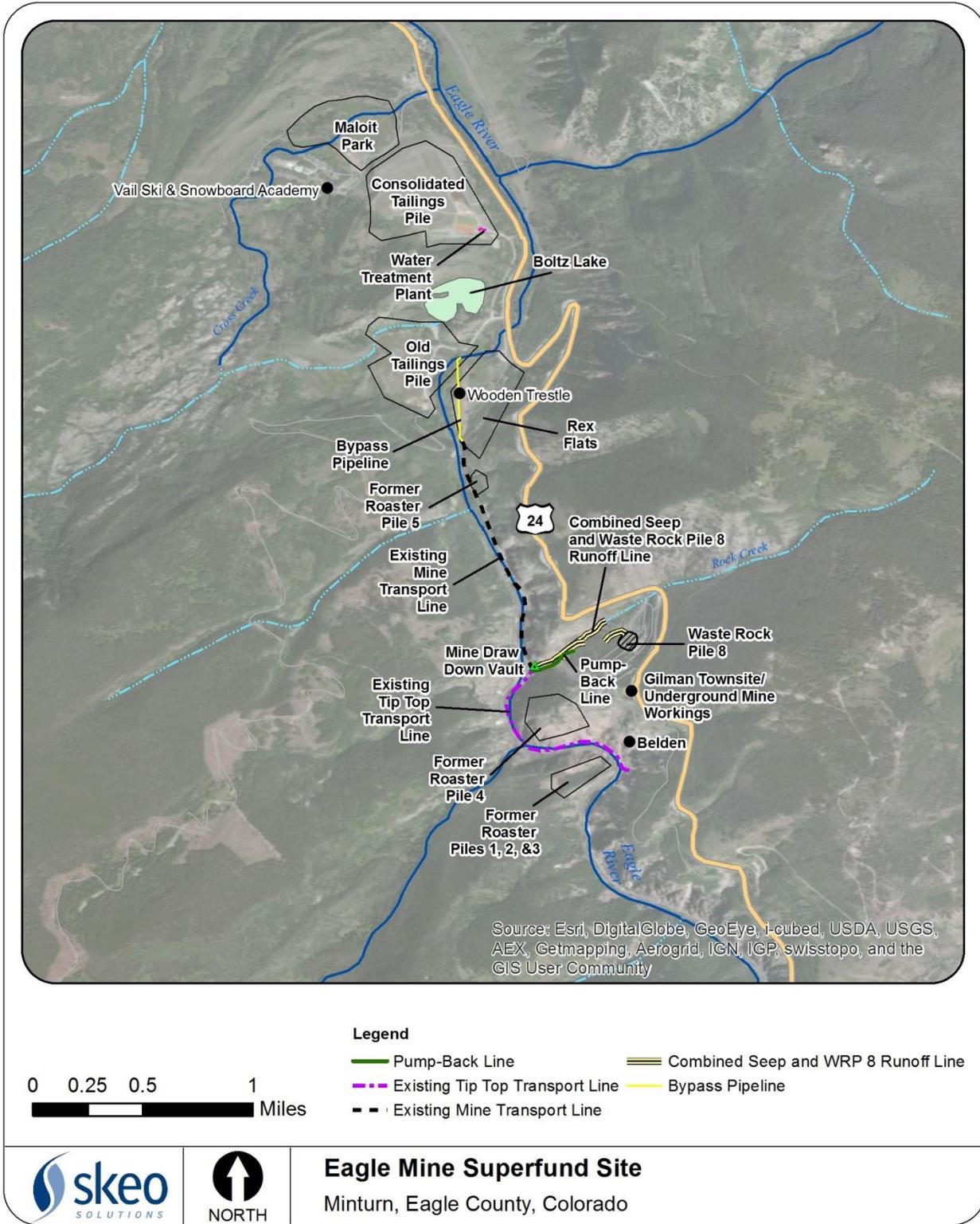
The Site has three OUs. OU1 was established to control the transport of toxic metals from the principal sources of mine waste pollution that are impacting the Eagle River and certain groundwater resources. These sources include the Eagle Mine, the Roaster Pile area, the WRPs, Rex Flats, the OTP, the CTP and the Maloit Park wetlands. OU2 was established to evaluate potential human health risks at the Site from soils in three areas: south Minturn, Maloit Park wetlands and Gilman. Because soils in south Minturn were subsequently shown to require no action and Maloit Park wetlands soils were removed and replaced with clean fill, the OU2 Record of Decision (ROD) addresses only Gilman. After the Site reached construction complete, OU3 (also referred to as the North Property) was established in the early 2000s to mirror the boundaries of a private residential development proposed for the area, which would require additional cleanup actions beyond those selected in the OU1 and OU2 RODs. OU3 is currently in the Remedial Investigation/Feasibility Study (RI/FS) stage and has not yet had a decision document issued that finalizes the components of the Site included in the OU. Components currently being considered for inclusion in the OU3 ROD include the OTP, Rex Flats, Maloit Park, Roaster Pile #5 and the CTP areas (all of which are part of the original Site and OU1) as well as Bolts Lake, which is located between the CTP and OTP and is currently drained (see Appendix G for an OU3 map from the 2007 FS). OU3 encompasses the northern portion of OU1 that historically received mine tailings from the Belden mill.

**Figure 1: Site Location Map**



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

**Figure 2: Site Details**



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

### **3.2 Land and Resource Use**

The Site is located entirely on private property. Trespassers occasionally visit the Site, particularly for outdoor recreation (e.g., hiking, cross-country skiing, rafting, kayaking) along the Eagle River between Minturn and Red Cliff and “urban exploration” in the abandoned town of Gilman. The Site and immediate surrounding area have little development and the natural habitat is home to numerous species of Rocky Mountain flora and fauna. The Canada Lynx (*Lynx canadensis*) is an Endangered Species Act threatened species that has been spotted in the general region. Hiking and other outdoor recreation is frequent in the area immediately surrounding the Site, particularly in the White River National Forest, which borders the Site to the south and west. Access to the Holy Cross Wilderness Area of the White River National Forest is facilitated by a road through the OTP area of the Site.

The Eagle River, which flows through the Site, is used as a water supply for irrigation and for recreation (e.g., rafting and kayaking). Fishing also occurs on the Eagle River from the headwaters to the Colorado River. There are numerous diversions from the Eagle River downstream of the Site for municipal water supply, stock watering and irrigation. The nearest residences to the Site are on Cross Creek Road, adjacent to Maloit Park. Minturn, the closest population center (about 1,000 people), has municipal wells located northwest of the CTP and across Cross Creek. Minturn draws its public water supply both from area wells and from Cross Creek.

The Town of Gilman (OU2) is an abandoned town where as many as 350 Eagle Mine employees and their families once lived. The town was founded in 1879 and completely abandoned in 1985. Gilman covers approximately 50 acres and an estimated 90 buildings remain within the Town boundaries. Many of the abandoned houses in Gilman were built in the 1940s and 1950s and are in disrepair. Numerous buildings have been vandalized.

In 2004, Ginn Battle North, now Battle North, LLC, the owner of northernmost portions of the Site, approached the EPA and CDPHE with a preliminary proposal to redevelop the North Property into a private residential golf and ski community called Battle Mountain. Previous cleanup activities on the Site were not intended to achieve cleanup levels for residential or recreational uses. Therefore, the proposed redevelopment of the North Property likely requires additional cleanup actions to ensure that residents, workers and visitors are protected.

### **3.3 History of Contamination**

Eagle Mine was once one of the largest zinc mines in the United States, and a major domestic source of zinc. According to statistics from the Colorado Geological Survey, Eagle Mine produced 12,837,000 tons of ore. The average ore grade was 8.5 percent zinc, 1.5 percent lead, 0.9 percent copper, 228 parts per million (ppm) silver and 1.7 ppm gold. Eagle Mine was also famous for its precious mineral specimens, especially pyrite, barite, rhodochrosite, galena and sphalerite.

The Eagle Mine area ore deposits were first mined in the 1870s. In the early 1900s, the New Jersey Zinc Company consolidated a number of individual mining claims into what is now known as Eagle Mine. Tailings disposal at the Eagle Mine dates back to at least 1914 when the U.S. Forest Service issued permits to the Eagle Mine to dispose of tailings from a roaster mill in an 8 acre area above the Eagle River to the west (now known as the Roaster Pile drainage) at Belden. Roaster material was also placed in other areas around the Eagle Mine including Roaster Pile #5. In 1919, the roasters were dismantled and an underground mill was constructed in the Eagle River valley at Belden. Construction of the pipeline to transport tailings from Belden to the OTP was started in 1928 and mine water and tailings were first discharged through the Mine Water Transport Pipeline and the Tailings Slurry Pipeline in 1929. Between 1929 and 1946, tailings were deposited through the pipelines to the OTP.

The mine workings were underground and located primarily on steep terrain above the Eagle River between 8,000 and 9,000 feet in elevation. Ores were processed by “roasting.” Residues from this process were left in five “roaster piles,” three on the west side of the Eagle River and two on the east side. Mill tailings were slurried down valley at about 7,000 feet in elevation and deposited at the OTP. Tailings were also deposited in the Rex Flats area and some were left under the slurry line, probably through accidental spillage. When the OTP area was “full” the slurry line was extended further to the north and the New Tailings Pile (NTP), now called the CTP, was created. Tailings and polluted water ran off the CTP depositing metals in the adjacent Maloit Park wetlands. In addition, groundwater in the Rex Flats, Old and New Tailings Pile, and Maloit Park wetlands area became polluted due to leaching from the piles. As a result of mine operations approximately one million tons of tailings were deposited in the 40-acre OTP and approximately 150,000 tons of tailings were deposited at 20-acre Rex Flats. These tailings have been removed and placed in the CTP; however, the groundwater that underlies the OTP and the Rex Flat area is contaminated with heavy metals. The depth to bedrock in the OTP and the Rex Flat area is approximately 40 feet.

Both the NTP and OTP were designed to allow seepage, in order to maintain their structural integrity. The mixing of surface water and groundwater with the tailings, as well as the addition of treated mine water to the CTP, led to the formation of acid seepage with high metal concentrations. Seepage from the NTP was historically documented north of the NTP towards Maloit Park, and also east to the Eagle River. Two groundwater collection sumps, Sumps #1 and #2, were historically located just north (Sump #1) and east (Sump #2) of the NTP. A third sump, Sump #3, was originally located at the OTP between Tigiwon Road and the Eagle River, in an area known as the historic Sump #3 area or the OTP floodplain. This historic Sump #3 area was moved to the current Sump #3 area, which is located in the northeast corner of the OTP. Prior to the construction of the CTP, this area contained a lake with a dam to the north. Underflow pipelines and risers were constructed prior to placing tailings in this area to decant liquid from the tailings in areas of the CTP. In October of 1982, a riser pipe in the tailings pond (also known as the Historic Pond designed to decant clear water from the surface of the pond into the underdrain) collapsed resulting in the discharging of large volumes of tailings

pond water and tailings material through the underdrain beneath the CTP to Maloit Park and to Cross Creek.

In the mid-1950s, Rex Flats, an area across the river to the east of the OTP, also received mill tailings to cover the vegetation and protect the Mine Water Transport Pipeline from fire hazards during the dry season. In 1946, the OTP was almost full and construction of the NTP (currently known as the CTP) was started to the north of the OTP. Prior to the construction of the NTP, the NTP area contained a lake with a dam to the north; this dam was constructed around 1939 of compacted gravel fill. Due to the presence of thick gravel beds underlying the area, under drains or gravel beds specifically designed to drain water from the interior of the dam were not constructed. Coarse tailings material was dropped at the NTP from the bottom of a 14-inch wood stave distribution pipeline to form a dike around about two-thirds of a pond (on the east and north side). The tailings consisted of predominantly pyrite, which can form natural cement to serve as a dam. A tailings dike separated the NTP into the main tailings area or impoundment and an area to the south known as the Winter Pond (near the present day WTP). In September, 1950, a sewage treatment plant was constructed (presumably at Gilman) and the effluent was added to the tailings stream to the NTP. This effluent was reportedly chlorinated before joining the tailings stream. As of 1968, a total of approximately 4,900,000 tons of tailings were transported in the tailings pipeline; about 750,000 tons were deposited at the OTP and the remainder at the NTP. In the 1960s, approximately 400,000 tons of material from the OTP were reprocessed for the sulfur content and used in the manufacture of sulfuric acid. After the Eagle Mine was closed, it was estimated that about 7 million tons of tailings remained in the OTP, NTP and Rex Flats.

In 1966, the New Jersey Zinc Company merged with Gulf & Western, Inc. In December 1977, Gulf & Western closed down the mill and most mining activities ceased. In September 1983, Colorado businessman Glenn T. Miller purchased the Eagle Mine, Town of Gilman and certain surrounding property. Miller then sold approximately 1,400 acres to Battle Mountain Corporation, including Gilman, the OTP and the CTP. In 1984, the property was abandoned, the pumps that were keeping the mine dry were shut off and the mine began to fill with water. Due to non-payment of property taxes, most Eagle Mine properties were sold at tax sales. Some properties were reconsolidated by Turkey Creek Limited and then sold to Ginn Battle North and Ginn Battle South in December 2004. In 2009, Battle North, LLC took over development of the North Property from Ginn Battle North. Battle North advanced a scaled-down, revised approach for the North Property, focused on remediating it for possible future residential use, without any specific development plans. Other portions of Eagle Mine remain with the Glenn Miller bankruptcy trustee. The RP implementing the cleanup is currently known as CBS Operations, Inc. (CBS). CBS acquired Viacom International, Inc., the successor in interest to New Jersey Zinc Company, a former operator at the time of disposal at the mine.

Studies from 1990 to 1992 provide insights into the relative contribution of the primary sources of contamination to the Eagle River. The studies determined that about 40 to 60 percent of the increase in metals loadings in the Eagle River at the Site is from Eagle

Mine seepage. Water retained in the flooded mine works percolates through fractures in the surrounding rock mass and emanates at several locations as surface and subsurface seeps. Seeps occur from the mine near Belden and along Rock Creek. Most of the surface seeps are being collected in both areas; subsurface seepage is indicated to occur predominantly along Rock Creek. The studies also determined that about 10 to 30 percent of metals loading were shown to emanate from non-point sources in the Belden area where waste rock containing elevated levels of metals could potentially be released during snowmelt and rainstorms. The loading of metals into to the Eagle River from the CTP ranged from 15 to 40 percent. Groundwater beneath the CTP is impacted from the historic deposition of wet tailings at that location. The historic pond on top of the CTP created a hydraulic head that contributed to the drive causing metals-laden groundwater from the pile to flow toward the east and northeast. A groundwater collection structure and two groundwater extraction trenches intercept impacted groundwater at the CTP and return it to the WTP for metals removal and eventual discharge to the Eagle River. The trenches require periodic maintenance to maintain their effectiveness.

Maloit Park was impacted by activities at the CTP, including seeps from the former NTP (now the CTP) to Maloit Park and a discharge of large volumes of tailings pond water and tailings material as a result of a collapsed riser pipe. As a result, portions of the wetlands were contaminated with visible tailings and some soils contained metals. Soil and tailings were removed and placed into the CTP, and uncontaminated soil was placed at Maloit Park. The groundwater extraction trenches for the CTP indicate that both the north and east groundwater extraction trenches are not 100 percent effective and a portion of metals impacted groundwater from the CTP flows past the trenches and into Maloit Park/Cross Creek and the Eagle River.

### **3.4 Initial Response**

In 1981, Gulf & Western personnel entered the mine and drained fluid containing polychlorinated biphenyls (PCBs) out of three transformers located in an abandoned portion of the mine. These three transformers were drained and flushed, but an estimated 28 pounds of PCBs remained. In June 1984, the EPA conducted an emergency response action to remove transformers containing PCBs. The EPA conducted the removal action because the Colorado Public Service Company notified the EPA that it planned to shut off electric power to the mine due to unpaid bills. After power was shut off, the mine would flood and electrical equipment containing PCBs would be under water.

In 1983, the State of Colorado filed a complaint against Gulf & Western and the New Jersey Zinc Company for natural resource damages under the Superfund statute. In 1986, the EPA placed the Site on the National Priorities List. The EPA and the State entered into a Memorandum of Agreement in 1986, designating the State as the lead agency for the Site's cleanup. The State and the RP resolved the State's natural resource damages claim in 1988 when the two parties entered into a Consent Decree/Remedial Action Plan (CD/RAP). This agreement included the following major provisions:

- Plugging the mine adits and grouting fracture zones to flood the mine workings to stop the generation of acid mine drainage.
- Removing the roaster piles, the tailings from Rex Flats, the pipeline corridor, and the toes of CTP and the OTP.
- Capping and temporary groundwater pumping at the CTP.
- Pumping water from the CTP into the mine workings (there was no WTP, so the water was pumped into the mine workings as a means of disposal).
- Setting compliance objectives and long-term monitoring of surface water, groundwater, mine water, vegetation, soils, CTP settlement and erosion. Compliance standards were set for dissolved zinc concentrations in the Eagle River, for soils cleanup (lead and pH standards), and for revegetation criteria.

The 1988 RAP also required run-on diversion ditches at the WRPs, site-wide treatment of underlying soils for pH adjustment, removal or isolation of soil with high lead levels and revegetation of disturbed areas. Temporary surface runoff and run-on control at Rex Flats, the OTP and the CTP were required as were an upgradient groundwater diversion ditch and two groundwater extraction trenches at the CTP, removal of the historic pond on top of the CTP, and construction of a lined surge pond at the CTP. Other RAP provisions included diversion of lower Rock Creek, disposal of contaminated water at the Site, regrading and stabilizing the CTP, dust control during construction, installing an Eagle River gauging station, and connecting a residence using groundwater for its drinking supply to the municipal water supply. The RAP included a Construction Quality Assurance/Quality Control (QA/QC) plan, construction element approvals by state inspectors, final construction reports, and a state inspection and certification program.

One notable aspect of the RAP relates to how the RP (known as Paramount at the time, now known as CBS) was to achieve compliance with the surface water quality goals set for the Eagle River. The Eagle River water quality goals were set at 150 µg/L dissolved zinc below the mine and 250 µg/L dissolved zinc immediately above the confluence with Cross Creek. The goals were to be met in September of an average flow year and were to be averaged over 30 days.

Although significant progress was initially made at the Site under the 1988 RAP, the EPA became concerned about the effectiveness of the cleanup in late 1989 and early 1990 when metals concentrations in the Eagle River were extremely high. In May 1990, the State and the RP amended the RAP to add a chemical WTP, a second lined surge pond, a mine seepage collection system, expanded groundwater/surface water monitoring, an annual contaminant loading report, temporary sludge disposal at CTP, Rock Creek grouting and evaluation, and OTP groundwater reduction.

On April 4, 1991, the EPA issued a Notice of Violation (NOV) to the Colorado Department of Health (CDH) (renamed CDPHE) for alleged violations of Section 301 of the Clean Water Act by Paramount. The violations, issued to CDH because the RP was conducting a “state-authorized” cleanup, included discharges from various mine seeps and from the Roaster Pile area. CDH responded to the NOV on November 1, 1991. In lieu of further NOV action, CDH and Paramount agreed that Paramount would do

additional work in the Roaster Pile area, collect additional mine seepage, and explore the possibility of collection of subsurface mine seepage in the colluvial material in Rock Creek. CDH also was to pursue Paramount for payment of fines for several of the alleged violations. The EPA accepted this proposal.

Also in 1991, the EPA became aware that hazardous substances may have been abandoned in the town of Gilman. Accordingly, the EPA and CDH decided to conduct a preliminary assessment and site inspection of the entire property.

EPA and CDH representatives found hazardous substances including explosives, laboratory chemicals, PCBs and one radioactive vial. Cleanup negotiations were concluded on November 21, 1991, when Paramount and the State signed an amendment to the RAP that called for Paramount to conduct a removal action, which was completed by September 1, 1992.

### **3.5 Basis for Taking Action**

The Site's contaminants of concern (COCs) are:

- Surface water: zinc, cadmium, copper, lead, silver.
- Groundwater: arsenic, cadmium, chromium, lead, mercury.
- Soil: lead.

Contaminated mining wastes included:

- Roaster waste: Roaster waste is waste that was produced from the inefficient process of roasting and magnetic separation. Roaster waste contains a large amount of highly leachable metals and was discarded near the river and on steep side slopes. Five distinct roaster piles were present at the Site at the time the mine ceased operation.
- Mill tailings: Mill tailings (also called mine tailings) are fine-grained waste from the milling process. Although most heavy metals were removed during milling, tailings still contained leachable metals and usually have a low pH.
- Waste rock: Waste rock is rock that was removed when mine tunnels and adits were constructed. Waste rock was not processed to remove metals and therefore usually does not present as severe a leaching hazard as other waste sources (e.g., roaster wastes and mill tailings). Waste rock from Eagle Mine was discarded on the hillside overlooking the Eagle River and Rock Creek, and is held in place by wooden cribbing in some areas.

Contaminated water included:

- Mine Pool: The mine pool is the water within the mine workings.
- Historic Pond: The historic pond was the water stored at the CTP from various sources.

- Runoff: Runoff is water flow that occurs when areas containing mine waste become full of water (from rain, meltwater or other source) and the excess water flows over the land.
- Groundwater: Groundwater below the OTP, CTP, Rex Flats and Rock Creek was impacted by mining wastes. Groundwater in the Belden area was also contaminated, most likely from a multitude of waste sources including ballast material beneath the rail lines that may contain roaster wastes, mill tailings or waste rock.

The most significant environmental impact from contaminated mine wastes and water was degradation of Eagle River water quality from dissolved metals. All known contamination in Rock Creek and Cross Creek originates from the Site. Segment 2 of the Eagle River has been impacted by non-site related mine wastes.

No baseline risk assessment has been prepared that comprehensively evaluates all potential human health and environmental risks at the Site. However, there have been multiple studies conducted that collectively assess the major potential exposure pathways for site media. The EPA determined that these studies provide all the information and analysis that would be necessary in a baseline risk assessment. The 2008 FYR reproduces the results of the 1997 Risk Assessment for Gilman (OU2) that summarizes the findings of multiple reports from 1985 to 1993 that investigated human health risks at the Site. In addition, the 2008 FYR discusses the results of the 2007 risk assessment completed to assist in considering new reuse possibilities at the Site.

Implementation of the RAP resulted in the removal of the tailings material from Roaster Piles 1-5, Rex Flats, and the OTP. This material was moved to the CTP, which was capped and revegetated. The RAP goal was to remove mine waste material from the tailings areas and to reduce residual lead levels to below 1,000 ppm lead in surface soils by removal or isolation. This goal was determined to be protective of human health for potential future on-site exposures to surface soils. Potential exposure to airborne contaminants was expected to be minimal because the Site is being revegetated.

Studies conducted by the Colorado Division of Wildlife in the early 1990s found that heavy metal concentrations (cadmium, copper and zinc) in the Eagle River from Belden to Minturn were above levels that are acutely and/or chronically toxic to some trout species. In addition, the fish and aquatic macroinvertebrate communities were severely reduced in this reach of the Eagle River. In 1992, the CDH evaluated the risks from the potential human consumption of fish that has bioaccumulated arsenic, cadmium, lead, mercury and selenium. The study concluded that no significant increase in cancer risk was expected and noncarcinogenic health effects were not expected as a result of consumption of fish from the Eagle River.

The results of the 1997 risk assessment for the abandoned town of Gilman concluded that there was a possible risk to trespassers exposed to lead in surface soil and waste rock, but qualified that the risks are likely to be proportionately less due to the use of conservative exposure assumptions. The risk assessment concluded that the uncertainty is high that the

exposure scenario assumptions overestimate the likelihood of contact with either surface soil or waste rock. Specifically, the risk assessment states that the waste rock concentrations do not adequately reflect the concentrations to which a potential receptor would be exposed based on the nature of the waste rock and the WRPs. In addition, the risk assessment stated that assuming an exposure frequency of 90 days overestimates the potential exposure and risk because the likely exposure frequency for the steep rocky terrain would be one to several days, resulting in risk estimates that would be proportionately less.

## **4.0 Remedial Actions**

In accordance with CERCLA and the NCP, remedial actions are required to protect human health and the environment and to comply with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

### **4.1 Remedy Selection**

The EPA decided that there was a need to address issues that had arisen since the 1988 RAP. The EPA prepared a FS Addendum to analyze the need for additional cleanup measures. The study was completed in 1992. As a result of the study, the EPA issued the ROD for OU1 in March 1993. A second ROD (for OU2) was issued in September 1998. The EPA has not yet issued a ROD for OU3.

#### OU1

The EPA established OU1 to control the transport of toxic metals from the principal sources of mine waste pollution that are impacting the Eagle River and certain groundwater resources. The EPA signed the OU1 ROD on March 29, 1993, selecting a remedy for OU1. To address the existing and potential risks, the EPA developed five remedial action objectives for OU1:

1. Improve the quality of water in the Eagle River to support Class 1 (cold water) aquatic life use.

2. Control or eliminate human ingestion of contaminated groundwater.
3. Control or eliminate exposure to airborne contaminants.
4. Control or eliminate exposure to contaminants in soil.
5. Ensure the long-term integrity of structures and facilities associated with remedial activities at the Site.

These remedial action objectives and their associated final numerical remedial action goals are shown in Table 2. The OU1 ROD established Table Value Standards (TVS) for select metals as final remediation goals and ARARs. However, the 1996 CD and Statement of Work (SOW) explicitly excludes the OU1 ROD table from the definition of performance standards, thus rendering surface water quality standards inapplicable as ARARs. The CD required that alternative surface water ARARs be developed using a biological approach, which culminated in the final standards adopted by the Water Quality Control Commission (WQCC) in 2008 (see Section 6.4 and Appendix H of the current FYR report).

**Table 2: General Remedial Action Objectives and Final Numerical Remedial Action Goals from OU1 ROD**

General Remedial Action Objective	Final Remedial Action Goals (µg/L, unless otherwise noted)		
	COC	Chronic	Acute
Improve the quality of water in the Eagle River to support Class 1 aquatic life use	Zinc	106	106
	Cadmium	1.1	1.1
	Copper	12	12
	Lead	4	4.0
	Silver	0.08	0.08
Control or eliminate human ingestion of contaminated groundwater	Arsenic	50	
	Cadmium	10	
	Chromium	50	
	Lead	50	
	Mercury	2	
Control or eliminate exposure to airborne contaminants	Total suspended particulates	135 µg/m <sup>3</sup>	
	Lead	1.5 µg/m <sup>3</sup>	
Control or eliminate exposure to contaminants in soil	Lead	1,000 mg/kg	
Ensure the long-term integrity of structures and facilities associated with remedial activities at the Site	NA		

The selected remedy addressed the principal sources of mine waste pollution that were impacting the Eagle River and certain groundwater resources. The major components of the selected remedy included:

- Installation of a system to collect additional mine seepage along Rock Creek.
- Diversion of Rock Creek upgradient of contaminated mine seepage.
- Expediting revegetation in the area of Roaster Pile 1 and associated drainage, and monitoring of seep water quality below the Roaster Pile 1 area.
- Surface water runoff and groundwater monitoring at the WRPs, leachability tests on the waste rock, with evaluation of the data for possible future action.
- Development of an inspection and maintenance plan to ensure the long-term integrity of structures and facilities associated with the Site.
- Implementation of use restrictions for groundwater at the Rex Flats, OTP and Maloit Park, and accelerated revegetation at Rex Flats.
- Rapidly complete the cap on the CTP, drain and cap the historic pond, extract and treat leachate/groundwater from the CTP extraction trenches, enhance CTP extraction trenches, construct a new upgradient groundwater diversion structure and relocate the Town of Minturn drinking water wells.
- Continue the treatment of contaminated mine seepage and leachate/groundwater from the CTP at the WTP until the cleanup goals can be met without such treatment, dewater the treatment sludge, and dispose of the dewatered sludge in on-site lined cells on the CTP.
- Remove the contaminated soils and sediments from the Maloit Park wetlands, control seepage from the CTP, and rapidly add topsoil and revegetate.
- Conduct regular monitoring of surface water, groundwater, mine pool, and biota at key locations on the Site and downstream of the Site to determine progress toward cleanup goals.

On August 31, 1999, the EPA issued an Explanation of Significant Differences (ESD) for OU1. The purpose of the ESD was to modify the remedy to include a new feature implemented voluntarily by the RP, a pumping well known as “Liberty No. 4 Well.” The well extracts clean groundwater from mine workings prior to it contacting the ore body and becoming contaminated.

## OU2

On September 3, 1998, the EPA issued the ROD for OU2 (soil in the town of Gilman). The OU2 ROD states that OU2 “was established to address current and potential human health risks from the soil and waste rock in the Town of Gilman.” The EPA selected access controls to restrict trespasser access and institutional controls to limit future uses at contaminated areas of Gilman.

## OU3

OU3 began the RI/FS stage on February 16, 2007, and has not yet had a decision document issued that finalizes the components of the Site included in OU3.

## 4.2 Remedy Implementation

### OU1

The following is a summary of response actions at OU1, implemented under the decision documents:

- Treating contaminated surface and groundwater collected from multiple locations (including from flooded mine workings) throughout OU1 with alkaline treatment at a WTP. The RP replaced the temporary WTP with a permanent facility in 1991. Sludge is disposed of in a lined cell on the CTP.
- Installing a well (Liberty Well) in an existing drift that connects the Eagle Mine workings to the Turkey Creek and Willow Creek watershed near Red Cliff. This response action was implemented to intercept clean water entering mine workings flooded with contaminated water. Intercepted water is discharged to Willow Creek.
- Constructing a temporary runoff control system at the OTP, Rex Flats and the CTP (see Figure 2 for locations of site features) to pump collected water into the Eagle Mine workings. This response action was discontinued when the permanent WTP was constructed.
- Excavating most surface soils with lead concentrations greater than 500 mg/kg from the Roaster Piles, Maloit Park, the OTP, Rex Flats and pipeline/trestle and consolidating them in the CTP. Most excavated areas were vegetated; in some cases, the areas were treated with hydrated lime. CTP construction included cover with a multi-layer engineered cap, groundwater extraction near the northern and eastern toes of the CTP with conveyance to the WTP, a clean groundwater diversion on the western perimeter, and run-on and runoff control systems.
- Sealing known channels and pathways of flow from the mine workings and grout fracture zones having identifiable discharge or seepage.
- Routing stormwater and other surface water flow (including lower Rock Creek) around selected WRPs.
- Providing municipal water service to a single residence.
- Removing transformers, oil, grease, compressed gas and other hazardous substances from the Gilman and Belden areas.
- Installing two drinking water wells for use by the Town of Minturn.

On June 28, 2001, the EPA and the State conducted a final site inspection and determined that the remedy had been constructed in accordance with all pertinent decision documents and CDs, including the 1996 Consent Decree/Statement of Work (CD/SOW) for OU1. Inspection results are documented in a September 17, 2001, Preliminary Site Close Out Report.

The EPA and CDPHE are currently working with the RP to address new water quality standards and the amount of metals loading in the Eagle River. A FS is currently being drafted and implementation of a ROD Amendment is expected to follow.

## OU2

The following is a summary of response actions at OU2, implemented under the decision documents:

- Establishing limited site security by maintenance of a locked gate at the roadway access to Gilman.
- CBS' contractors indicated they are working with local law enforcement to deter trespassers.
- Institutional controls called for in the OU2 ROD have not yet been implemented.

## OU3

The EPA has not yet selected a remedy for OU3.

### **4.3 Operations and Maintenance (O&M)**

#### OU1

O&M activities are being conducted by CBS and include a daily presence at the Site related to water collection and water treatment facilities. The WTP operates continuously and is staffed seven days per week. CBS also routinely inspects mine bulkheads, the Rock Creek groundwater extraction system, the Rock Creek culvert, CTP groundwater extraction systems, Liberty Well, the seep collection system, pipelines, water collection and conveyance structures, the CTP cap and ditches, and vegetation. CBS submits surface water monitoring plans annually that describe proposed surface water monitoring procedures.

In 2010, the EPA and CDPHE conducted audits of the WTP and the collection and conveyance systems. Many upgrades to the system were conducted as a result of these audits. See Section 6.4 of this FYR report for a discussion.

The EPA and CDPHE are in the process of working with CBS to update the emergency response and contingency plan for the Site. This update includes reporting requirements to downstream users of the Eagle River.

#### OU2

O&M for OU2 consists primarily of periodic inspections of Gilman for signs of trespassing or vandalism of the gate. If trespassers are found on the Site, the Eagle County Sheriff's Office is contacted. As noted during the site inspection, there appear to be frequent trespassers across the Site, especially at the abandoned town of Gilman.

## Sitewide

The State currently requires CBS to submit annual reports summarizing data collected, O&M activities and any community relation activities. The 1988 RAP requires that the RP submit a Compliance Monitoring Plan (CMP) to the State at the end of construction activities. However, because new water quality standards have been established and because many 1988 RAP requirements were subsequently modified by the 1996 CD/SOW, the CMP must address compliance with new water quality standards and include monitoring for CD/SOW remedy components. Therefore, the State and the EPA have not yet approved the CMP.

O&M costs for the past five years were requested from the RP, but were not received. The 1993 ROD estimated annual O&M costs at \$1.9 million.

## **5.0 Progress Since the Last Five-Year Review**

The protectiveness statement from the 2008 FYR for the Site stated the following:

*The following protectiveness statements apply to OUI, OU2 and Site-wide surface water quality.*

### *OUI*

*The remedy at OUI currently protects human health and the environment through implementation of various actions to isolate contaminants from humans as well as collection and treatment of contaminated surface and ground water. However, in order for the remedy to be protective in the long-term, ICs [institutional controls] to regulate development under existing or revised land zoning are necessary to ensure future land use is consistent with the remedy. In addition, ICs to prohibit new water wells must be formalized. The two CDs currently in place effectively addressed completed remedial actions, but do not adequately address current/future operation, inspection, maintenance and monitoring activities nor do they establish POCs [points of compliance] and time frame for compliance with ARARs. New CDs will have to be developed in order to ensure protection of human health and the environment in the long-term.*

### *OU2*

*The remedy at OU2 currently protects human health and the environment through implementation of access restrictions and an IC in the form of a commitment by the Eagle County Sheriff's department to patrol the Gilman area and arrest trespassers. However, in order for the remedy to be protective in the long-term, ICs to regulate development under existing or revised land zoning are necessary to ensure future land use is consistent with the remedy.*

### *Site-wide*

*The remedy is not protective of human health and the environment because additional response actions are necessary to achieve protection of the aquatic ecosystem. New water quality standards have been adopted by the Colorado Water Quality Control*

*Commission. The Site does not comply with the standards and will not comply in the future without further reductions in zinc loading through additional response actions.*

The 2008 FYR included nine issues and recommendations. This report summarizes each recommendation and its current status below.

**Table 3: Progress on Recommendations from the 2008 FYR**

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
1. The State and EPA will develop a CD that updates terms, established performance standards, POC(s), ARAR compliance schedule, current/future activities, reporting requirements, schedules and any other items. These requirements will be incorporated into a CMP.	EPA, CDPHE, CBS	12/31/2009	Ongoing. CD negotiation underway.	NA
2. Revision of water quality standards through WQCC occurred in June 2008. New standards adopted by the WQCC become performance standards for the Site surface water and will be incorporated into the CD discussed in Issue No. 1. The new water quality standards will be identified as Site ARARs in an ESD or ROD Amendment. Additional response actions would be required to comply with the new performance standards and would be implemented as discussed in the Metals Loading and Water Quality Standards Attainability Analysis (CDPHE, 2008), at a minimum. Such additional response actions would be identified in an ESD or ROD Amendment and the CD discussed in Issue No. 1.	CDPHE and EPA	New water quality standards-June 2008. ESD or ROD Amendment-9/30/2009. Implementation of additional response actions-to be determined and defined in the CD discussed in Issue No. 1.	Ongoing. Water quality standards in place. The EPA expects to address in an upcoming ROD amendment.	NA
3. Prepare an ESD or ROD Amendment identifying the need for ICs and the form the ICs will take. This may include environmental covenants (Colorado Environmental Covenant Law, C.R.S.§§ 25-15-317 to 25-15-327) for areas of the Site where the land owner is willing to enter into such agreements. County ordinances or other mechanism to maximize the likelihood that appropriate government entities control and/or oversee changes in land use.	EPA/ CDPHE/ Minturn or Eagle County	ESD or ROD Amendment-9/30/2009. Environmental Covenants-To be determined based on land redevelopment plans. Other ICs-12/31/2009	Ongoing. Will be addressed with OU3 ROD.	NA
4. Formalize and enforce the ICs through an Environmental Covenant.	CDPHE, Minturn, Eagle County	12/31/2009	Will begin as soon as ICs are specified in OU3 ROD.	NA
5. Define OU boundaries through resolution of Issue Nos. 3 and 4.	EPA/ CDPHE	9/30/2009	Ongoing. Will be addressed with OU3 ROD.	NA

<b>Recommendations</b>	<b>Party Responsible</b>	<b>Milestone Date</b>	<b>Action Taken and Outcome</b>	<b>Date of Action</b>
6. Repair cover to reestablish surface drainage (on the CTP)	CBS	12/31/2009	Considered and not implemented. The low spot on the CTP was part of the original design, as a drainage swale, and was not the result of excessive settlement.	7/31/2009
7. Repair geomembrane (on the CTP)	CBS	12/31/2009	Considered and not implemented. It was anticipated that the cell would be closed and capped as part of the Battle Mountain project.	7/31/2009
8. The State and EPA will work with CBS to address the rehabilitation of the mine tunnel to ensure continued access to the mine workings and to allow periodic confirmatory measurements of the mine pool elevation.	CDPHE/ CBS/EPA	12/31/2009	Considered, but not implemented. CBS found an alternate way to make mine pool elevation measurements.	2/10/2012
9. The current property owner (Ginn Entities) has requested Bona Fide Prospective Purchaser Status and therefore will be required to perform additional actions at the Site to place the Site in a condition that is consistent with the intended land use. These actions will be documented under future decision documents.	CDPHE/ EPA/Ginn Entities	12/31/2011	Ongoing. Will be addressed with OU3 ROD.	NA

Table 3 indicates that implementation of several of the recommendations from the 2008 FYR are ongoing. A CD requiring CBS to develop a CMP will address Recommendation 1. A ROD Amendment will identify new ARARs for the Site and address Recommendation 2 (expected completion date September 2014). The anticipated OU3 ROD will identify needed institutional controls, define OU boundaries, and outline additional actions needed at the Site to protect human health and the environment with a change in land use, thereby addressing Recommendations 3, 5 and 9. Recommendation 4, formalizing and enforcing institutional controls, can begin after the OU3 ROD is in place.

## **6.0 Five-Year Review Process**

### **6.1 Administrative Components**

EPA Region 8 initiated the FYR in February 2013 and scheduled its completion for September 2013. EPA remedial project manager (RPM) Leslie Sims led the EPA site review team, which also included EPA toxicologist Susan Griffin, EPA Hydrogeologist Andrew Schmidt, EPA community involvement coordinator Jennifer Chergo, State Project Officer Wendy Naugle and contractor support provided to the EPA by Skeo Solutions. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR report development and review.

### **6.2 Community Involvement**

In March 2013, the EPA published a public notice in the *Vail Daily* newspaper announcing the commencement of the FYR process for the Site, providing contact information for EPA and state staff and inviting community participation. The press notice is available in Appendix B.

In addition, EPA and CDPHE staff met with interested community members the week of April 8, 2013. The purpose of the meeting was to discuss the FYR process for the Site and to function as a forum for public input. For the EPA and the CDPHE, this was an opportunity to discover new information from interviews with a broad spectrum of individuals including local elected officials, environmental groups, local residents and business representatives. Interviews are summarized in Section 6.6 of this FYR report.

The EPA will make the final FYR report available to the public. The EPA will place copies of the document in the designated site repository: Minturn Town Hall, 302 Pine Street, Minturn, Colorado 81645. Upon completion of the FYR, the EPA will place a public notice in the *Vail Daily* newspaper to announce the availability of the final FYR report in the Site's document repository and on the EPA website.

### **6.3 Document Review**

This FYR included a review of relevant, site-related documents including the RODs, ESD, remedial action reports and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

## ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain “a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment.” The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those standards that, while not “applicable,” address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are more stringent than federal requirements may be applicable or relevant and appropriate. To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical-specific ARARs include maximum contaminant levels (MCLs) under the federal Safe Drinking Water Act and ambient water quality criteria enumerated under the federal Clean Water Act.

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity, such as discharge of contaminated groundwater or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

Remedial actions are required to comply with all ARARs identified in the ROD. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

### *Surface Water*

The 1993 ROD lists the Colorado Water Quality Standards as relevant and appropriate to the Site’s surface water. At the time of the ROD, the Colorado Water Quality Standards did not include site-specific standards for the Site’s surface water; therefore, the ROD

selected the generic TVS as the cleanup goals. The current Colorado Water Quality Standards provide site-specific standards for the Site's surface water. The EPA plans to adopt these current standards as the Site's surface water cleanup goals in a new ROD. Appendix H provides a comparison of the surface water standards at the time of the ROD and the current standards. The current standards are protective of resident species in the specific water bodies. The current standards are hardness-based equations, rather than specific numbers (see Appendix H). The current standards are, in most cases, less stringent than TVS, yet reflect attainable levels considering the anticipated reduction in loading following future remedial work.

While arsenic was not listed in the OU1 ROD as an ARAR, the ROD anticipated new standards would eventually be set by the WQCC, establishing numeric standards deemed protective of the aquatic community. Once set, the OU1 ROD envisioned EPA adopting these new standards as final remedial action goals. While an ESD or ROD has yet to be issued, the 2012 sampling plan was modified to include arsenic sampling in the Eagle River in the fall 2012 sampling round.

#### *Groundwater*

The 1993 ROD stated that Colorado's groundwater standards (then codified at 5 CCR 1002-8, Section 3.11) are relevant and appropriate to the Site's groundwater. Colorado's groundwater standards rely on a scheme for classifying groundwater based on its use; however, none of the groundwater at the Site has been classified. Therefore, when the EPA ROD was issued in 1993, a groundwater classification was assumed for each area of the Site based on site-specific conditions. Groundwater at Maloit Park north of Cross Creek was listed as Class 1 (Domestic Use Quality), groundwater beneath the CTP was listed as Class 4 (Potentially Usable Quality), groundwater at Rex Flats and adjacent to the Eagle River were listed as Class 3 (Protection of Surface Water) and groundwater at the OTP was listed as Class 5 (Limited Use and Quality).

In 1994, after the publication of the ROD, the Colorado WQCC adopted a new method of applying standards to groundwater that does not have a site-specific classification, called the Interim Narrative Standard (codified at 5 CCR 1002-41). The Interim Narrative Standard requires that the most stringent of the standards listed in Regulation 41 be applied to unclassified groundwater.

Table 4 below presents a comparison of the groundwater standards at the time of the 1993 ROD and the current standards. Since the 1993 ROD, the groundwater standards for some of the COCs and some of the areas have become more stringent, while others have become less stringent. Table X-1 in the OU1 ROD specifies that the ARARs for groundwater are the Colorado Groundwater Standards.

**Table 4: ARAR Review for Groundwater COCs**

Groundwater COC	Standard at Time of 1993 ROD (µg/L)			Current Standard (µg/L) <sup>a</sup>
	Maloit Park North of Cross Creek, and CTP	Rex Flats and Adjacent to Eagle River	OTP	
Arsenic	50	no ARAR	no ARAR	10
Cadmium	10	1.1	no ARAR	5
Chromium	50	no ARAR	no ARAR	100
Lead	50 <sup>b</sup>	4	no ARAR	50 <sup>b</sup>
Mercury	2	no ARAR	no ARAR	2

*Note:*  
a) Colorado’s Regulation 41 is available at <http://www.colorado.gov/cs/Satellite/CDPHE-WQ/CBON/1251616241322>, accessed 5/3/2013. This column shows the current groundwater standard regardless of area or location.  
b) The current federal standard is 15 µg/L. However, table X-1 of the OU1 ROD specifies that the ARARs are the Colorado Groundwater Standards. Colorado’s Regulation 41 has a current standard of 50 µg/L for lead in groundwater.

*Soil*

The 1993 ROD selected a soil cleanup level of 1,000 mg/kg for lead, based on the 1989 EPA guidance document “Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites.” The guidance document was considered as TBC guidelines. The soil cleanup level is discussed in Section 7.2 of this FYR report.

Institutional Control Review

Both the 1993 OU1 ROD and the 1998 OU2 ROD call for institutional controls to protect public health and the environment. Specifically, the OU1 ROD calls for use restrictions for groundwater at the Rex Flats, OTP and Maloit Park areas. The OU2 ROD called for land use restrictions at Gilman prohibiting future development and dictating that the EPA and CDPHE be informed of any proposed change in land use at the Site. If land use at the Site changes, the agencies must determine if additional remediation would be required. The EPA and CDPHE must review any developer-generated plans to assure that they are protective of human health and the environment.

**Table 5: Institutional Control (IC) Summary Table**

Media	ICs Needed	ICs Called for in the Decision Documents	Impacted Areas	IC Objective	Instrument in Place	Notes
Ground water	Yes	Yes	OU1	Prevent exposure to contaminated groundwater	None	The OU1 ROD calls for use restrictions for groundwater at Rex Flats, OTP and Maloit Park.
Soil	Yes	Yes	OU1	Prevent exposure to contaminated soil. Protect the integrity of the remedy.	None	The OU1 ROD calls for county zoning to control development of areas where tailings have been removed and state regulations and local zoning to protect the CTP cap.
Soil	Yes	Yes	OU2	Prevent exposure to contaminated soil	None	The OU2 ROD calls for ICs such as zoning, building permit rules, and notification prior to changes in land use.

#### 6.4 Data Review

According to the 2006 RI (ERM, 2006), groundwater impacts beneath the CTP have diminished since the remedy has been implemented. CTP groundwater is monitored by collecting samples from extraction trenches located north and east of the CTP and from the upgradient groundwater diversion trench (a buried pipe intended to divert clean groundwater around the CTP for eventual discharge into the Maloit Park wetlands). Groundwater monitoring and past modeling efforts indicate that the highest concentrations of the groundwater plume are under the northeast part of the CTP. As a result of the reconfiguration of the CTP, which included installation of a cap and groundwater collection trenches, the surface water loadings of zinc to the Eagle River have decreased.

Groundwater beneath the OTP and Rex Flats area continues to be impacted by metals from the former placement of mine tailings materials in these areas prior to remediation. Groundwater in these areas flows towards and into the Eagle River. The ground surfaces of the OTP and Rex Flats are wet during the spring snow melt with the OTP remaining wet for a longer period of time. Surface water run-on at the OTP is controlled by overflow from the Beaver Ponds, to the west of the OTP, and through leaking north and south surface water diversion ditches. Portions of the surface water diversion trenches were built near mine tailings and water leaking from these trenches interacts with these tailings forming acidic seeps that contain elevated metals. These seeps drain into the OTP and indirectly to the Eagle River, and infiltrate into the groundwater, which flows into the Eagle River. Groundwater in the northern portion of Rex Flats seeps along the south bank of the Eagle River. Water from these seeps contains elevated dissolved metals including zinc and manganese which exceed the Eagle River surface water standards.

### Surface Water

Eagle River surface water quality exhibits significant seasonal variation. An early spring “high metals” season and a longer “low metals” season are evident. The onset of the high metals season occurs as snow begins to melt in early spring (typically early March), mobilizing metals present in mine wastes. This snow melt reaches the Eagle River during typically low flow conditions in March and April. As snow melts at higher elevations later in spring, upstream and tributary flows of clean water increase and dilute metal concentrations in the river.

Extensive studies at the Site show that zinc occurs in the highest concentrations and other metals associated with mine wastes (with the possible exception of copper) show a high degree of correlation with dissolved zinc concentrations in surface water.

While arsenic was not listed in the OUI ROD as an ARAR, the ROD anticipated new standards would eventually be set by the WQCC, establishing numeric standards deemed protective of the aquatic community. While an ESD or ROD has yet to be issued, the 2012 sampling plan was modified to include arsenic sampling in the Eagle River in the fall 2012 sampling round. The 2013 sampling plan also includes additional sampling for arsenic. However, at the time of this FYR, there is not enough data to assess compliance with the arsenic water quality standard. Upcoming sampling and analysis plans should continue to include collection of arsenic data from the river, but should also add in a study of the sources of contaminated surface water at the Site to determine which on-site sources may contribute arsenic to surface water.

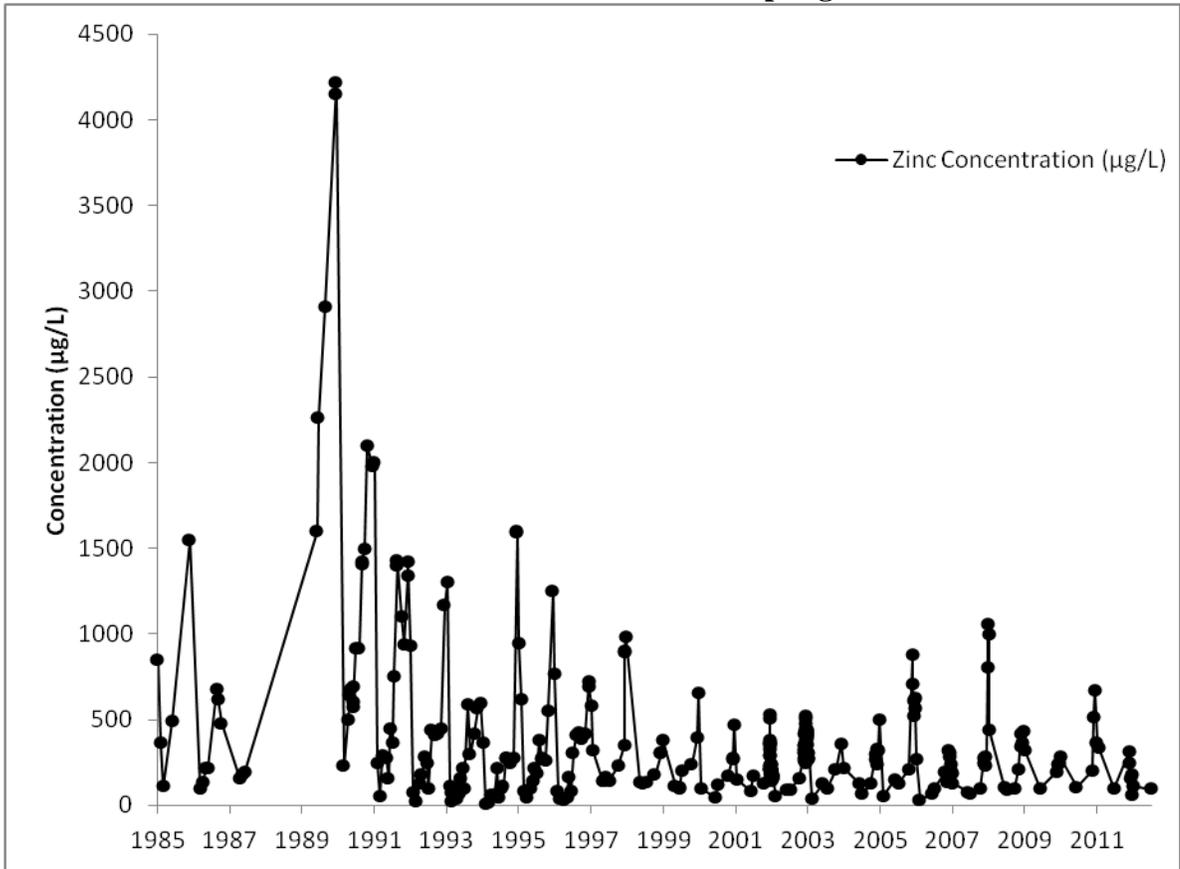
As shown in the 2012 *Eagle Mine Annual Report*, dated April 24, 2013, cadmium and copper concentrations in surface water met the current water quality standards for all of the 2012 sampling events. Zinc concentrations also met the standard for all of the 2012 events when the standard is calculated using each sample’s hardness value. However, if the standard is calculated using the sampling station’s average hardness over 2009 to

2012, then one sample slightly exceeded the zinc water quality standard during the spring high metals season (March 12, 2012).

The 2012 surface water sampling results demonstrate an improvement as compared to the data for 2010 and 2011, when a number of exceedances were recorded for zinc, cadmium and copper. Overall, metals concentrations in the Site's surface water have decreased greatly since 1990, based on the zinc concentration at monitoring location E-12A, which is considered to be representative of the Site's overall surface water quality (see Figure 3). The current zinc standard generally ranges from 100 to 300 µg/L, depending on the water's hardness value.

EPA and CDPHE approved discontinuing surface water monitoring for the other two surface water COCs (lead and silver). Monitoring of silver was discontinued in approximately 2003 when water quality parameter testing for the Biological Monitoring Sampling and Analysis Plan was ended due to completion of monitoring requirements. In 2005, lead was removed from the monitoring because previous samples had been non-detect and were consistently meeting the TVS.

**Figure 3: Dissolved Zinc Concentrations at Surface Water Sampling Location E-12A**



## National Pollutant Discharge Elimination System (NPDES) Permits

A compliance review was conducted for the two permitted discharge locations that included data collected from 2009 to 2013 for the Eagle Mine Water Treatment Plant Permit (NPDES ID: CO0042480) and the Liberty Well Permit (NPDES ID: CO0042480). The Enforcement & Compliance History Online website was accessed to obtain a summary of the effluent violations at these two discharges ([http://www.epa-echo.gov/echo/compliance\\_report\\_water.html](http://www.epa-echo.gov/echo/compliance_report_water.html)). Based on a review of the effluent data from 2009 and 2013 two violations were observed for the Eagle Mine Water Treatment Plant Permit and one violation for the Liberty Well Permitted discharges was noted. The Eagle Mine violations occurred on January of 2010 where the daily maximum pH exceeded the upper bound of the permitted range of 6.5 to 9 with a pH of 9.1; while the monthly average of copper in January of 2010 of 64.3 ug/L exceeded the permitted value of 12 ug/L. Except for this isolated exceedance, the remaining concentrations of copper were all well below 12 ug/L. The Liberty well permit denoted as LIB-4, had one violation of the daily maximum for total suspended solids in December 2011 where the daily maximum of 48.9 mg/L slightly exceeded the permit value of 45 mg/L while all remaining data were well below this value.

## Biological Monitoring

Biological investigations at the Site have been conducted since 1990 using a variety of sampling locations and methodologies. Since 2005, when the RP's commitment to conduct biological sampling expired according to the conditions in the 1996 CD various public agencies have conducted sampling. These agencies have included Colorado Parks and Wildlife, Eagle River Water and Sanitation District, U.S. Forest Service and CDPHE. CDPHE conducted a biological review of data for the current FYR. The complete review is available in Appendix I.

As shown in Figure 4, fish and macroinvertebrates are sampled at six locations within and downstream of the former mine site (Belden, Bishop Gulch, Two Elk, Boneyard, Minturn and Arrowhead), along with two upstream reference locations (Red Cliff and Above Belden). Reference locations were selected to be representative of ecologically similar conditions to the Site, but upstream of environmental influences from the Site.

Macroinvertebrate data are interpreted using CDPHE's Multi-Metric Index (MMI), developed in 2010.<sup>1</sup> The MMI determines whether environmental stresses have impaired a biological community, but it does not identify the specific cause of the impairment, such as habitat loss or a particular contaminant. If a stream sampling location's MMI value is above the attainment threshold, the location is considered to be in attainment; if it is below the impairment threshold, the location is considered to be impaired. For sites that fall within the MMI's "grey zone" between attainment and impairment, additional metrics are used to determine whether they are in attainment.

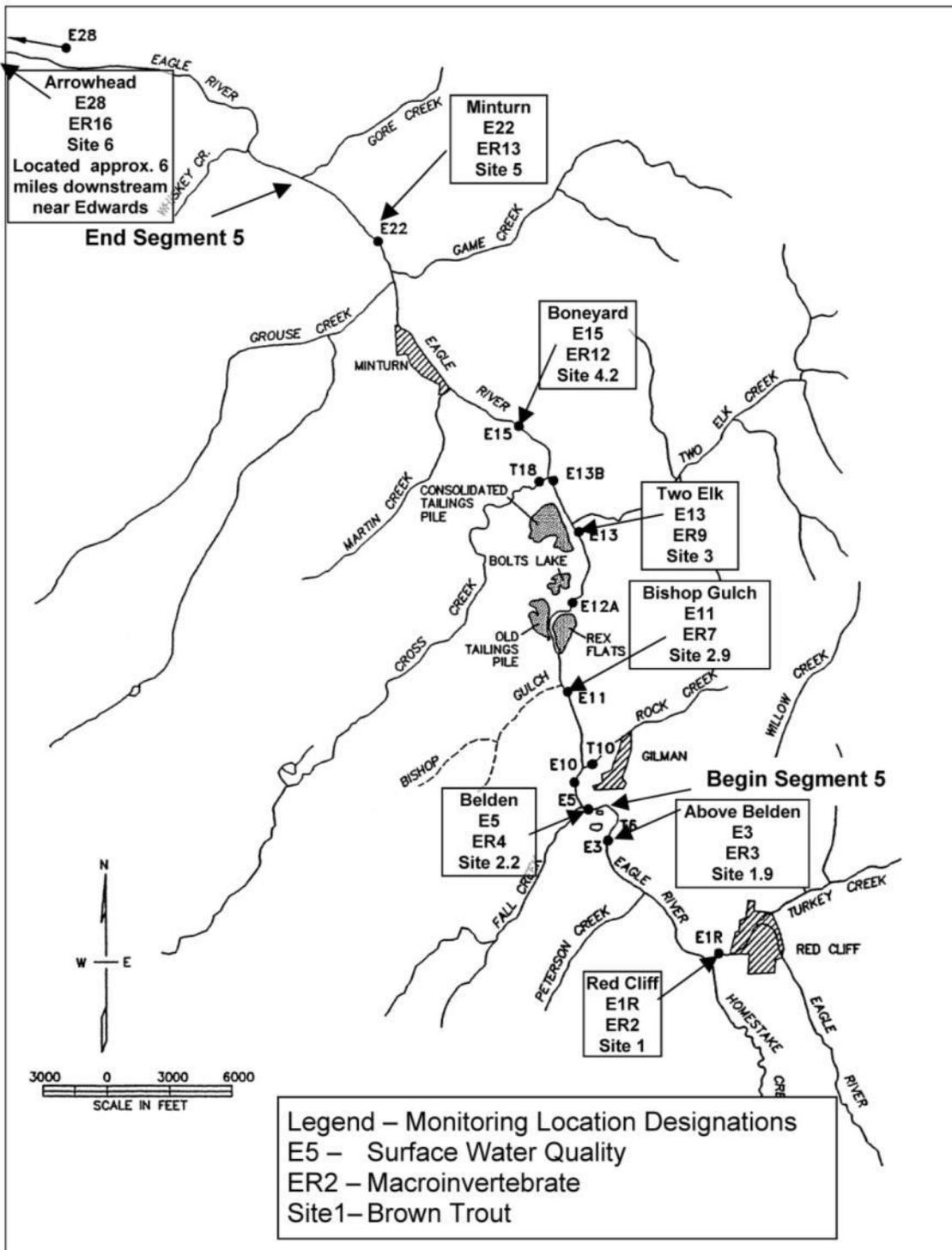
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<sup>1</sup> Information about the MMI is available in Water Quality Control Commission Policy Statement 10-1 "Aquatic Life Use Attainment, Methodology to Determine Use Attainment for Rivers and Streams," October 2010.

The macroinvertebrate community within and immediately downstream of the Site is fairly healthy. Table 6 presents the MMI values for locations sampled near the Site. Nearly all of the samples were in attainment. The Arrowhead location is not in attainment for several of the samples. Given that this location is approximately 13 miles downstream of the Eagle Mine, and that locations immediately downstream of the Eagle Mine are in attainment, other environmental stressors (besides metals concentrations related to the mine) are most likely responsible for non-attainment at the Arrowhead location.

Brown trout population size (density) has increased as metals concentrations have been mitigated in and around the Eagle Mine. Prior to 2000, the majority of the mine-impacted reaches had population estimates of less than 200 fish per acre. Since that time, all mine-impacted populations have increased to more than 200 fish per acre. In recent years, density has often been greater at the mine sites than at the reference sites. The brown trout population is recovering after the most damaging mine wastes (roaster piles and tailings) were contained, the CTP was capped, and the WTP went online, post-1997.

**Figure 4: Biological Sampling Locations**



Adapted from December 1996 “Biological Monitoring Sampling and Analysis Plan for Eagle Mine Site Surface Water Biological Monitoring Program,” Dames & Moore.

**Table 6: Macroinvertebrate Sampling Results**

	StationID	Location	MMI Values										Attainment Threshold	Impairment Threshold	
			April 2000	October 2000	April 2001	October 2001	October 2002	October 2003	September 2009	September/October 2010	October 2011	July 2012			
Reference Sites	ER2 (Site 1)	Red Cliff above Homestake Creek (reference site)		69.2	65.3	78.4	84.3	82.5			63**		69.4	50	42
							76.7								
	ER3 (Site 1.9)	Above Belden (reference site)		73.2	69.7	84.2	79.4	87.8			53.1**		74.5		
							84.3								
Mine Sites	ER4 (Site 2)	Belden Above Fall Creek		74.4	81.6	76.0	70.5				69**		56.7		
	ER7 (Site 2.9)	Below Bishop Gulch		82.8	82.6	89.5	83.8				68.3**		51.3		
	ER9 (Site 3)	Above Two Elk Creek		62.5	84.4	71.7	70.9	58.5	80.1			69.6**			
							<b>48.1</b>	83.7							
								74.8							
	ER12 (Site 4)	Below Cross Creek (FS Boneyard)		77.5	75.4	69.0	68.6				78.2**		85.2		
ER13 (Site 5)	Below Minturn		78.9	71.7	62.1					78**	81.8	77.8			
	ER16 (Site 6)	Arrowhead		63.7	<b>42.8</b>	57.7				42.4***	<b>40.8*</b>	<b>40.9*</b>	<b>30.7*</b>	52	

Notes:

**Bold values indicate impairment.**

All samples collected with Hess Sampler unless otherwise noted. \*Indicates samples collected with Kick Net. \*\*Indicates samples collected with Surber.

\*\*\*Although the MMI was below the attainment threshold, the auxiliary metrics (Hilsenhoff Biotic Index and Shannon Diversity) indicate attainment.

Threshold values depend on a location's ecological classification (biotype). All of the locations are in the Mountains biotype, except for Arrowhead, which is in the Transition biotype.

Data from 2001-2003 collected by CBS. Data from 2009-2011 collected by Eagle River Water and Sanitation District. Data from October 2010 collected by U.S. Forest Service. Data from 2012 collected by CDPHE.

## Groundwater

The conveyance system and WTP are components of the remedy selected in the OU1 ROD to collectively ensure that surface water and groundwater at the Site are managed in a way to achieve the remedial action objective of improving the quality of water in the Eagle River to support Class 1 (cold water) aquatic life use. As discussed previously, the Eagle River continues to be impacted by zinc contamination from two primary contaminant transport pathways to include direct discharge from surficial groundwater and from overland flow. The OU1 ROD did not require a remedy that would ensure groundwater would be returned to productive use (e.g., potable use). However, in order for the WTP to cease operations in the future, groundwater must meet cleanup goals. There is no expectation that treatment will cease in the foreseeable future. Additionally, CDPHE and the EPA are currently investigating ways to further reduce the amount of zinc impacting the Site and entering the Eagle River.

In preparation for the current FYR, CBS conducted groundwater monitoring at several groundwater wells. Samples were collected in October 2012 at the OTP (OTP-MW 2), Rex Flats (REX-MW 2 and REX-MW 4S), and CTP (DAP-MW 4R, DT-5, NTP-MW 1, NTPMW 3, NTP-MW 4, and NTP-MW 5R). The 2008 and 2012 water quality analytical results were reviewed for this FYR to evaluate if surficial groundwater continues to contribute zinc loading to the Eagle River<sup>2</sup>. Three monitoring wells have been selected for this report to graphically illustrate changes in zinc concentrations over time because they are located by primary sources of zinc loading to the Eagle River (one each from the CTP, OTP and Rex Flats areas). Well DAP-MW 4R is located on the north side of the CTP, OTP-MW2 is located on the east side of the OTP and REX-MW2 is located in the northwest corner of Rex Flats. The dissolved zinc concentrations in each of these wells are shown on Figures 5 through 7.

Since the completion of the CTP cap in 1996, zinc concentrations in groundwater at the CTP have decreased greatly. However, the October 2012 sampling event showed a rebound, as seen in Figure 5 for well DAP-MW 4R. Another CTP monitoring well (NTP-MW 5R) exhibited a similar but smaller rebound, increasing from less than 100 mg/L in 2006-2008 to 171 mg/L in 2012. Additional sampling will be needed to determine whether this is a new trend developing or indicative of a problem.

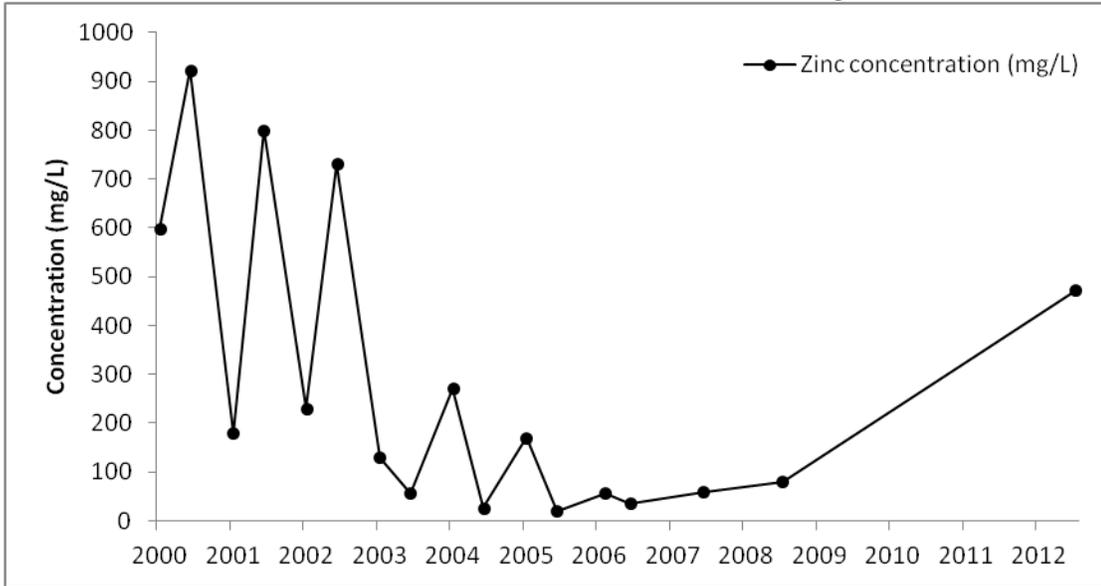
The concentration of dissolved zinc in well OTP-MW 2 has decreased sharply over the past two decades due to source removal activities at the OTP. As shown in Figure 6, zinc concentrations in groundwater at this location, while once greater than 1,200 mg/L, are now consistently below 10 mg/L.

Zinc concentrations in groundwater at Rex Flats have also greatly improved over the past two decades. As shown in Figure 7, zinc concentrations at REX-MW 2 have dropped from about 200 mg/L to about 10 mg/L.

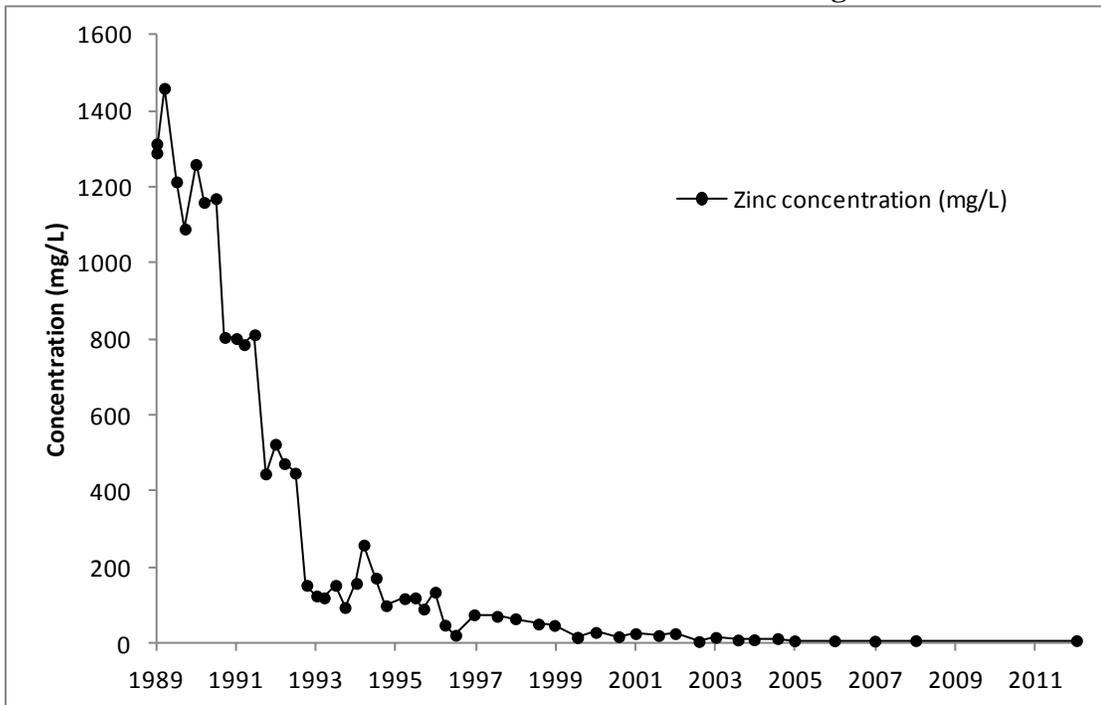
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<sup>2</sup> Complete data results are available in *Eagle Mine Annual Report 2012*. Prepared by NewFields. April 24, 2013.

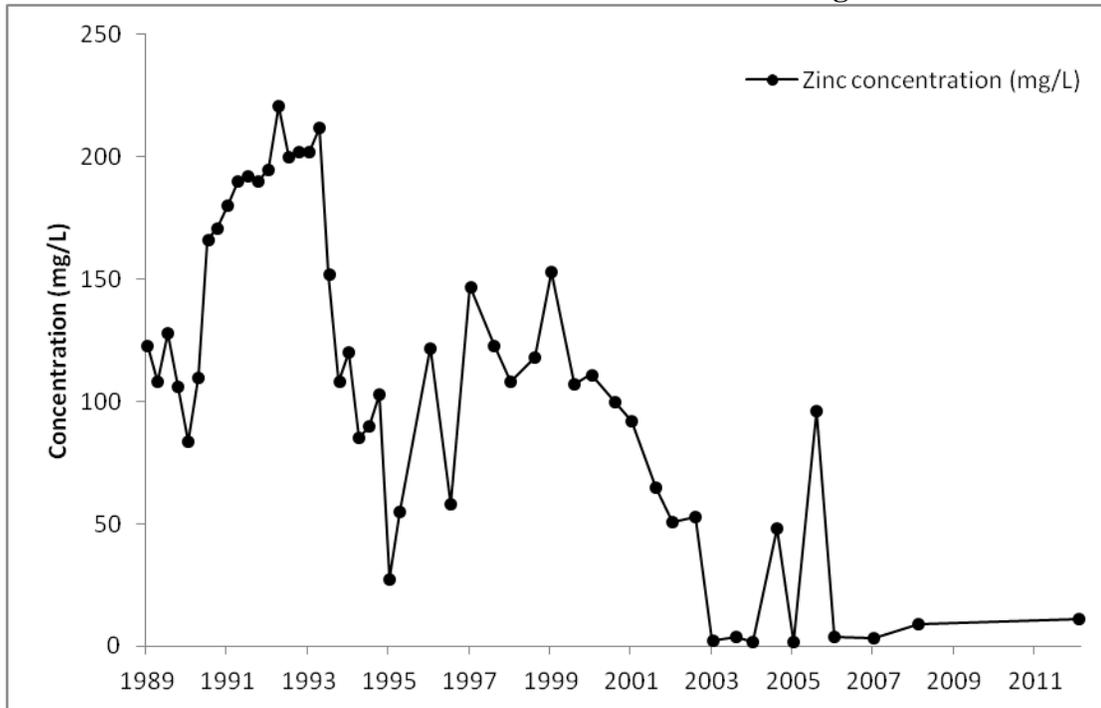
**Figure 5: Dissolved Zinc Concentrations in Groundwater Monitoring Well DAP-MW 4R**



**Figure 6: Dissolved Zinc Concentrations in Groundwater Monitoring Well OTP-MW 2**



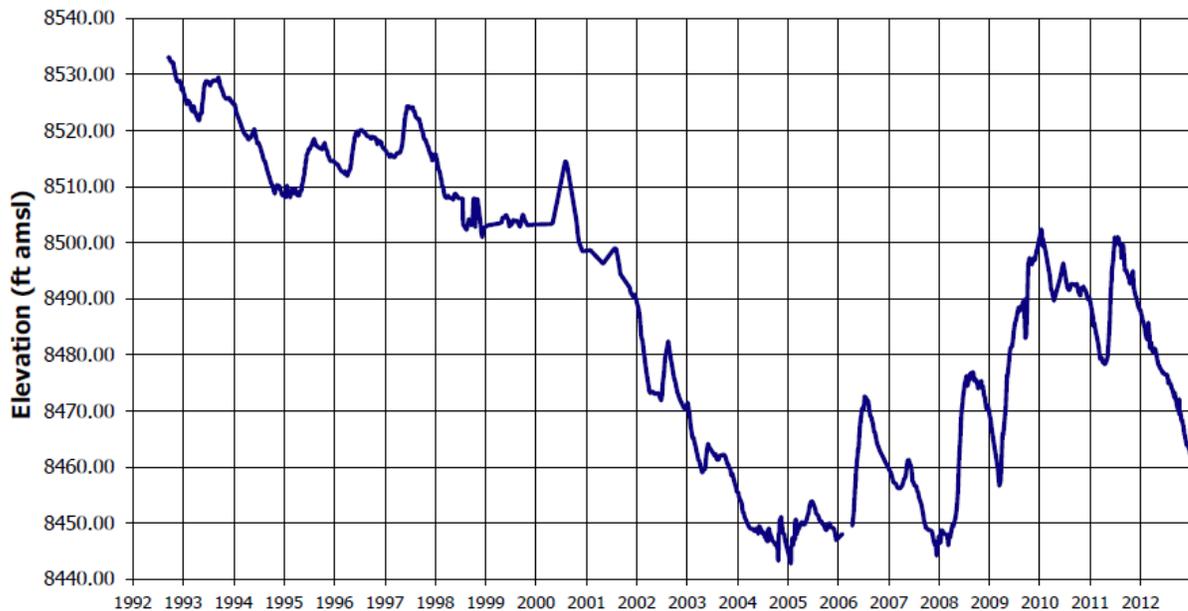
**Figure 7: Dissolved Zinc Concentrations in Groundwater Monitoring Well REX-MW 2**



### Mine Pool Elevation

Since 1998, the RPs have attempted to maintain the mine pool at the lowest possible elevation. Maintaining a lower mine pool results in benefits to the environment, including a decrease in the amount of seepage reaching Rock Creek and likely improvements in water quality in the Belden area. A mine pool elevation of between 8,445 and 8,455 feet above mean sea level is targeted. Actual mine pool elevation during the previous five years ranged from 8,450 to 8,500 feet (see Figure 8). The mine pool rises naturally due to snow melt in the spring. When operational problems with the conveyance system or the WTP occur, they can also result in increases in the mine pool elevation. However, it should be noted that although the operational target elevation is between 8,445 and 8,455 feet, seepage (like that which occurred in 1990) is not expected unless the mine pool rises to an elevation above 8,520 feet.

**Figure 8: Mine Pool Elevation, 1992-2012**



### WTP and Conveyance System

The Eagle Mine WTP treats contaminated water from flooded mine workings and groundwater from the CTP. The mine water reaches the plant via a pipeline, part of which is on a historic trestle, and a bypass line built in early 2010 when the trestle line froze. The WTP continues to be effective in treating the contaminated surface water/groundwater from the mine and surrounding area. Since implementation of the cleanup, there have been incidents where releases occurred at the WTP or conveyance system that impacted the Eagle River. One recent incident occurred in November 2012, when approximately 400,000 gallons of raw water were released to the area due to a rupture in the conveyance system. Since the previous FYR, the owner has hired additional operators and made some needed repairs to the WTP. Repairs and upgrades included a new compressor system, installing a new computer system and obtaining spare parts.

The WTP was designed to operate at flows of up to 275 gallons per minute (gpm) but has achieved up to 400 gpm. During the site inspection, the O&M contractor indicated that in general it operates at approximately 330-340 gpm. As the WTP continues to age, some components are outdated and in need of frequent repair, but the facility appears to operate within design specifications.

In 2010, CDPHE and the EPA responded to stakeholder concerns by requesting an audit of the WTP by the CDPHE Water Quality Control Division and an audit of the water collection/conveyance systems by URS Corp., an EPA contractor. In addition, EPA and CDPHE are in the process of working with CBS to update the emergency response and contingency plan for the Site. This update includes reporting requirements to downstream users of the Eagle River.

URS Corp. submitted its final report, *Audit of Collection and Conveyance Systems for the Eagle Mine, Minturn, CO*, in January 2011. The pipeline report made recommendations for improving water collection and conveyance, reducing scale build-up in the line and improving site security. CBS has implemented a majority of the recommendations. CBS believes that some of the audit's recommended actions are not needed, and has declined to conduct those actions.<sup>3</sup> These include:

1. *Installing remote monitoring to monitor water levels in manholes in the groundwater extraction trenches.*
2. *Installing a chemical feed system to keep iron and manganese from solidifying in the mine water transport pipeline.*
3. *Burying the bypass pipeline to prevent freezing and damage from trespassers.*
4. *Connecting and testing the pump-back system.*
5. *Making significant enhancements to the run-on/runoff control systems and acid rock drainage collection/conveyance systems at WRP 8.*

The CDPHE Water Quality Control Division conducted an audit of the Eagle Mine WTP in October 2010. The audit evaluated equipment, maintenance, and operating and emergency procedures. The final report, dated September 2011, is titled *Eagle Mine Water Treatment Plant: Summary of October 2010 Performance Evaluation*. The report recommended a variety of improvements to the plant's equipment, maintenance and operations. CBS has implemented most of these recommendations. However, CBS believes that some of the recommended actions are not needed.<sup>4</sup> These actions and CBS' reasoning include:

1. *Identifying chemistry changes in the incoming water in order to optimize treatment processes.* CBS believes that measuring the pH of the influent is now sufficient, due to an improved process for recycling filtrate. In addition, CBS states it appears that the plant influent pH can be an indicator of the seasonal change.
2. *Repairing the reverse osmosis system to improve polymer performance.* CBS believes that "RO quality water is not necessary to achieve satisfactory polymer addition system performance," and does not plan to repair the reverse osmosis system.
3. *Performing a detailed study to determine what additional treatment methods or operations practices will be needed to comply with future discharge standards beginning in December 2013.* CBS reviewed recent dissolved zinc and the mercury plant effluent data, and concluded that "no changes in the WTP design or operations are needed" to achieve the more stringent future discharge standards for zinc and mercury.

Based on recent information, the sludge cell continues to have adequate capacity.

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<sup>3</sup> February 10, 2012 letter from Environ to CDPHE and the EPA. CDPHE has not yet responded.

<sup>4</sup> December 15, 2011 letter from Environ to CDPHE and the EPA. CDPHE has not yet responded.

## 6.5 Site Inspection

Two site inspections were conducted for this FYR. The first occurred on February 12, 2013, with the primary purpose of touring the WTP and getting a general sense of site features. Participants included Les Sims and Susan Griffin, EPA; Wendy Naugle, CDPHE; Treat Suomi and Krissy Russell-Hedstrom, Skeo Solutions; David Heinze and Michelle White, Environ; and David Hinrichs, NewFields.

The second site inspection occurred on May 10, 2013, with the primary purpose of walking the Site and observing conditions during spring runoff. Participants included Les Sims, Susan Griffin and Andrew Schmidt, EPA; Sherry Skipper, U.S. Fish and Wildlife Service/EPA; Treat Suomi and Krissy Russell-Hedstrom, Skeo Solutions; David Heinze, Michelle White and Ephraim Tooley, Environ; David Hinrichs, NewFields; and Mike Jackson, Battle Mountain Resorts. The Site Inspection Checklist is provided in Appendix D of this FYR report. Photographs from the site inspection are provided in Appendix E.

For both site inspections, participants met at the WTP and drove and walked the Site as needed. Safety briefings were provided for both inspections. During both site inspections, participants viewed the following site features:

- WTP.
- Gilman area: surface water diversion channels at WRP 8; WRP 8 upper collection basin/piping; Fancy Shaft overflow.
- Rock Creek area: Rock Creek culvert at WRP 8 lower collection; WRP 8 lower collection basin; Seep 7 collection basin; Seepage collection at Adit 5; Adit 5 area; Adit 6; Rock Creek valve/piping enclosure.
- Belden area: Belden wells; Copper Tipple trench; tramway culvert; Ben Butler drainage/culvert; crib walls; dog hole seep piping/valve; Adit 143 piping.
- OTP area: OTP cover and general area; OTP south end trench/culvert; OTP manhole.
- Rex Flats area: mine water transport pipeline and bypass.
- CTP area: Surge ponds, temporary cell, CTP swale near temporary cell, sludge cell, upgradient groundwater diversion trench, east trench, north trench, lower surge pond overflow pipe.
- Maloit Park.

The WTP, although noticeably aging, was in good working operation at the time of the site inspections. All required documents, including safety and O&M guides, were available in the command station of the WTP. The surge ponds and cells at the WTP were in good condition.

The soil surfaces of the OTP, the CTP, Rex Flats and Maloit Park were in good condition. Entrances to the Site at the WTP, Gilman, Rex Flats and the road to Belden were locked and clearly marked with no trespassing signs. No trespassing signs and barbed wire fencing were present along other areas of the Site, including along the road

through Rex Flats. Evidence of trespassing was evident, however, including vandalism at Gilman and Belden, cross-country ski tracks along the road to Belden, campfire rings in the OTP area and some areas with downed barbed wire fences. O&M contractors have recently installed security cameras at areas around the Site.

The site inspection team viewed a number of the Site's monitoring and extraction wells. Some of the older wells were locked, but many monitoring wells were unlocked.

The mine water conveyance system to the WTP was delivering water to the WTP, but site inspection participants viewed several issues related to O&M of the WTP, conveyance system and surface water drainage systems as follows:

- A leaking sludge compressor at the WTP.
- A beaver dam in Rock Creek near the WRP 8 collection area causing clean water from Rock Creek to be diverted into the WRP 8 diversion trench.
- A blockage in the WRP 8 lower collection piping, which allowed overflow of WRP 8 mine water to go back into Rock Creek. (The blockage was removed during the site visit.)
- A visible leak in the bypass pipeline in Rex Flats, causing a release of untreated mine water to the ground. (This leak was reported to the CDPHE Spill Line during the site visit. A subsequent spill report indicated that the leak was corrected on May 13, 2013, and will be replaced in June 2013 with visual inspections occurring on a weekly basis.)
- The tramway culvert needs to be backhoed to reveal the culvert.
- A trail of staining across the road from the Adit 143 pipe was observed. The O&M contractors indicated that they believe that was the result of snow melt and that it would be gone within 5 days. They intended to check back to ensure it was not indicative of a larger problem.
- Significant water flow was observed from the Ben Butler drainage in Belden. However, since the entrance to the culvert was blocked when the crib walls were built, the excess water was flowing over the road.
- Visible leaks in the mine water conveyance system in the wooden trestle as indicated by orange-colored icicles and staining on rocks and grass where leaks occur.
- Staining was observed in the OTP south trench.
- Staining and some minimal surface water flow was observed at the repaired OTP manhole, the area of the January 2011 sump overflow. It was not clear whether this was snow melt and old staining or potentially a new leak or issue at the manhole.

Following the second site inspection, Skeo Solutions staff reviewed the site-related documents available to the public in the Site's document repository at the Minturn Town Hall. The repository contained seven boxes of documents, most of which were historical documents related to the Site, including monitoring reports. However, the repository did not contain several key documents, including the 1998 ROD, the 1999 ESD and the 2008

FYR. The EPA will work with the repository to ensure that necessary documents are available for the community to review.

## 6.6 Interviews

The FYR process included interviews with CDPHE, the current landowner, O&M contractors and community members. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. All of the interviews except for the community interviews took place via email between February and June 2013. The EPA performed in-person community interviews between April 8 and May 10, 2013. The interviews are summarized below. Appendix C provides the complete interviews.

**Wendy Naugle:** Wendy Naugle completed her interview through email on April 17, 2013. She works for the CDPHE. Ms. Naugle expressed that the remedy is successful at improving overall water quality at the Eagle River, but improvements could be made with timely repairs and further restrictions to improve the brown trout population. She stated that the CDPHE received letters and complaints from water users and residents living downstream from the Site and the WTP. Ms. Naugle indicated that the State Water Quality Control Commission has issued Temporary Modifications for arsenic in surface water for Segment 5b of the Eagle River. The Commission is also considering further changes to the arsenic standards for surface water. In the meantime, arsenic should be added to the COC list for the site and added as an ARAR. In regards to institutional controls, she would like to see an environmental covenant with Battle Mountain and stricter enforcement against trespassers who camp on the Site. Ms. Naugle did note that Battle Mountain proposed residential development on a portion of the Site. She recommends an updated Inspection and Maintenance Plan for the Site.

**Mike Jackson:** Mike Jackson completed his interview through email on May 15, 2013. He is the representative for the landowner of the Battle Mountain Resort. He expressed overall satisfaction with the remedial activities, objectives and responsiveness of the Site's management. Mr. Jackson indicated that generally the surrounding community questions the remedy only when an incident occurs. He personally feels well informed about site activities and appreciates the open communication with project management.

**David Heinze:** David Heinze completed his interview through email communications on March 14, 2013. He is an O&M contractor for the Site through Environ. He stated that Environ is satisfied with the WTP operations in treating groundwater and mine water, and complying with water quality standards. Mr. Heinze noted that while contaminant levels vary over time, the WTP consistently met the State of Colorado's NPDES Permit discharge standards. Mr. Heinze thoroughly outlined Environ operating activities at the Site, which included daily inspections of the WTP and conveyance system components, preventative maintenance inspections and routine maintenance. A monitoring system supervises the plant during off-hours and activates a call-out system if an unexpected issue develops. All data are recorded in detail, and repairs are completed by on-site staff or contractors.

**David Hinrichs:** David Hinrichs completed his interview through email on March 19, 2013. He is an O&M contractor through NewFields. Mr. Hinrichs explained that the remediation is nearly finished, but that groundwater work in Belden remains. He stated that all operations are going well, except for a few problems due to the WTP reaching the end of its operational capacity. The WTP, according to Mr. Hinrichs, needs regular maintenance which requires extra money. Specifically, he mentioned that pipes will clog from seasonal snow melt. He stated that metal concentrations in the mine pool are decreasing over time, but fluctuate with seasons. He mentioned that surface water sampling increased over the years.

**Todd Fessenden:** Todd Fessenden submitted a letter to the EPA on July 5, 2013. Mr. Fessenden is the Director of Operations for the Eagle River Water and Sanitation District. Mr. Fessenden expressed concerns with operations at the Site on behalf of the Eagle River Water Users group. He brought up issues related to: changes in Water Quality Table Standards; operational funding and staffing related to the conveyance system and WTP; an increased frequency of spills and incidents that threaten downstream water systems; concerns about the emergency response system and reporting requirements to downstream users. Mr. Fessenden also provided information that spills and releases from the Site are causing disruptions in the Eagle River Water and Sanitation District public drinking water system.

**Community Interviews:** The EPA Community Involvement Coordinator conducted FYR interviews with sixteen individuals. In addition, a letter was provided by ERWC – Eagle Mine Ltd. The interviewees represented a broad spectrum of interests, including local elected officials, environmental groups, state officials, local residents, and business representatives. Overall, the interviewees felt that the Eagle Mine remedy has been successful and that there has been much improvement over the last 20-30 years. However, interviewees generally indicated that there is still much work to be done and that the remedy should go much further than it does and it is just maintaining the problem rather than fixing it for good. There were also a number of interviewees who felt that progress and activity at the Site has significantly slowed since 2008 and that there seemed to be many more spills and incidences at the Eagle Mine Site than there used to be. In general, concerns were expressed regarding site operation and maintenance, the WTP and conveyance system, ongoing spills and leaks, and the safety of trespassers.

Interviewees mentioned that the majority of the community is neither fully aware nor fully informed about the Eagle Mine Site. In general, the community only hears about the Site after a spill or related incident is reported in the local paper. Water quality of the Eagle Mine River is a particularly important concern to people living in Minturn because the Site is the location of their future water supply.

Interviewees suggested ways in which the regulators could communicate with the broader community and population. Suggestions included the Red Cliff community board, local radio stations, Facebook and public tours. One interviewee suggested a more holistic type

of communication led by a facilitator or “central watershed coordinator” to focus on the Eagle Mine Site as well as other watershed issues.

The EPA and CDPHE will be following up with information to assist in answering questions and concerns expressed by community members.

## **7.0 Technical Assessment**

### **7.1 Question A: Is the remedy functioning as intended by the decision documents?**

Yes. The remedy, as implemented, currently protects human health and the environment through the collection and treatment of contaminated surface water and groundwater, access restrictions, and capped areas that prevent contact with contaminated subsurface soil.

Metals concentrations in the Site’s surface water have decreased greatly since 1990, based on the zinc concentration at monitoring location E-12A, which is representative of the Site’s overall surface water quality. The macroinvertebrate community within and immediately downstream of the Site is improving, as indicated by attainment of the biological criteria established in the Eagle River. The brown trout population is recovering after the most damaging mine wastes (roaster piles and tailings) were contained, the CTP was capped, and the WTP went online, post-1997. From 2007 to 2011, brown trout population density has increased as metals concentrations have been mitigated in and around the Eagle Mine.

Despite warning signs, fences and gates, trespassing continues to be a problem at the Site. The 1997 risk assessment indicated that the lead levels in soil and WRPs at Gilman were not protective of human health for the trespasser. As a result, the remedy called for access and institutional controls. Current access controls have proven inadequate to discourage trespassers. However, trespassing is not expected to result in unacceptable risks. The 2008 FYR concluded that based on updated lead risk methods, which remain current for this FYR, the lead risks are below a level of concern for trespassers. Further, although the 1997 risk assessment indicated that trespasser exposure to lead in waste rock may result in risks above levels of concern, high uncertainties were identified in the analysis because exposure to contaminated waste rock is considered unlikely due to the nature of the waste rock and the WRPs (i.e., a person is unlikely to incidentally ingest rock). Trespassers also may create additional strain on the conveyance system. Many of the valves and components are not secure and can be easily tampered with. In order to ensure long-term protectiveness, additional efforts may be needed to discourage trespassing. Recent installation of security cameras and increased communication with local law enforcement may assist with these efforts. The RP and property owners should post additional warning signs that more explicitly convey the potential risks and additional security cameras.

The WTP continues to be effective in treating the contaminated surface water/groundwater from the mine and surrounding area. However, there have been incidents where releases occurred at the WTP or the conveyance system that impacted the

Eagle River. Since the 2008 FYR, the RP has hired additional operators and made some needed repairs to the WTP. Some components of the WTP are outdated and in need of frequent repair. O&M is a challenge at the Site. With the aging of the WTP and the frequent maintenance required to keep the mine water conveyance system functioning properly, the Site may not be meeting the remedial action objective established in the OU1 ROD that requires ensuring the long-term integrity of structures and facilities associated with remedial activities at the Site. Numerous releases of contaminated mine water have been reported over the last five years and significant O&M issues needing attention were observed during the site inspection.

Staining was observed at the OTP south trench. Sampling conducted for the Battle Mountain RI determined that seepage of snowmelt through remaining tailings material causes the accumulation of contaminated water in the borrow ditch. The EPA should determine if additional remediation is required to address this issue.

Since the completion of the CTP cap in 1996, zinc concentrations in groundwater at the CTP have decreased greatly. However, the October 2012 sampling event showed a rebound in zinc concentrations at wells DAP-MW 4R and NTP-MW 5R. Additional sampling will be needed to determine whether this is a new trend developing or indicative of a new source.

Overall the Site requires continued O&M activities to keep up with the aging infrastructure. A continual review of the possible upgrades for the WTP and conveyance system, as well as an updated sampling and analysis plan that includes an updated Quality Assurance Project Plan (QAPP) will assist in ensuring long-term protectiveness at the Site.

Groundwater and land use institutional controls that are needed at the Site have not yet been implemented. With investigations into possible changes in site use, implementation has been halted while a new FS for OU3 is completed.

**7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the time of remedy selection still valid?**

No. Colorado's WQCC revised the Site's surface water quality standards in June 2008. These new standards are currently being considered during Site operations and the new water quality standards are expected to be identified as the Site's cleanup levels in an OU1 ROD Amendment scheduled for completion by September 30, 2014. Surface water sampling results showed that cadmium, copper and zinc met the new standards in 2012. While arsenic was not identified as a COC in the OU1 ROD, there are now more stringent arsenic standards for surface water. The 2012 sampling plan was modified to include arsenic sampling in the Eagle River in the fall 2012 sampling round. The 2013 sampling plan also includes additional sampling for arsenic. However, at the time of this FYR, there is not enough data to assess compliance with the arsenic water quality standard. Any additional response actions required to comply with the new performance standards will be identified in the upcoming OU1 ROD Amendment.

The 2008 FYR conducted a review of the human health risks at Gilman and the Minturn Middle School (see Attachment C of the 2008 FYR). The 2013 FYR reviewed the chronic toxicity values used in the 2008 review. The chronic toxicity values have not changed since the 2008 review with one exception; the exposure assumptions and methods for evaluating lead exposures have changed. Therefore the 2008 FYR conclusion that the levels of metals remaining in surface soil at the Minturn Middle School are protective of human health is valid for non-lead metals. However, lead was re-evaluated to consider more current risk assessment methodology (Appendix J). Based on updated lead risk methods, the risks from lead in soil are below a level of concern for trespassers. Further, the levels of contaminants in surface soil at Minturn Middle School are protective of human health since the maximum detection lead concentration of 194 mg/kg is well below EPA's May 2013 Regional Screening Level (RSL) of 400 mg/kg established for lead under a unrestricted use exposure scenario.

The 1993 ROD called for removing surface soils with lead concentrations above 1,000 mg/kg. For surface soils with lead concentrations between 500 and 1,000 mg/kg, the ROD called for treating with lime. Most soils with lead concentrations greater than 500 mg/kg were excavated and consolidated in the CTP. The EPA's current screening levels for lead are 400 mg/kg for residential use and 800 mg/kg for industrial use. Therefore, the EPA will review sampling data to verify whether the residual soil lead levels are protective for the anticipated future land uses. The current property owner has conducted a thorough RI and is now conducting a FS to determine what additional actions may be required to place the Site in a condition that is consistent with residential land use. These actions will be documented under future decision documents.

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

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

**7.4 Technical Assessment Summary**

The remedy as implemented currently protects human health and the environment through the collection and treatment of contaminated surface water and groundwater. In addition, access restrictions and capped areas prevent contact with contaminated subsurface soil.

Metals concentrations in the Site's surface water have decreased greatly since 1990. However, the recovery of the brown trout population is still hampered by metals loading.

Despite warning signs, fences and gates, trespassing continues to be a problem at the Site. In order to ensure long-term protectiveness, additional efforts may be needed to further discourage trespassing at Gilman. Recent installation of security cameras and increased communication with local law enforcement may assist in addressing the problem. The RP and property owner should consider additional warning signs that more explicitly convey

the potential risks, additional security cameras, or other appropriate measures including institutional controls.

Some components of the conveyance system and WTP are outdated and require frequent repair. O&M is a challenge at the Site, with the aging of the WTP and frequent maintenance required to keep the mine water conveyance system functioning properly. Numerous releases of contaminated mine water have been reported over the last five years and significant O&M issues needing attention were observed during the site inspection.

## 8.0 Issues

Table 7 summarizes the current site issues.

**Table 7: Current Site Issues**

Operable Unit	Issue	Affects Current Protectiveness?	Affects Future Protectiveness?
1	Trespassing continues to occur at OU1.	No	Yes
1	A Compliance Monitoring Plan has not been developed.	No	Yes
1	Colorado's surface water and groundwater standards have changed since the Site's cleanup levels were established in the 1993 ROD.	No	Yes
1	Institutional controls are not in place for OU1.	No	Yes
1	A proposed change in land use will require that additional actions be taken at the Site to ensure that the conditions are consistent with the intended land use.	No	Yes
1	Zinc concentrations have increased at wells near the CTP.	No	Yes
1	Numerous releases of contaminated mine water have been reported over the last five years and significant O&M issues related to the conveyance system were observed during the site inspections.	No	Yes
1	There is a leaking sludge compressor at the WTP.	No	Yes
1	A trail of staining across the road from the Adit 143 pipe was observed.	No	Yes
1	Significant water flow was observed from the Ben Butler drainage to the Ben Butler culvert near Belden, which was draining directly into the Eagle River without being treated. In addition, the culvert was filled in when the crib walls were built.	No	Yes
1	Staining was observed in the OTP south trench.	No	Yes
1	The bypass line had a temporary repair of a leak at Rex Flats.	No	Yes
1	A number of wells on the Site are unlocked.	No	Yes
2	Trespassing continues to occur at Gilman (OU2).	No	Yes
2	Institutional controls are not in place for OU2.	No	Yes

## 9.0 Recommendations and Follow-up Actions

Table 8 provides recommendations to address the current site issues.

**Table 8: Recommendations to Address Current Site Issues**

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Trespassing continues to occur at OU1.	The RP and property owners should post additional warning signs that more explicitly convey the potential risks, provide additional security patrols, and utilize additional security cameras.	CBS	EPA, CDPHE	12/30/2013	No	Yes
A Compliance Monitoring Plan has not been developed.	Develop a compliance monitoring plan that includes an updated sampling and analysis plan, an updated QAPP, establishes performance standards, POC(s), ARAR compliance schedule, current/future activities, reporting requirements and schedules.	CBS	EPA, CDPHE	9/30/2014	No	Yes
Colorado's surface water and groundwater standards have changed since the Site's cleanup levels were established in the 1993 ROD.	Issue a decision document to update the surface water and groundwater cleanup levels. If needed, execute a CD to outline additional response actions required to comply with the new cleanup levels.	EPA	EPA, CDPHE	9/30/2014	No	Yes
Institutional controls are not in place for OU1.	Implement institutional controls for OU1.	CBS	EPA, CDPHE	9/30/2015	No	Yes

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
A proposed change in land use will require that additional actions be taken at the Site to ensure that the conditions are consistent with the intended land use.	Complete the FS currently underway and issue any required decision documents.	Battle Mountain North	EPA, CDPHE	09/30/2014	No	Yes
Zinc concentrations have increased at wells near the CTP.	Update the sampling and analysis plan and QAPP to allow for additional monitoring and analysis.	CBS	EPA, CDPHE	9/30/2014	No	Yes
Numerous releases of contaminated mine water have been reported over the last five years and significant O&M issues related to the conveyance system were observed during the site inspections.	Consider upgrades for the WTP and conveyance system and continue to implement recommendations from the prior WTP and conveyance system audits.	CBS	EPA, CDPHE	9/30/2014	No	Yes
There is a leaking sludge compressor at the WTP.	Repair or replace the compressor.	CBS	EPA, CDPHE	9/30/2014	No	Yes
A trail of staining across the road from the Adit 143 pipe was observed.	Determine the cause of the staining and take appropriate action.	CBS	EPA, CDPHE	10/30/2013	No	Yes

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Significant water flow was observed from the Ben Butler drainage to the Ben Butler culvert near Belden, which was draining directly into the Eagle River without being treated. In addition, the culvert was filled in when the crib walls were built.	Determine how to correct the flow issue and take appropriate action.	CBS	EPA, CDPHE	10/30/2013	No	Yes
Staining was observed in the OTP south trench.	Use the remedy selection process to determine if additional remediation is required.	CBS	EPA, CDPHE	9/30/2014	No	Yes
The bypass line had a temporary repair of a leak at Rex Flats.	Complete planned valve replacement.	CBS	EPA, CDPHE	10/30/2013	No	Yes
A number of wells on the Site are unlocked.	Secure all wells currently in use and properly abandon any wells that are no longer functional.	CBS	EPA, CDPHE	12/30/2014	No	Yes
Trespassing continues to occur at Gilman (OU2).	The RP and property owners should post additional warning signs that more explicitly convey the potential risks, provide additional security patrols, and utilize additional security cameras.	CBS	EPA, CDPHE	12/30/2013	No	Yes
Institutional controls are not in place for OU2.	Implement institutional controls for OU2.	CBS, Battle Mountain North	EPA, CDPHE	9/30/2015	No	Yes

## 10.0 Protectiveness Statements

The remedy at OU1 currently protects human health and the environment because the collection and treatment of contaminated surface water and groundwater is occurring, access restrictions

and capped areas are in place to prevent contact with contaminated subsurface soil, and the brown trout population is recovering. However, in order for the remedy to be protective in the long term, the following actions need to be taken:

- Develop a compliance monitoring plan, an updated sampling and analysis plan, and an updated QAPP.
- Issue a decision document to update the surface water and groundwater cleanup levels.
- Implement institutional controls.
- Complete the FS for updating the surface water and groundwater cleanup levels.
- Consider possible upgrades for the WTP and conveyance system and continue to implement recommendations from the prior WTP and conveyance system audits.
- Secure all wells currently in use and properly abandon any wells that are no longer functional.

The remedy at OU2 currently protects human health and the environment because access restrictions currently exist to deter trespassers. However, in order for the remedy to be protective in the long term, the following actions need to be taken:

- Implement institutional controls.
- Consider appropriate measures to further deter trespassers.

Because the remedial actions at OU1 and OU2 are currently protective, the Site is currently protective of human health and the environment.

## **11.0 Next Review**

The next FYR will be due within five years of the signature/approval date of this FYR.

## **Appendix A: List of Documents Reviewed**

2005 Final Report: Factors Influencing Brown Trout Populations in Mine-impacted Reaches of the Eagle River following Remediation Efforts. Prepared by Colorado Division of Wildlife. October 3, 2005.

Amended Permit, Colorado Wastewater Discharge Permit System. Prepared by Colorado Department of Public Health and Environment. May 1, 2006.

Annual Biological Monitoring of the Eagle Mine Superfund Site 2001. Prepared by John Woodling, Jennifer Ketterlin, State of Colorado, Department of Natural Resources, and Colorado Division of Wildlife. March 1, 2002.

Assessment of Risk Associated with the Potential Exposure of Children to Metals in Airborne Mine Wastes at the Minturn Middle School and Maloit Park Area, Minturn, Colorado. Prepared by Colorado Department of Health Disease Control and Environmental Epidemiology Division. March 1990.

Assessment of Risk Associated with the Potential Exposure of Children to Metals in Airborne Mine Wastes at the Minturn Middle School and Maloit Park Area, Minturn, Colorado. Prepared by Colorado Department of Health Disease Control and Environmental Epidemiology Division. February 2, 1992.

Audit of Collection and Conveyance Systems for Eagle Mine, Minturn, Colorado. Prepared by URS. January 13, 2011.

Biological Assessment for Ginn Battle North, LLC's Proposed Remedial Activities for the North Property Eagle County, Colorado. Prepared by Rocky Mountain Ecological Services, Inc. January 2007.

Biological Monitoring Report for the Eagle Mine Superfund Site for the Period of April 1900 to April 2003. Prepared by John Woodling and Ashleah Rollings. February 1, 2004.

Biological Monitoring Report for the Eagle Mine Superfund Site for the Period of April 1900 to April 2004. Prepared by John Woodling and Ashleah Rollings. May 1, 2005.

Biological Monitoring Sampling and Analysis Plan for Eagle Mine Site Surface Water Biological Monitoring Program. Prepared by Dames & Moore. December 2, 1996.

Colorado Wastewater Discharge Permit Application, Certification and Verification for Liberty Well, Red Cliff, Eagle County, Colorado. Prepared by Colorado Water Quality Control Division. Received on February 19, 2013.

Development and Application of a Biological Index to Assess the Influence of Heavy Metals on Stream Invertebrates in Mineralized Areas of Colorado. Prepared by Statistical Design. March 2001.

Eagle Mine Annual Monitoring Data Report 1993. Prepared by Dames & Moore. March 18, 1994.

Eagle Mine Annual Report 2002. Prepared by NewFields. March 3, 2003.

Eagle Mine Annual Report 2004. Prepared by NewFields. March 1, 2005.

Eagle Mine Annual Report 2006. Prepared by NewFields. March 9, 2007.

Eagle Mine Annual Report 2007. Prepared by NewFields. February 9, 2008.

Eagle Mine Annual Report 2008. Prepared by NewFields. March 2, 2009.

Eagle Mine Annual Report 2010. Prepared by NewFields. March 11, 2011.

Eagle Mine Annual Report 2011. Prepared by NewFields. April 27, 2012.

Eagle Mine Annual Report 2012. Prepared by NewFields. April 24, 2013.

Eagle Mine Site Inspection and Maintenance Plan. Prepared by Eagle Engineering Services, Inc. December 9, 1996.

Eagle Mine Superfund Site Eagle Mine News. Prepared by the CDPHE. Fall 2010.

Eagle Mine Superfund Site Eagle Mine News. Prepared by the CDPHE. Summer 2011.

Eagle Mine Superfund Site Eagle Mine News. Prepared by the CDPHE. Winter 2012.

Eagle Mine Superfund Site Targeted Spring Runoff Inspection Report for May 2011. Prepared by Colorado Department of Public Health and Environment. May 16, 2011.

Eagle Mine Remedial Investigations and Appendices. Prepared by the EPA. December 2, 1985.

Eagle Mine Water Treatment Plant Response to October 2010 Performance Evaluation Report. Prepared by Environ. December 15, 2011.

Eagle River Inventory and Assessment. Prepared by Colorado State University. August 2005.

Emergency Response/Contingency Plan Eagle Mine Superfund Site. Prepared by ENVIRON International Corporation. April 2013.

Explanation of Significant Differences Eagle Mine Superfund Site. Prepared by the EPA. August 31, 1999.

Final Report on the Health Risk Assessments for the Eagle Mine Superfund Site, Minturn, Colorado. Prepared by Dr. John S. Reif. April 15, 1993.

Final Risk Assessment Deliverables, Risk Assessment Summary, Gilman Townsite Recreational-Trespasser User Soil Exposure Risk Assessment, and Risk Analysis Outline for Potential Redevelopment for the Eagle Mine Superfund Site. Prepared by Morrison Knudsen Corporation and ICF Kaiser Engineers, Inc. February 11, 1997.

Five-Year Review Report for Eagle Mine Superfund Site Eagle County, Colorado. Prepared by EPA Region 8. September 21, 2000.

Health Assessment for Eagle Mine Minturn, Colorado. Prepared by Colorado Department of Health Disease Control and Environmental Epidemiology Division. March 1, 1989.

Health Risk Assessment for Maloit Park Wetlands and Screening-Level Assessment for Selected Study Areas Eagle Mine Site Minturn, Colorado. Prepared by Morrison Knudsen Corporation and ICF Kaiser Engineers, Inc. July 30, 1993.

Human Health Risk Assessment for Bolts Lake Area and Areas within OU-1 of Eagle Mine Site. Prepared by Environmental Resources Management and Terra Technologies. September 15, 2006.

Human Health Risk Assessment for Bolts Lake Area and Areas within OU-1 of Eagle Mine Site. Prepared by Environmental Resources Management and Terra Technologies. February 2, 2007.

Interim Ground Water Data Summary Report for Bolts Lake Area and Areas within OU-1 of Eagle Mine Site. Prepared by Environmental Resources Management. February 28, 2006.

Quarterly Construction and Environmental Monitoring Process Report No. 21. Prepared by Dames & Moore. April 14, 1994.

Record of Decision Eagle Mine Site Operable Unit 1. Prepared by the EPA. March 29, 1993.

Record of Decision Eagle Mine Site Operable Unit 2. Prepared by the EPA. September 3, 1998.

Remedial Investigation Report for the Bolts Lake Area within OU-1 of Eagle Mine Site. Prepared by Environmental Resources Management for EPA Region 8 and CDPHE. September 15, 2006.

Remediation Feasibility Study for the Bolts Lake Area within OU-1 of the Eagle Mine Site. Prepared by Environmental Resources Management for EPA Region 8 and the CDPHE. February 16, 2007.

Responses to Comments on the Human Health Risk Assessment, Bolts Lake Area and Areas within OU-1 of Eagle Mine Site for the North Property. Prepared by Ginn Battle North, LLC. October 26, 2006.

Risk Assessment for Metals Exposure at the Minturn Middle School. Prepared by Slosky & Company, Inc. August 7, 1989.

Risk Assessment for Metals Exposure to Residents of Maloit Park and Employees of the Minturn Middle School. Prepared by Slosky & Company, Inc. January 31, 1992.

Second Five-Year Review Report for Eagle Mine Superfund Site Eagle County, Colorado. Prepared by EPA Region 8. September 27, 2005.

Seepage Collection and Conveyance Systems Map for Eagle Mine, Eagle County Colorado. Prepared by Environ.

Summary of Audit Recommendation, Responses and Follow-up Actions. Prepared by CBS and Environ. February 10, 2012.

Surface Water and Groundwater Monitoring in 2006 Eagle River Mine Site. Sent to Jeff Groy, Viacom, and Wendy Naugle, CDPHE. January 12, 2006.

Surface Water and Groundwater Monitoring in 2012 Eagle River Mine Site. Sent to Mike Holmes, EPA, and Wendy Naugle, CDPHE. January 24, 2012.

Surface Water Discharge Permit for CBS Operations, Inc. and Frank Environmental Services, Inc. Prepared by Colorado Department of Public Health and the Environment. June 26, 2009.

Third Five-Year Review Report for Eagle Mine Superfund Site Eagle County, Colorado. Prepared by EPA Region 8. September 30, 2008.

Total Maximum Daily Load Assessment for Eagle River, Cross Creek, Eagle County, Colorado. Prepared by the Colorado Department of Public Health and Environment. January 2009.

Update to the 2008 Five-Year Review for Eagle Mine Superfund Site Minturn, Colorado. Prepared by the EPA. January 2011.

## Appendix B: Press Notice



### EPA Five-Year Review Planned for the Eagle Mine Superfund Site



Colorado Department  
of Public Health  
and Environment

The U.S. Environmental Protection Agency (EPA) is conducting the fourth Five-Year Review of the remedial actions performed under the Superfund program for operable units (OUs) 1 and 2 at the Eagle Mine Superfund site in Minturn and Red Cliff, Colorado. The purpose of the Five-Year Review is to make sure the selected cleanup actions for OUs 1 and 2 effectively protect human health and the environment. The Five-Year Review is scheduled to be completed by September 2013.

The site is located in Eagle County, Colorado, about one mile southeast of Minturn. The site is defined as the area impacted by past mining activity along the Eagle River between the towns of Red Cliff and Minturn. Miners began working the Eagle Mine in the 1880s, searching for gold and silver. The mine later became a large zinc mining operation, leaving high levels of arsenic, cadmium, copper, lead and zinc in the soil and in surface water and groundwater. Copper and silver production continued at Eagle Mine until the mine workings were allowed to flood and the mine closed in 1984. EPA placed the site on the National Priorities List (NPL) of contaminated sites in 1986.

The OU1 remedy controls the transport of metals from various sources to the Eagle River and to groundwater. The OU2 remedy restricts access to the abandoned company town of Gilman and surrounding areas. Because waste remains on site, EPA will continue to conduct Five-Year Reviews to make sure the remedy remains protective of human health and the environment.

**EPA invites community participation in the Five-Year Review process:** Community members are encouraged to contact EPA staff with any information that may help the Agency make its determination regarding the protectiveness and effectiveness of the remedies at the site.

Additional site information is available at:

**Minturn Town Hall**

302 Pine Street  
Minturn, CO 81645  
970-827-4104

**Or visit the EPA website at:**

<http://www.epa.gov/region8/superfund/co/eagle>

*Questions? Please Contact:*

**EPA Region 8**

**Jennifer Chergo**

Community Involvement Coordinator  
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**Colorado Department of Public Health and Environment**

**Warren Smith**

Community Involvement Manager  
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**Wendy Naugle**

State Project Manager  
Phone: 888-569-1831 ext. 3394  
Email: [wendy.naugle@state.co.us](mailto:wendy.naugle@state.co.us)

## Appendix C: Interview Forms

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Site Name:	<u>Eagle Mine</u>	EPA ID No.:	<u>COD081961518</u>
Interviewer Name:	<u>Krissy Russell-Hedstrom</u>	Affiliation:	<u>Skeo Solutions</u>
Subject Name:	<u>Wendy Naugle</u>	Affiliation:	<u>CDPHE</u>
Subject Contact Information:	<u>wendy.naugle@state.co.us</u>		
Time:		Date:	<u>04/17/2013</u>
Interview Location:	<u>Email</u>		
Interview Format (circle one):	<u>In Person</u>	<u>Phone</u>	<u>Email</u> <u>Other:</u>

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Interview Category: State Agency

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

My overall impression of the project is that the original remedy was highly successful at restoring water quality in the Eagle River. However, additional remediation to further reduce metals loading to the river is needed in order to fully restore the brown trout fishery. In addition, the original remedy is aging and now requires frequent repairs and maintenance.

2. What is your assessment of the current performance of the remedy in place at the Site?

The remedy is aging, so more frequent inspections and maintenance are needed to assure that it continues to perform as designed.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

Yes, there have been complaints regarding site-related environmental issues raised by the downstream water users over the past five years. Letters have been written to the CDPHE Director of Environmental Programs and complaints have been logged on the CDPHE Emergency Spill Line.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

Because the Site is managed as a Joint-Lead between EPA and CDPHE all site-related activities and communications over the past five years have been conducted by our office in full cooperation with EPA.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

The State has been working to modify the surface water criteria for arsenic. This issue has been in flux for the past 2 to 3 years and the Site has only recently been collecting data to

assess water quality in relation to the arsenic standards. The most recent decision by the Water Quality Control Commission was to establish Temporary Modifications to the standards, which means that the standards will be less stringent on a temporary basis. On-going monitoring and assessment is needed to ascertain the future protectiveness of the remedy with respect to arsenic in surface water. This may also require that CBS collect samples of various sources of metals loading at the Site in order to determine where the arsenic originates.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

I would like to see the land owner (Battle Mountain) voluntarily enter into environmental covenants with the State which will further enhance our institutional control over the property. Covenants will be required once a new decision is made with respect to reuse of the property. However, in the meantime, it would be prudent to establish better controls over the property, especially for the Gilman area, which is not slated for development until after redevelopment of OU1 occurs. I would also like to see better enforcement against trespassers, especially parties who camp along the river near the Old Tailings Pile during the summer.

7. Are you aware of any changes in projected land use(s) at the Site?

Yes, the landowner (Battle Mountain) is proposing residential development on a portion of the Site.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

I think it would be beneficial to have CBS produce a new Site-wide Inspection and Maintenance Plan in the interim period before the new Consent Decree is negotiated. The FFS process has taken longer than anticipated and in the meantime, there is no comprehensive Inspection and Maintenance plan for the Site.

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<b>Site Name:</b> <u>Eagle Mine</u>	<b>EPA ID No.:</b> <u>COD081961518</u>
<b>Interviewer Name:</b> <u>Krissy Russell-Hedstrom</u>	<b>Affiliation:</b> <u>Skeo Solutions</u>
<b>Subject Name:</b> <u>Mike Jackson</u>	<b>Affiliation:</b> <u>Battle Mountain Resort</u>
<b>Subject Contact Information:</b>	
<b>Time:</b>	<b>Date:</b> <u>05/15/2013</u>
<b>Interview Location:</b> <u>Email</u>	
<b>Interview Format (circle one):</b> <b>In Person</b> <b>Phone</b> <u><b>Email</b></u> <b>Other:</b>	

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**Interview Category:**    **Landowner**

1. What is your overall impression of the remedial activities at the Site?

Overall we are pleased with the remedial activities. We realize the challenges with this site. Management does a good job of responding to these challenges with appropriate monitoring and field adjustments.

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

Generally speaking, the surrounding community displays a neutral opinion unless an incident occurs that affects the Eagle River.

3. What is your assessment of the current performance of the remedy in place at the Site?

We feel the current remedy is generally fulfilling its designed performance objective.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

Water quality is a high priority of the surrounding communities. The more incidents – large or small – that affect the Eagle River water quality, the more we hear the community questioning the remedy.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might the EPA convey site-related information in the future?

Yes, we feel well-informed regarding the site activities.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

We have a good relationship with the current management team. They keep us well informed and are responsive to our needs. We greatly appreciate this open communication.

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Site Name: Eagle Mine EPA ID No.: COD081961518  
Interviewer Name: Krissy Russell-Hedstrom Affiliation: Skeo Solutions  
Subject Name: David Heinze Affiliation: Environ International Corp.  
Subject Contact Information: Environ International Corporation  
303 E. 17<sup>th</sup> Avenue, Suite 400  
Denver, CO 80203  
303-382-5474  
dheinze@environcorp.com  
Time: \_\_\_\_\_ Date: 03/14/13  
Interview Location: Email  
Interview Format (circle one): In Person Phone Email Other:

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Interview Category: O&M Contractor

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

Environ has operated the Eagle Mine Water Treatment Plant (EMWTP) since May 2010; consequently, responses are limited to the water treatment operations in this time frame. The EMWTP has operated continuously since Environ took over operations with limited downtime for repairs and maintenance. The plant has experience a limited number of releases since 2010 and none have been at a level considered to be a Reportable Quantity. Environ believes the WTP has been very successful at treating mine water and groundwater and maintaining compliance with water quality discharge standards.

2. What is your assessment of the current performance of the remedy in place at the Site?

The current remedy for treatment of mine water and groundwater is effective as demonstrated by the continued compliance with applicable discharge limits.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

Environ collects data on the operation of the EMWTP. The influent mine water contaminant levels vary over time and no obvious trends have been observed over the time that Environ has operated the WTP. The WTP consistently meets the State of Colorado NPDES Permit discharge standards. Additional solids are generated during the snow melt period which requires adjustment of the operating schedule to maintain throughput.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

Environ operates the Eagle Mine Water Treatment Plant (EMWTP) with operators present seven days per week. Daily inspections (Monday through Friday) are performed by Environ water treatment plant (WTP) personnel of the WTP and conveyance system components including but not limited to the:

- North and East Trench pump operation;
- Tip Top adit at the furthest upstream end of the conveyance system;
- Pipeline from Belden to Rock Creek;
- Mine Drawdown (MDD) collection system at Rock Creek which includes the vault and piping components; and
- Pipeline between the MDD vault and the bypass line.

The daily inspections are documented on a log form. At each location, information is recorded such as pump operation, run time, totalizer readings, etc. If the inspections result in an observation of a problem requiring repair, repairs are initiated either using on-site staff or by subcontracting the work from the list of on-call contractors.

In addition, Preventative Maintenance inspections are performed of all major WTP components at an appropriate frequency for the various pieces of equipment which are documented on a log form. Routine maintenance is performed by WTP personnel and outside contractors.

During periods when the plant is unattended, it is monitored by a SCADA [supervisory control and data acquisition] system. If an issue develops, the SCADA will activate a call-out program. The call-out program calls down a preset list of the operators and announces the issue.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

Since taking over operation of the WTP in 2010, Environ has improved operation and maintenance of the WTP implementing a Preventative Maintenance program and upgrading various systems at the site. Equipment has been rebuilt or replaced as needed. The changes ultimately improve the operation and reliability of the WTP.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

The plant has experienced operational problems since Environ took over operations which is to be expected due to the age of the WTP. Environ has performed preventative maintenance as well as unexpected repairs on the WTP including: Gear box and Paddle Mixer replacement in Reaction Tank #1, valve and piping replacement at the MDD vault, and minor conveyance system repairs.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

Operations and maintenance activities have been optimized through the Preventative Maintenance program. Critical replacement parts and equipment were obtained for immediate replacement providing for less WTP downtime. Increased frequency of equipment maintenance has also provided for more reliable plant operations.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

No additional comments.

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Site Name: <u>Eagle Mine</u>	EPA ID No.: <u>COD081961518</u>
Interviewer Name: <u>Krissy Russell-Hedstrom</u>	Affiliation: <u>Skeo Solutions</u>
Subject Name: <u>David Hinrichs, PG</u>	Affiliation: <u>NewFields</u>
Subject Contact Information: <u>303-378-1388</u>	
Time:	Date: <u>03/19/2013</u>
Interview Location: <u>Email</u>	
Interview Format (circle one):	<u>In Person</u> <u>Phone</u> <u>Email</u> <u>Other:</u>

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**Interview Category: O&M Contractor/Feasibility Study Project Manager**

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

The cleanup is essentially finished except for future groundwater work in Belden that will be guided by the Feasibility Study, in progress. The site is in O&M. Developers have purchased the land and that could fall under “reuse.”

2. What is your assessment of the current performance of the remedy in place at the Site?

CTP cap – good. CTP groundwater extraction needs work that will be undertaken this summer. WTP is reaching the end of its operational lifetime and requires continuous attention. Pipeline is functioning as designed but needs regular maintenance to prevent clogging with scale. Mine pool – good, lowest level since 2008. Seep collection – good with occasional upsets due to weather or piping malfunctions. Liberty interception – good.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

CTP groundwater and mine pool metal concentrations have dropped with time. The River may exceed criteria in March and April if snowpack is above normal – these levels fluctuate with the season. See FS.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

See Environ, NewFields provides periodic or seasonal O&M of seep collection, tunnels, piping, and pumping facilities.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

Groundwater sampling was dropped in 2006 with no decrease in effectiveness. Surface water sampling has increased over the last several years with the addition of sample results from

other Stakeholders and focused sampling during the Spring. The WTP and pipeline are requiring more maintenance each year as the systems age.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

The WTP and pipeline are requiring more maintenance each year as the systems age, resulting in extra costs.

7. Have there been opportunities to optimize O&M activities or sampling efforts?

NewFields and EPA and CDPHE optimize the sampling program each year in January to improve the efficiency and limit the waste of money.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

No.

## **Community Notification and Involvement**

(Summary provided by Community Involvement Coordinator Jennifer Chergo)

A display ad was published in the Vail Daily on March 6, 2013 to announce the five-year review and to invite public input.

EPA and CDPHE staff hosted a stakeholder meeting on April 9, 2013 at the Eagle County Building. The meeting was announced to members of the Eagle River Watershed Council, Eagle River Water and Sanitation District, and Eagle River Watershed Council, Eagle Mine, Ltd., and others. The intention of the meeting was to discuss a number of issues at the Eagle Mine site, one of which was to discuss the five-year review process and opportunities for public input.

The EPA Community Involvement Coordinator conducted five-year review interviews with sixteen individuals, and the EPA Eagle Mine Site Project Manager attended a number of those interviews. The interviewees represented a broad spectrum of interests, including local elected officials, environmental groups, state officials, local residents, and business representatives. These interviews are valuable to the five-year review process, providing a forum for individual, two-way conversations between the agencies and the stakeholders about the site. During the interviews, respondents have an opportunity to provide their views regarding the Eagle Mine cleanup and its continued protectiveness. Often, EPA and CDPHE discover new information from these interviews to be considered in the five year review.

Overall, the interviewees feel that the Eagle Mine remedy has been successful and that there has been much improvement over the last 20-30 years. One noted that they were impressed with how things have been handled. A couple interviewees pointed out how beneficial the NRDS projects have been for the river and the community. However, interviewees generally indicated that there is still much work to be done and that the remedy should go much further than it does. For instance, although one interviewee noted that there has been a recovery in the sculpin population, showing much progress, another pointed out that the fish populations still show evidence of metals impacts, indicating that more should be done. One interviewee noted that the cleanup has been very beneficial aesthetically, and the rocks are not stained anymore and the river no longer runs orange. Still, a number of interviewees stated that the remedy needs to do more and it does not really fix the problem in the long term, it's just maintaining the problem rather than fixing it for good.

A number of interviewees felt that progress and activity at the site has slowed significantly since 2008 and that there seemed to be many more spills and incidents at the Eagle Mine site than there used to be. One interviewee noted that when the remedy is working, it's working fine, but the current remedy must be improved to avoid spills and incidents. Another interviewee concurred noting that things at the site seem to keep falling apart and site visits keep resulting in more things to be done. The interviewee adds that the site is still a "timebomb" due to mine adits filling, tailings remaining, monitoring issues, etc.

There were many different perspectives among the interviewees regarding whether or not they thought the remedy was protective of human health and the environment. Many said they thought it seemed protective, or mostly protective for both. Some said it seemed protective for

human health, but not for the environment because of the ongoing fish impacts. Some said the opposite, that is seemed to be protective of the environment but not human health because of the continued metals discharges into the Eagle River. There was no consensus among the interviewees on this topic.

There was widespread agreement among the interviewees that the local community has very little awareness to no awareness of the Eagle Mine site. One interviewee mentioned that most old-timers say the mine site and river are better than they used to be. The interviewees also generally agreed that if people in the community hear about the Eagle Mine site, it's typically only when the local paper reports a spill or incident. The interviewees also generally agreed that people in the community do pay attention when water quality or appearance is impacted. One interviewee noted that anglers have some questions about the fish in the Eagle River. The interviewee said that the anglers have many misconceptions about the metals and their toxicity to fish and to humans. A couple of interviewees noted that the remedy is particularly important to people in Minturn because the site is the location of their future water supply.

In every case, with just one exception, the interviewees said that they are aware of trespassing on the Eagle Mine site. Interviewees said people frequently walk or ski on the railroad tracks, rock climb in the area between Red Cliff and Belden, and kayak the rivers. Interviewees suggested a number of possible solutions including improving security where there is now little or none. One interviewee suggested that authorized people might put signs in their car windows to make unauthorized cars obvious. Another suggestion was for the property owners and regulators to give more guided public tours to skiers and others so they would be less likely to trespass on their own. Most interviewees seemed concerned primarily for the safety of people who trespass in or near the mine workings.

The interviewees all had a number of individual concerns and suggestions that are grouped together as follows:

- **Site features:** There were a couple of questions about the wastepile in Gilman and a concern about WRP # 8. There was a comment that there is a new ice-free stretch of river just downstream of the outflow above Two Elk confluence that should be investigated. There was a question about whether runoff coming from over or under the Belden wall might be contributing metals to the river. There was a suggestion that source areas should be sampled next time there is a large spring runoff, because there hasn't been one in years. There was a comment that the trestle leaks orange icicles in winter and that fishermen have seen the CTP leaking. There was some continued concern about the stability of Belden cribbings.
- **Site Maintenance and Monitoring:** There were a number of concerns about inadequate site maintenance and monitoring. One interviewee said the links between sources of contamination and leaks are poorly identified so it is uncertain where ongoing contamination is occurring. One interviewee stated that right now there is just "deferred maintenance" rather than proactive maintenance that anticipates problems. One interviewee suggested more innovative and proactive monitoring is in order, such as a

“mobile lab”. A couple of interviewees had concerns about the CBS data – that it’s poorly attributed and not collected in real time.

- **Water Treatment Plant:** A number of interviewees had concerns about the water treatment plant and conveyance system. A concern was raised about how the pipeline needs to be a better protected and not lying on the ground. One interviewee noted that the water treatment plant design is outdated and there are maintenance issues and the staff there is inadequate. Another commented that the new staff at the water treatment plant is good to work with, considering the resources and staffing available to them. There were a couple of questions about whether there would be enough sludge space left in the water treatment plant cell. There was concern about operational problems at the water treatment plant and inadequate maintenance of the conveyance system. There were some questions about whether the water treatment plant was going to be moved.
- **Spills and Incidents:** Almost all interviewees seemed to feel that the frequency of spills and incidents has increased in the past few years. A couple of interviewees noted that the reporting of spills and incidents has improved. One interviewee said there was still concern about timely notification. Further, the interviewee continues to be concerned that the notification system for spills and incidents remains inadequate and suggested some kind of alarm system or other means. One interviewee suggested there should be a feedback loop on the call down tree for spills and incidents so people on the call down tree are informed not just of the spill but also the outcome. There was a question about why none of the previous spills and incidents at the site have resulted in enforcement actions.
- **Other:** There was a question about whether there are small sources of metals outside the site boundaries and whether they would ever be addressed. There were a couple of suggestions for more public tours and informational displays for the public about the site. One interviewee suggested an informational/educational display about Eagle Mine at the Lionshead Lake, where the water treatment plant is easy to see.

Almost all of the interviewees agreed that the local community would probably get most of its information about the Eagle Mine from the Vail Daily. Other suggestions for communicating with the local community about issues and activities at the Eagle Mine site included: the Red Cliff community board, weekly email updates to stakeholders, the TAG Website, KSKI radio station, Facebook, Eagle Mine public tours, hosting an open house occasionally in the summer in the amphitheater, Waterwise Wednesdays, and KZYR radio station.

A few interviewees suggested that continued communication from the regulators to the stakeholders would be very useful. Some interviewees felt that communication from the regulators has declined in the past five years. The interviewee suggested a more holistic type of communication led by a facilitator or “central watershed coordinator” that would focus on the Eagle Mine site as well as other watershed issues and interests, as they are all connected. The interviewee felt that EPA and CDPHE needed to do a better job communicating to the broader stakeholders and that too much time was spent communicating reactively to special interests. A comment was made that certain interests in the watershed create an acrimonious atmosphere and

further the need for a facilitator and an effort to reach out to a broader audience. In addition, it was suggested that the communication about the site should come more often directly from the regulators, rather than through local groups. There was a desire by one interviewee to be involved earlier, before decisions are made and for communication to be more timely.



**EAGLE RIVER  
WATER & SANITATION DISTRICT**

846 Forest Road • Vail, Colorado 81657  
(970) 476-7480 • FAX (970) 476-4089  
www.erwsd.org

July 5, 2013

United States Environmental Protection Agency  
Les Sims, Remedial Project Manager  
Jennifer Chergo, EPA Community Involvement Coordinator  
US EPA, Region 8  
1595 Wynkoop Street (8EPR-SR)  
Denver, CO 80202-1129

Dear Jennifer and Les,

First, I want to thank you for making the time to meet Bob Weaver and I as part of your Eagle Mine Superfund Site 5-year review process. We know you are busy and are most appreciative of your flexibility in creating the time, and your patience in listening to our concerns on behalf of the Eagle River Water Users group (ERWU), which includes Vail Resorts, Eagle River Water and Sanitation District (ERWSD), and Upper Eagle Regional Water Authority (UERWA).

We thought it would be helpful to summarize what we felt were our key points with regard to the effectiveness of the existing remedy and the current state of operations and maintenance at the site. The Eagle River Water Users and the communities we serve rely heavily on the Eagle River as a source of drinking, irrigation and snowmaking water and as a resource that supports our tourism and recreation based economy. Incidents involving the discharge or contaminants have been occurring with increased frequency at the Eagle Mine Superfund and threaten the safety of the public drinking water supply and the local resort-based economy. The following key issues remain unresolved since the last 5-year review:

- Water Quality Table Standards were relaxed in 2008, yet continue to be exceeded in segments 5a, 5b, and 5c of the Eagle River;
- We are satisfied with the expertise of the new operational contractor, Environ, but have continuing concerns relative to operational funding and staffing, which appear woefully insufficient as noted in recent audits of conveyance systems and the permitted wastewater treatment plant conducted by EPA and CDPHE. (We appreciate your willingness to conduct these audits, both of which were requested by local stakeholders.);
- The lack of ongoing maintenance and proper staffing at the site appears to have resulted in diminished effectiveness of the existing remedy, as indicated by the increasing frequency of spills and incidents that threaten downstream drinking water systems and public health;



WATER, WASTEWATER, OPERATIONS & MANAGEMENT SERVICES



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\* (Letter Recipient(s))

\* (Letter Date)

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- The audit report conducted by CDPHE identified concerns about insufficient redundancy, treatment technology, and alarming and notification systems at the existing Eagle Mine Wastewater Treatment Plant (EMWWTP);
- The Focused Feasibility Study, which was initiated in 2008 to identify additional cleanup measures needed to meet water quality standards, has now been underway for nearly 5 years. Recommendations in the draft version of the report were poorly documented and the evaluation of alternatives failed to demonstrate that the proposed additional remedial actions would result in sufficient contaminant load reductions to meet water quality standards. The status of this important document remains in limbo;
- Notification of spill events at the site typically come from the public rather than Eagle Mine staff due to insufficient staffing and monitoring of existing facilities. As a result of this lack of oversight, our water treatment plant operators must make decisions relative to public drinking water supplies on the fly or after-the-fact due to lack of notice when incidents have occurred at the site; and
- While the fishery has shown signs of recovery, the failure to meet even relaxed stream standards for aquatic life continues to be a significant concern to Eagle River stakeholders.

At our meeting, Les requested data to support our contention that Eagle Mine site is threatening treatment processes in the UERWA plants. I am attaching a pared-down list of metals results from the E-22 monitoring site on the Eagle River, downstream of the EMWWTP, including a correlation showing peaking metals concentrations to the UERWA's Avon Drinking Water Facility. It is worth noting that the Eagle River is joined by Gore Creek below the E-22 site and metals are diluted by Gore Creek's typically low metals levels. As you know Kennedy-Jenks Consultants are currently developing a report which quantifies the ADWF's ability to treat background contaminants. We are confident that increased metals loading events shown here at 8-fold the background levels will be determined to overwhelm the design parameters of this facility and support the plant shut down events that have occurred with increasing frequency in the last 5 years. A non-exhaustive list of those events is also attached. We are also attaching data which shows the numerous Zinc, Copper and Cadmium exceedences from the Eagle Mine site in the recent past, which continue to threaten aquatic life in this segment of the Eagle River.

One of the primary objectives of the original cleanup at the Eagle Mine was to restore a viable brown trout fishery to the Eagle River. The remedy was not focused on human health concerns because the aquatic life water quality standards for the trace metals originating at the site were generally more stringent than the water supply standards. However, it appears that risks to human health associated with rapidly occurring spikes in metals concentrations that interfere with the disinfection processes at downstream treatment plants was not considered. We feel that it is critically important to address this issue in the 5-year review process.

I'd like to reiterate our perspective that we are all working towards the same goal of protecting the natural environment and public health. Our comments are not meant to be merely critical, but to also

\* (Letter Recipient(s))

\* (Letter Date)

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support the EPA's goal of achieving its mission which is our mission too. We have been raising these concerns frequently over the last several years but have been disappointed by the lack of responsiveness from CBS and the regulatory agencies responsible for overseeing the site. The 5-year review process provides an opportunity to address the issues outlined herein, and we greatly appreciate your efforts to address our concerns. Please contact me with any questions, and thank you again for the opportunity to provide input.

Sincerely,

Todd Fessenden  
Director of Operations  
ERWSD

## **Eagle Mine Spills and Releases Causing Public Drinking Water System Disruption 2008 - 2013**

12/2009 - Eagle Mine WWTP releases untreated discharges from a sludge bed/clarifier directly into the Eagle River. **ERWSD notified by Town of Minturn residents who see river flowing orange.**

12/22/09 - A holding pond associated with the Eagle Mine Water Treatment Plant is breached. The water flows at approximately 145 gallons per minute and overtops the berm of the lower surge pond and flows into the storm channel leading to the Eagle River. **ERWSD hears of the spill before CDPHE and shuts drinking water treatment facility intakes.**

12/24/2009 – Pipeline in trestle freezes and mine begins to fill. Notified by Colorado Department of Public Health and Environment that the mine would probably spill soon, and that CBS staff won't be around for holidays to notify us. ERWSD performed sampling and analysis at request of Colorado Department of Public Health and Environment, CBS refused to pay the cost of said sampling.

12/31/09 - Eagle Mine trunk pipe overflowed out of concrete overflow chamber. We continued to sample this from 12/31/09 to 2/3/10. Notified by EMWWTP operator.

1/8/11 - Release from Eagle Mine pipeline. It was a leaking OTP manhole by Eagle Mine staff. Release was first observed at 0800 on 1/8/11, and the release was stopped at 0930. Release did not reach the river.

3/2/12 - Spill occurred on Eagle Mine property starting mid February, leak from Belden Tip Top pipe first reported by **Minturn Town Manager**. Roughly 40,000 gallons released.

10/23/12 - Seep from interceptor ditch at CTP reported by **fisherman**. It was discovered that one of three pumps had failed in the ditch.

10/27/12 - Informed of partially treated water from treatment plant released to the Eagle River by Environ. 49,500 gallons released.

11/28/12 – **Passerby** notified Colorado Department of Public Health and Environment of Eagle River showing a green discoloration. Suspect an Eagle Mine release. That type of discoloration had been identified in other releases. Release occurred over a two day period, 428,000 gallons.

5/15/13 - Run off near Old Tailings Pile tailings pile reported by **hiker**. The runoff enters a ditch or channel and migrates to the Eagle River, pH lower than stream standards allow.

Eagle Mine Site E22 Water Quality Data, Dissolved Metals (ug/L)

Reporting limits: 1 1 1 0.1 0.5 1

Date	Sample Time	Water Temp C	Measured Surface Water Concentration			Calculated	Measured Surface Water Concentration			Calculated Water Quality Standard			Measured Surface Water Concentration			Calculated Water Quality Standard		
			Ca (mg/L)	Mg (mg/L)	Hardness (mg/L)		Cd	Cd (ch)	Cd (ac)	Cu	Cu (ch)	Cu (ac)	Zn	Zn (ch)	Zn (ac)			
04/02/08	0910	0.5	29	14	130	0.9	1.85	2.14	3.2	10.43701	23.19272	362	219.2	257.9				
04/09/08	0925	2.0	27	12	117	1.6	1.70	1.95	7.6	9.797231	20.87812	523	200.0	235.3				
04/16/08	0745	1.0	26	10	106	1.7	1.58	1.79	9.6	9.25603	18.99655	519	184.2	216.7				
04/23/08	0805	6.0	24	8	93	1.4	1.43	1.60	9.9	8.556915	16.67197	341	164.4	193.4				
05/01/08	0840	4.0	24	8	93	0.6	1.43	1.60	9.7	8.556915	16.67197	143	164.4	193.4				
10/29/08	0912	31	13	131	0.1	1.86	2.15	0.25	10.4784	23.34581	74	220.4	259.4					
11/11/08	0845	1.5	25	10	104	0.7	1.56	1.76	1	9.126948	18.55828	71	180.5	212.4				
12/09/08	0831	0	31	13	131	0.1	1.86	2.15	1	10.4784	23.34581	75	220.4	259.4				
01/14/09	0818	0.5	30	13	128	0.1	1.83	2.12	0.8	10.3601	22.90939	80	216.8	255.1				
02/11/09	0831	0	32	16	148	0.2	2.01	2.37	0.005	11.16373	25.93812	130	241.6	284.3				
03/03/09	0840	1.4	30	13	128	0.5	1.83	2.12	5	10.3601	22.90939	170	216.8	255.1				
03/10/09	0932	1.0	47	14	175	0.4	2.31	2.77	2.2	12.43344	31.02354	180	282.4	332.2				
03/17/09	1505	6.5	32	13	133	0.3	1.88	2.19	2.7	10.59578	23.78206	159	224.0	263.6				
03/24/09	0902	0.6	28	11	115	0.6	1.69	1.93	5.3	9.716843	20.59417	269	197.6	232.5				
04/07/09	0705	0.2	30	13	128	0.5	1.83	2.12	6.5	10.3601	22.90939	231	216.8	255.1				
04/14/09	0920	3.2	22	8	88	0.5	1.37	1.52	5.7	8.282505	15.79283	213	156.8	184.5				
04/21/09	0835	2.2	20	8	83	0.3	1.31	1.45	4.9	8.001616	14.9127	131	149.2	175.5				
04/28/09	1004	3.3	17	6	67	0.4	1.12	1.20	6.6	7.067915	12.13375	121	124.7	146.7				
05/12/09	1010	5.4	15	5	58	0.7	1.00	1.06	4.5	6.485563	10.5179	38	110.1	129.5				
06/09/09	0720	5.9	16	6	65	0.1	1.09	1.17	3.4	6.911741	11.69142	19	120.7	142.0				
07/14/09	0952	10.9	14	4	51	0.1	0.92	0.95	1.6	6.038929	9.341709	84	99.3	116.8				
08/11/09	1335	15.2	22	8	88	0.1	1.37	1.52	2.0	8.282505	15.79283	43	156.8	184.5				
09/16/09	0740	10	30	10	116	0.1	1.70	1.94	1.9	9.760342	20.74763	61	198.9	234.0				
10/13/09	1315	8.7	24	9	97	0.1	1.48	1.66	2.0	8.778664	17.39619	58	170.6	200.7				
11/10/09	1015	2.2	27	10	109	0.2	1.81	1.83	1.9	9.383671	19.43461	91	187.9	221.1				
12/08/09	1320	0.8	33	13	138	0.2	1.91	2.23	1.3	10.71226	24.21815	142	227.6	267.8				
01/12/10	0855	0.7	31	13	131	0.2	1.86	2.15	1	10.4784	23.34581	129	220.4	259.4				
02/09/10	0915	0.4	38	16	161	0.2	2.17	2.58	2.1	11.82663	28.54797	139	262.6	309.0				
02/20/10	1129	1.1	36	16	156	0.3	2.12	2.51	6.2	11.6086	27.67858	148	255.7	300.8				
02/26/10	1502	0.3	37	16	158	0.1	2.14	2.54	3.4	11.71797	28.11334	138	259.2	304.9				
03/05/10	1147	-0.5	39	16	163	0.3	2.19	2.61	5.6	11.9346	28.96246	168	266.1	313.1				
03/09/10	1136	3.8	38	15	157	0.1	2.12	2.52	2.5	11.64705	27.83112	160	256.9	302.3				
03/18/10	1245	4.0	41	17	172	0.2	2.28	2.74	3.3	12.323	30.56889	188	278.8	328.0				
03/22/10	0845	1.5	45	18	186	0.2	2.42	2.93	2.8	12.90802	33.01644	179	298.1	350.8				
03/26/10	1136	1.3	38	15	157	0.3	2.12	2.52	2.9	11.64705	27.83112	213	256.9	302.3				
03/30/10	0820	1.4	37	15	154	0.3	2.10	2.48	3.8	11.53721	27.39626	198	253.4	298.1				
04/01/10	0820	2.2	32	13	133	0.3	1.88	2.19	3.9	10.59578	23.78206	224	224.0	263.6				
04/05/10	0735	2.4	34	14	143	0.4	1.98	2.32	3.7	11.01666	25.37268	222	237.0	278.9				
04/07/10	1401	4.1	33	14	140	0.3	1.95	2.28	3.5	10.90245	24.937	196	233.5	274.7				
04/09/10	1240	2.4	33	14	140	0.3	1.95	2.28	3	10.90245	24.937	218	233.5	274.7				
04/14/10	1415	7.1	19	8	80	0.5	1.28	1.41	11	7.858572	14.47224	244	145.3	171.0				
04/15/10	1210	3.7	19	7	76	0.5	1.23	1.35	5.3	7.618618	13.74524	188	139.0	163.5				
04/16/10	1423	5.4	15	5	58	0.3	1.00	1.06	6	6.485563	10.5179	132	110.1	129.5				
04/21/10	1023	2.4	19	7	76	0.3	1.23	1.35	7.8	7.618618	13.74524	135	139.0	163.5				
04/27/10	1108	4.1	15	6	62	0.3	1.06	1.13	6.2	6.753072	11.24874	110	116.7	137.3				
05/04/10	1258	5.6	22	8	88	0.4	1.37	1.52	5.3	8.282505	15.79283	138	156.8	184.5				
05/11/10	1300	5.9	18	6	70	0.1	1.15	1.24	6.9	7.221723	12.57577	93	126.6	151.3				
05/18/10	0825	6.0	18	6	70	0.7	1.15	1.24	7	7.221723	12.57577	99	126.6	151.3				
05/25/10	1315	6.6	18	6	70	0.7	1.15	1.24	4.3	7.221723	12.57577	62	126.6	151.3				
06/01/10	1255	7.8	14	4	51	1.0	0.92	0.95	4.1	6.038929	9.341709	24	99.3	116.8				
07/19/10	959	12.8	25	7	91	0.1	1.41	1.57	2.4	8.468523	16.36872	45	161.9	190.6				
08/19/10	1233	15.8	25	8	95	0.7	1.46	1.64	2.1	8.691846	17.11118	53	168.2	197.9				
09/24/10	0835	6	26	9	102	0.1	1.54	1.73	3.4	9.042466	18.27365	80	178.1	209.5				
10/25/10	750	5.1	25	10	104	0.2	1.56	1.76	3.1	9.126948	18.55828	85	180.5	212.4				
11/09/10	0920	2.4	26	10	106	0.1	1.58	1.79	3.1	9.25603	18.99655	87	184.2	216.7				
12/14/10	0850	1.5	30	12	124	0.1	1.78	2.06	1.8	10.16293	22.18928	96	210.9	248.1				
01/11/11	1045	0.2	32	12	129	0.2	1.84	2.13	3.2	10.40171	23.06251	93	218.1	256.6				
02/22/11	1310	3	40	16	166	0.2	2.22	2.65	3.1	12.0419	29.41682	162	269.6	317.2				
03/01/11	1259	2.4	37	17	162	0.2	2.18	2.60	2	11.8968	28.83004	156	264.9	311.7				
03/08/11	1457	3.1	29	15	134	0.1	1.89	2.20	4.7	10.63062	23.91219	145	225.1	264.8				
03/15/11	1357	3.6	33	13	136	0.4	1.91	2.23	4.4	10.71226	24.21815	203	227.6	267.8				
03/22/11	1349	2.5	29	11	118	0.8	1.71	1.96	8.0	9.840482	21.03153	358	201.3	236.8				
03/29/11	1200	2	27	11	113	0.7	1.86	1.89	9.6	8.5521	20.15663	298	194.0	228.2				
04/05/11	1115	2	29	12	120	0.9	1.74	2.00	8.3	9.952879	21.43228	371	204.6	240.7				
04/12/11	1213	3.5	24	10	101	1.0	1.53	1.72	10.1	8.990915	18.10083	357	176.6	207.8				
04/19/11	1047	2.4	19	8	81	0.8	1.29	1.42	10.0	7.893855	14.58039	291	146.3	172.1				
04/26/11	1334	3.3	24	9	96	0.9	1.47	1.64	13.1	8.725713	17.22214	306	169.1	199.0				
05/03/11	1607	6.3	26	10	105	0.9	1.57	1.78	9.9	9.199217	18.80315	272	182.6	214.8				
05/10/11	1052	2.8	18	7	73	0.4	1.19	1.30	9.0	7.424326	13.16757	129	133.9	157.5				
06/14/11	1016	16.7	14	4	53	0.1	0.94	0.98	2.8	6.146969	9.621124	20	101.8	119.8				
07/12/11	1016	8.6	9	3	34	0.4	0.67	0.67	4.1	4.731171	8.226809	24	69.7	82.0				
08/16/11	1102	12.8																

Notes:

Metals standards based on the following equations:  
 Zn (ch) = 0.986\*EXP(0.8537\*LN(hardness)+1.2481)  
 Zn (ac) = 0.978\*EXP(0.8537\*LN(hardness)+1.4189)  
 Cu (ch) = 0.96\*EXP(0.5897\*(LN(hardness))-0.4845)  
 Cu (ac) = 0.96\*EXP(0.9801\*(LN(hardness))-1.5855)  
 Cd (ch) = (1.101672\*(LN(hardness)+0.041838))\*EXP(0.7998\*(LN(hardness))-3.1725)  
 Cd (ac) = (1.136672\*(LN(hardness)+0.041838))\*EXP(0.9151\*(LN(hardness))-3.6236)

Italicized values were reported as non-detections. The value listed in this table is 1/2 the detection limit.  
 Red font indicates an exceedance of the calculated water quality standard for the constituent shown.

QA/QC:

Check on Zn (ac) using Regulation 31 TVS equation and Table IV Hardness of 100 160.0  
 Check on Cu (ch) using Regulation 31 TVS equation and Table IV Hardness of 100 9.0  
 Check on Cd (ac) (trout) Regulation 31 TVS equation and Table IV Hardness of 100 1.7

93.3

Keith Kepler, Board President  
ERWC - Eagle Mine Ltd.  
111 Swift Gulch Road, Suite 300  
Avon, CO 81632

May 24, 2013

Jennifer Chergo  
US EPA  
Region VIII - 80C  
1595 Wynkoop Street  
Denver, CO 80202

Dear Jennifer,

Thank you for coming to Avon to meet with ERWC - Eagle Mine Ltd. regarding the five year review. It was most helpful for us to gain a better understanding of the process for moving forward with the cleanup of the Eagle Mine.

Prior to 2008, a great deal was accomplished to cleanup the mine. Since 2008, the challenge has been to further the cleanup process and reduce the zinc load by at least 40 pounds per day. This amount of reduction in load has been cited as necessary to bring the Eagle River into compliance with the Stream standards adopted by the Water Quality Control Commission nearly five years ago.

Over the past five years, a major focus has been to study the various problems at the mine, pipeline, and treatment plant. Currently, an emergency response plan is being reviewed. This plan has been needed and requested for several years now, and was a major focus of a meeting of local water interests, CDPHE and EPA in February 2010. We are hopeful that an acceptable plan will result in the very near future.

Over the past few years, there have been several problems with the pipeline that connects the mine to the treatment plant. An audit of that pipeline has been completed, and some of the recommendations from that plan have been implemented. What remains to be accomplished is a plan for continued maintenance and improvements in order to prevent future spills or plugging.

We understand that operations of the treatment plant have improved significantly with the current operators. At the same time, there appears to be a need for upgrades and improvements to the facility

Monitoring at the site has generally not been sufficient to detect when and where spills occur. It seems that over the past 5 years, spills have been detected by citizens more often than by the contractors. This raises concerns that some spills may go undetected and thus unreported. Sudden increases in pollutant levels that may

occur as a result of a spill are of great concern to those who divert water for municipal use.

While the quality and annotation of water quality data collected by the contractors seems to be improving, confidence in past data is low due to poor data management or incorrect or missing metadata. The quality and utility of data is critical to the analysis of problems and solutions.

The Focused Feasibility Study currently in process is intended to determine the most practical method to reduce the loading of zinc, copper and cadmium to the Eagle River to meet the current stream standards. This study has been underway for several years. The first draft was offered by representatives of the responsible party in 2011, and comments were submitted by ERWC - EML in October 2011. We commented that the first draft of the FFS lacked clear and compelling evidence regarding the sources of contamination and that the link between the data and the conclusions reached in the evaluation of alternatives seemed weak. For this reason, stakeholders are concerned about the effectiveness of future remedies.

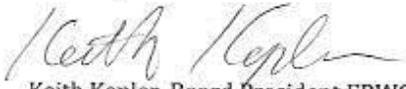
We understand that a second draft of the FFS is currently under review by the State and EPA. We hope that the concerns expressed in our prior comments are addressed. Further progress is needed to finalize a plan and implement the improvements needed.

The responsible party and their consultants seem to be moving at a slow pace in conducting the studies necessary to move forward with actual solutions to the problem. The Emergency Response Plan that is now being reviewed is an example of how slow progress has been. The emergency response plan is not only important, but also urgent. In February 2010 we met in Denver with the CDPHE and EPA and stressed the need for such a plan. Only now, three years later, do we have a draft of sufficient substance to be offered for review.

Our meetings with EPA and CDPHE have helped us to understand the process. We understand that the EPA, with input from CDPHE, must arrive at a record of decision and then seek a Consent Decree to make those determinations enforceable. Until such time as that is accomplished, EPA and CDPHE can only ask for improvements to be made and have little leverage to require the improvements or set a timetable for such improvements.

We would again like to thank EPA and CDPHE for the recent meetings that we have had and the information that you have provided. It is of great assistance to us to understand the process and to be informed of progress. ERWC - Eagle Mine Ltd. appreciates the opportunity to express our concerns and hopes we can move forward to achieve a higher water quality in the Eagle River.

Sincerely,

A handwritten signature in cursive script that reads "Keith Kepler".

Keith Kepler, Board President ERWC – Eagle Mine Ltd.

cc. Les Sims, US EPA  
Wendy Naugle, CDPHE

## Appendix D: Site Inspection Checklist

<b>FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST</b>															
<b>I. SITE INFORMATION</b>															
<b>Site Name: Eagle Mine</b>		<b>Date of Inspection: 2/12/2013 and 5/10/2013</b>													
<b>Location and Region: Minturn, CO Region 8</b>		<b>EPA ID: COD081961518</b>													
<b>Agency, Office or Company Leading the Five-Year Review: EPA Region 8</b>		<b>Weather/Temperature: 2/12/2013: sunny, 35°F 5/10/2013: sunny, 65°F</b>													
<b>Remedy Includes:</b> (Check all that apply) <table style="width: 100%; border: none;"> <tr> <td><input checked="" type="checkbox"/> Landfill cover/containment</td> <td><input type="checkbox"/> Monitored natural attenuation</td> </tr> <tr> <td><input checked="" type="checkbox"/> Access controls</td> <td><input type="checkbox"/> Ground water containment</td> </tr> <tr> <td><input checked="" type="checkbox"/> Institutional controls</td> <td><input type="checkbox"/> Vertical barrier walls</td> </tr> <tr> <td><input type="checkbox"/> Ground water pump and treatment</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> Surface water collection and treatment</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Other:</td> <td></td> </tr> </table>				<input checked="" type="checkbox"/> Landfill cover/containment	<input type="checkbox"/> Monitored natural attenuation	<input checked="" type="checkbox"/> Access controls	<input type="checkbox"/> Ground water containment	<input checked="" type="checkbox"/> Institutional controls	<input type="checkbox"/> Vertical barrier walls	<input type="checkbox"/> Ground water pump and treatment		<input checked="" type="checkbox"/> Surface water collection and treatment		<input type="checkbox"/> Other:	
<input checked="" type="checkbox"/> Landfill cover/containment	<input type="checkbox"/> Monitored natural attenuation														
<input checked="" type="checkbox"/> Access controls	<input type="checkbox"/> Ground water containment														
<input checked="" type="checkbox"/> Institutional controls	<input type="checkbox"/> Vertical barrier walls														
<input type="checkbox"/> Ground water pump and treatment															
<input checked="" type="checkbox"/> Surface water collection and treatment															
<input type="checkbox"/> Other:															
<b>Attachments:</b> <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached															
<b>II. INTERVIEWS</b> (check all that apply)															
1. <b>O&amp;M Site Manager</b>	<u>David Heinze</u> Name	<u>Senior Manager</u> Title	<u>03/14/2013</u> Date												
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone    Phone: _____ Problems, suggestions <input checked="" type="checkbox"/> Report attached: see Appendix C															
2. <b>O&amp;M Site Manager</b>	<u>David Hinrichs</u> Name	<u>Senior Geologist</u> Title	<u>03/19/2013</u> Date												
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone    Phone: _____ Problems/suggestions <input checked="" type="checkbox"/> Report attached: see Appendix C															

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 Wendy Naugle Engineer/Hydr 04/17/2013 303-692-3394  
 Name Title Date Phone No.

Problems/suggestions  Report attached: see Appendix C

Agency \_\_\_\_\_  
 Contact \_\_\_\_\_ Name \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_ Phone No. \_\_\_\_\_

Problems/suggestions  Report attached: \_\_\_\_\_

Agency \_\_\_\_\_  
 Contact \_\_\_\_\_ Name \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_ Phone No. \_\_\_\_\_

Problems/suggestions  Report attached: \_\_\_\_\_

Agency \_\_\_\_\_  
 Contact \_\_\_\_\_ Name \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_ Phone No. \_\_\_\_\_

Problems/suggestions  Report attached: \_\_\_\_\_

Agency \_\_\_\_\_  
 Contact \_\_\_\_\_ Name \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_ Phone No. \_\_\_\_\_

Problems/suggestions  Report attached: \_\_\_\_\_

4. **Other Interviews** (optional)  Report attached: see Appendix C

Les Sims, EPA PRM

Mike Jackson, Landowner

**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: \_\_\_\_\_

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.	<b>Permits and Service Agreements</b>	<input type="checkbox"/> Air discharge permit	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
		<input checked="" type="checkbox"/> Effluent discharge	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
		<input type="checkbox"/> Waste disposal, POTW	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
		<input checked="" type="checkbox"/> Other permits: <u>Liberty Well discharge permit</u>	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
	Remarks: _____				
5.	<b>Gas Generation Records</b>		<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: _____				
6.	<b>Settlement Monument Records</b>		<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
	Remarks: <u>2010 Annual</u>				
7.	<b>Ground Water Monitoring Records</b>		<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
	Remarks: _____				
8.	<b>Leachate Extraction Records</b>		<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: _____				
9.	<b>Discharge Compliance Records</b>				
	<input type="checkbox"/> Air	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A	
	<input checked="" type="checkbox"/> Water (effluent)	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A	
	Remarks: _____				
10.	<b>Daily Access/Security Logs</b>		<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: <u>Facility is secured.</u>				
<b>IV. O&amp;M COSTS</b>					
1.	<b>O&amp;M Organization</b>				
	<input type="checkbox"/> State in-house	<input type="checkbox"/> Contractor for state			
	<input type="checkbox"/> RP in-house	<input checked="" type="checkbox"/> Contractor for RP			
	<input type="checkbox"/> Federal facility in-house	<input type="checkbox"/> Contractor for Federal facility			
	<input type="checkbox"/> _____				

2.	<b>O&amp;M Cost Records</b>	<input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> Funding mechanism/agreement in place <input checked="" type="checkbox"/> Unavailable Original O&M cost estimate: _____ <input type="checkbox"/> Breakdown attached	
		Total annual cost by year for review period if available	
	From: <u>mm/dd/yyyy</u> Date	To: <u>mm/dd/yyyy</u> Date	_____ Total cost <input type="checkbox"/> Breakdown attached
	From: <u>mm/dd/yyyy</u> Date	To: <u>mm/dd/yyyy</u> Date	_____ Total cost <input type="checkbox"/> Breakdown attached
	From: <u>mm/dd/yyyy</u> Date	To: <u>mm/dd/yyyy</u> Date	_____ Total cost <input type="checkbox"/> Breakdown attached
	From: <u>mm/dd/yyyy</u> Date	To: <u>mm/dd/yyyy</u> Date	_____ Total cost <input type="checkbox"/> Breakdown attached
	From: <u>mm/dd/yyyy</u> Date	To: <u>mm/dd/yyyy</u> Date	_____ Total cost <input type="checkbox"/> Breakdown attached
<b>3. Unanticipated or Unusually High O&amp;M Costs during Review Period</b>			
Describe costs and reasons: _____			
<b>V. ACCESS AND INSTITUTIONAL CONTROLS</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
<b>A. Fencing</b>			
1.	<b>Fencing Damaged</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A
Remarks: <u>Some barbed wire fencing damage.</u>			
<b>B. Other Access Restrictions</b>			
1.	<b>Signs and Other Security Measures</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
Remarks: <u>Warning signage is adequate. Security cameras were installed to assist with discouraging trespassers and gathering information on trespassers. In addition, the Sherrif's office is regularly patrolling the area to keep trespassers out of the area.</u>			
<b>C. Institutional Controls (ICs)</b>			

1.	<b>Implementation and Enforcement</b>	
	Site conditions imply ICs not properly implemented	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
	Site conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
	Type of monitoring (e.g., self-reporting, drive by): _____	
	Frequency: _____	
	Responsible party/agency: <u>RP</u>	
	Contact _____	<u>mm/dd/yyyy</u> _____
	Name	Title      Date      Phone no.
	Reporting is up to date	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
	Other problems or suggestions: <input checked="" type="checkbox"/> See Section 6.3 of the current report.	
2.	<b>Adequacy</b> <input type="checkbox"/> ICs are adequate <input checked="" type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A	
	Remarks: <u>ICs have not yet been implemented.</u>	
<b>D. General</b>		
1.	<b>Vandalism/Trespassing</b> <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No vandalism evident	
	Remarks: <u>Evidence of trespassing was evident including vandalism at Gilman and Belden, cross-country ski tracks along the road to Belden, campfire rings in the OTP area and some areas with downed barbed wire fences.</u>	
2.	<b>Land Use Changes On Site</b> <input checked="" type="checkbox"/> N/A	
	Remarks: <u>There is a potential for new development that was not anticipated at the time of the decision documents. A new RI/FS is underway to evaluate what remedy changes may be necessary to ensure long-term protection of human health and the environment.</u>	
3.	<b>Land Use Changes Off Site</b> <input checked="" type="checkbox"/> N/A	
	Remarks: _____	
<b>VI. GENERAL SITE CONDITIONS</b>		
<b>A. Roads</b>	<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	<b>Roads Damaged</b> <input checked="" type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A	
	Remarks: <u>Maintained and snowplowed.</u>	
<b>B. Other Site Conditions</b>		
	Remarks: <u>Retaining walls in Belden area in good condition.</u>	
<b>VII. LANDFILL COVERS</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
<b>A. Landfill Surface</b>		

1.	<b>Settlement</b> (low spots)	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Settlement not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
2.	<b>Cracks</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Cracking not evident
	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	<b>Erosion</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	<b>Holes</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	<b>Vegetative Cover</b>	<input type="checkbox"/> Grass	<input checked="" type="checkbox"/> Cover properly established
	<input checked="" type="checkbox"/> No signs of stress	<input type="checkbox"/> Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: _____		
6.	<b>Alternative Cover</b> (e.g., armored rock, concrete)		<input checked="" type="checkbox"/> N/A
	Remarks: _____		
7.	<b>Bulges</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	<b>Wet Areas/Water Damage</b>	<input checked="" type="checkbox"/> Wet areas/water damage not evident	
	<input type="checkbox"/> Wet areas	<input type="checkbox"/> Location shown on site map	Arial extent: _____
	<input type="checkbox"/> Ponding	<input type="checkbox"/> Location shown on site map	Arial extent: _____
	<input type="checkbox"/> Seeps	<input type="checkbox"/> Location shown on site map	Arial extent: _____
	<input type="checkbox"/> Soft subgrade	<input type="checkbox"/> Location shown on site map	Arial extent: _____
	Remarks: _____		
9.	<b>Slope Instability</b>	<input type="checkbox"/> Slides	<input type="checkbox"/> Location shown on site map
	<input checked="" type="checkbox"/> No evidence of slope instability		
	Arial extent: _____		
	Remarks: _____		
<b>B. Benches</b>			
	<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A	
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	<b>Flows Bypass Bench</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
	Remarks: _____		

2.	<b>Bench Breached</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
Remarks: _____			
3.	<b>Bench Overtopped</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
Remarks: _____			
<b>C. Letdown Channels</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			
1.	<b>Settlement</b> (Low spots)	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of settlement
Aerial extent: _____		Depth: _____	
Remarks: _____			
2.	<b>Material Degradation</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of degradation
Material type: _____		Aerial extent: _____	
Remarks: _____			
3.	<b>Erosion</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of erosion
Aerial extent: _____		Depth: _____	
Remarks: _____			
4.	<b>Undercutting</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of undercutting
Aerial extent: _____		Depth: _____	
Remarks: _____			
5.	<b>Obstructions</b>	Type: _____	<input checked="" type="checkbox"/> No obstructions
<input type="checkbox"/> Location shown on site map		Aerial extent: _____	
Size: _____			
Remarks: _____			
6.	<b>Excessive Vegetative Growth</b>	Type: _____	
<input checked="" type="checkbox"/> No evidence of excessive growth			
<input type="checkbox"/> Vegetation in channels does not obstruct flow			
<input type="checkbox"/> Location shown on site map		Aerial extent: _____	
Remarks: _____			
<b>D. Cover Penetrations</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	<b>Gas Vents</b>	<input type="checkbox"/> Active	<input type="checkbox"/> Passive
<input type="checkbox"/> Properly secured/locked		<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled
<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> Good condition
		<input type="checkbox"/> N/A	
Remarks: _____			

2.	<b>Gas Monitoring Probes</b>	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
		<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A	
Remarks: _____					
3.	<b>Monitoring Wells</b> (within surface area of landfill)	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
		<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A	
Remarks: _____					
4.	<b>Extraction Wells Leachate</b>	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
		<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A	
Remarks: _____					
5.	<b>Settlement Monuments</b>	<input type="checkbox"/> Located	<input type="checkbox"/> Routinely surveyed	<input type="checkbox"/> N/A	
Remarks: _____					
<b>E. Gas Collection and Treatment</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A		
1.	<b>Gas Treatment Facilities</b>	<input type="checkbox"/> Flaring	<input type="checkbox"/> Thermal destruction	<input type="checkbox"/> Collection for reuse	
		<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance		
Remarks: _____					
2.	<b>Gas Collection Wells, Manifolds and Piping</b>	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance		
Remarks: _____					
3.	<b>Gas Monitoring Facilities</b> (e.g., gas monitoring of adjacent homes or buildings)	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A	
Remarks: _____					
<b>F. Cover Drainage Layer</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A		
1.	<b>Outlet Pipes Inspected</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A		
Remarks: _____					
2.	<b>Outlet Rock Inspected</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A		
Remarks: _____					
<b>G. Detention/Sedimentation Ponds</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A		
1.	<b>Siltation</b>	Area extent: _____	Depth: _____	<input type="checkbox"/> N/A	
	<input type="checkbox"/> Siltation not evident				
Remarks: _____					

2.	<b>Erosion</b>	Area extent: _____	Depth: _____
	<input type="checkbox"/> Erosion not evident		
	Remarks: _____		
3.	<b>Outlet Works</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks: _____		
4.	<b>Dam</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks: _____		
<b>H. Retaining Walls</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Deformations</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
	Horizontal displacement: _____	Vertical displacement: _____	
	Rotational displacement: _____		
	Remarks: _____		
2.	<b>Degradation</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
	Remarks: _____		
<b>I. Perimeter Ditches/Off-Site Discharge</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Siltation</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
	Area extent: _____	Depth: _____	
	Remarks: _____		
2.	<b>Vegetative Growth</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
	<input type="checkbox"/> Vegetation does not impede flow		
	Area extent: _____	Type: _____	
	Remarks: _____		
3.	<b>Erosion</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
	Area extent: _____	Depth: _____	
	Remarks: _____		
4.	<b>Discharge Structure</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks: _____		
<b>VIII. VERTICAL BARRIER WALLS</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Settlement</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
	Area extent: _____	Depth: _____	
	Remarks: _____		

2.	<b>Performance Monitoring</b>	Type of monitoring: _____
	<input type="checkbox"/> Performance not monitored	
	Frequency: _____	<input type="checkbox"/> Evidence of breaching
	Head differential: _____	
	Remarks: _____	
<b>IX. GROUND WATER/SURFACE WATER REMEDIES</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
<b>A. Ground Water Extraction Wells, Pumps and Pipelines</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	<b>Pumps, Wellhead Plumbing and Electrical</b>	
	<input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells properly operating	<input type="checkbox"/> Needs maintenance <input type="checkbox"/> N/A
	Remarks: _____	
2.	<b>Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances</b>	
	<input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance	
	Remarks: _____	
3.	<b>Spare Parts and Equipment</b>	
	<input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Good condition	<input checked="" type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided
	Remarks: _____	
<b>B. Surface Water Collection Structures, Pumps and Pipelines</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	<b>Collection Structures, Pumps and Electrical</b>	
	<input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> Needs maintenance	
	Remarks: <u>The pipeline delivering water from the collection areas to the WTP is above ground and extends across a long distance. The pipeline frequently has areas in need of repair throughout the year, especially in winter. See report for more details.</u>	
2.	<b>Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances</b>	
	<input type="checkbox"/> Good condition <input checked="" type="checkbox"/> Needs maintenance	
	Remarks: <u>Site inspection participants viewed several issues related to O&amp;M of the conveyance system (see report for more details).</u>	
3.	<b>Spare Parts and Equipment</b>	
	<input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Good condition	<input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided
	Remarks: _____	
<b>C. Treatment System</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		

<p>1. <b>Treatment Train</b> (check components that apply)</p> <p><input checked="" type="checkbox"/> Metals removal                      <input type="checkbox"/> Oil/water separation                      <input type="checkbox"/> Bioremediation</p> <p><input type="checkbox"/> Air stripping                      <input type="checkbox"/> Carbon adsorbers</p> <p><input type="checkbox"/> Filters: _____</p> <p><input checked="" type="checkbox"/> Additive (e.g., chelation agent, <b>flocculent</b>): <u>lime</u></p> <p><input type="checkbox"/> Others: _____</p> <p><input checked="" type="checkbox"/> Good condition                      <input type="checkbox"/> Needs maintenance</p> <p><input checked="" type="checkbox"/> Sampling ports properly marked and functional</p> <p><input checked="" type="checkbox"/> Sampling/maintenance log displayed and up to date</p> <p><input checked="" type="checkbox"/> Equipment properly identified</p> <p><input checked="" type="checkbox"/> Quantity of combined ground and surface water treated annually: <u>176 million gallons</u></p> <p>Remarks: <u>The system was designed to treat 275 gpm. O&amp;M staff indicate that it has achieved up to 400 gpm. In general, it operates at 330-340 gpm. There was a leaking sludge compressor observed during the site inspection.</u></p>
<p>2. <b>Electrical Enclosures and Panels</b> (properly rated and functional)</p> <p><input type="checkbox"/> N/A                      <input checked="" type="checkbox"/> Good condition                      <input type="checkbox"/> Needs maintenance</p> <p>Remarks: _____</p>
<p>3. <b>Tanks, Vaults, Storage Vessels</b></p> <p><input type="checkbox"/> N/A                      <input checked="" type="checkbox"/> Good condition                      <input checked="" type="checkbox"/> Proper secondary containment                      <input type="checkbox"/> Needs maintenance</p> <p>Remarks: <u>CBS improved the storage ponds at the WTP to ensure that the backup storage is sufficient during spring runoff and plant downtime.</u></p>
<p>4. <b>Discharge Structure and Appurtenances</b></p> <p><input type="checkbox"/> N/A                      <input checked="" type="checkbox"/> Good condition                      <input type="checkbox"/> Needs maintenance</p> <p>Remarks: _____</p>
<p>5. <b>Treatment Building(s)</b></p> <p><input type="checkbox"/> N/A                      <input checked="" type="checkbox"/> Good condition (esp. roof and doorways)                      <input type="checkbox"/> Needs repair</p> <p><input checked="" type="checkbox"/> Chemicals and equipment properly stored</p> <p>Remarks: <u>WTP is aging; O&amp;M contractor has implemented preventative maintenance regime; has daily presence on site to address O&amp;M needs; maintains necessary spare parts for repairs. Computer monitoring system provides 24/7 alerts for operating issues.</u></p>
<p>6. <b>Monitoring Wells</b> (pump and treatment remedy)</p> <p><input type="checkbox"/> Properly secured/locked                      <input checked="" type="checkbox"/> Functioning                      <input checked="" type="checkbox"/> Routinely sampled                      <input checked="" type="checkbox"/> Good condition</p> <p><input type="checkbox"/> All required wells located                      <input type="checkbox"/> Needs maintenance                      <input type="checkbox"/> N/A</p> <p>Remarks: <u>Many wells needs to be secured. Wells in Maloit Park need to be secured and/or properly adandoned if no longer needed.</u></p>
<p><b>D. Monitoring Data</b></p>

1. <b>Monitoring Data</b> <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality
2. <b>Monitoring Data Suggests:</b> <input type="checkbox"/> Ground water plume is effectively contained <input checked="" type="checkbox"/> Contaminant concentrations are declining
<b>E. Monitored Natural Attenuation</b>
1. <b>Monitoring Wells</b> (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs maintenance <input checked="" type="checkbox"/> N/A Remarks: _____
<b>X. OTHER REMEDIES</b>
If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
<b>XI. OVERALL OBSERVATIONS</b>
<b>A. Implementation of the Remedy</b> 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). <u>The remedy is designed to meet the remedial action objectives selected in the decision documents. The remedy is currently functioning as designed, but in order to be effective in the long term, a number of actions need to be taken (see report).</u>
<b>B. Adequacy of O&amp;M</b> 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. <u>Developing a compliance monitoring plan, an updated sampling and analysis plan and an updated Quality Assurance Project Plan will allow O&amp;M to occur more smoothly and make the remedy more protective in the long term.</u>
<b>C. Early Indicators of Potential Remedy Problems</b> 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. <u>There is a high frequency of maintenance needed in both the mine water conveyance system and at the WTP, which could compromise the remedy.</u>
<b>D. Opportunities for Optimization</b> Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>The conveyance system and WTP both may need upgrades to ensure long-term efficiency.</u>

February 12, 2013 Site Inspection Team:

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## Appendix E: Photographs from Site Inspection Visit



Gated entrance to WTP with emergency contact sign



WTP monitoring system



R1 tank in WTP



WTP pH monitoring system



Leaking sludge compressor at WTP



WTP effluent



Upper pond. Barrels mark mine drawdown intake pipe.



Lower pond with WTP in background



Sludge cell



Abandoned town of Gilman with WRP 8 covered with snow at left and WRP 7/11 shown on right



Locked gated entrance to Gilman



Abandoned homes in Gilman with WRP 8 in background



Looking up at surface water diversion channel at top of WRP 8



WRP 8 runoff/snow melt



WRP 8 upper diversion pipe to Fancy Shaft



Beaver dam on Rock Creek



Groundwater flow from upper to lower diversion



Lower collection basin with overflow going into pipe to Rock Creek



Rock Creek culvert



Plugged pipe from lower collection basin being cleared by site inspection team



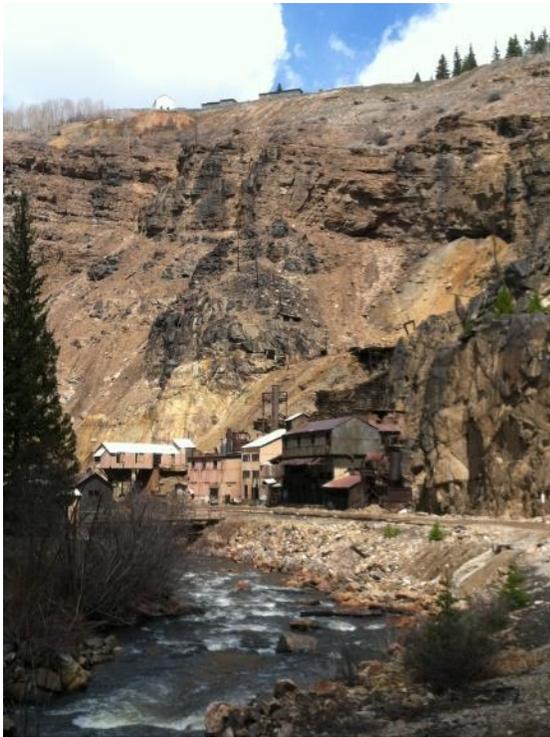
Where Seep 5 and Seep 7 water come together at the “Triple Point”



MDD vault with piping coming down hillside



Unlocked well at MDD vault



Belden with Gilman visible on ridge above



Unlocked well at Belden



Ben Butler drainage near Belden and ponding on road below



Staining on retaining wall from Doghole seep piping valve



Locked Belden access gate



Recently repaired area of the pipeline conveyance system with icicles indicating areas of leaking



Trestle with bypass line at right on the ground



Leak in bypass line



Leak in bypass line draining towards Eagle River



Repaired OTP manhole area of January 2011 sump overflow



Evidence of camping next to south run-on ditch of OTP



Ponding of contaminated water in the borrow ditch



OTP with barbed wire and warning sign



Broken barbed wire fence at OTP



CTP



WTP effluent to Eagle River



CTP and east trench



Unlocked well at CTP



Maloit Park looking toward Vail Ski and Snowboard Academy, formerly known as the Minturn Middle School

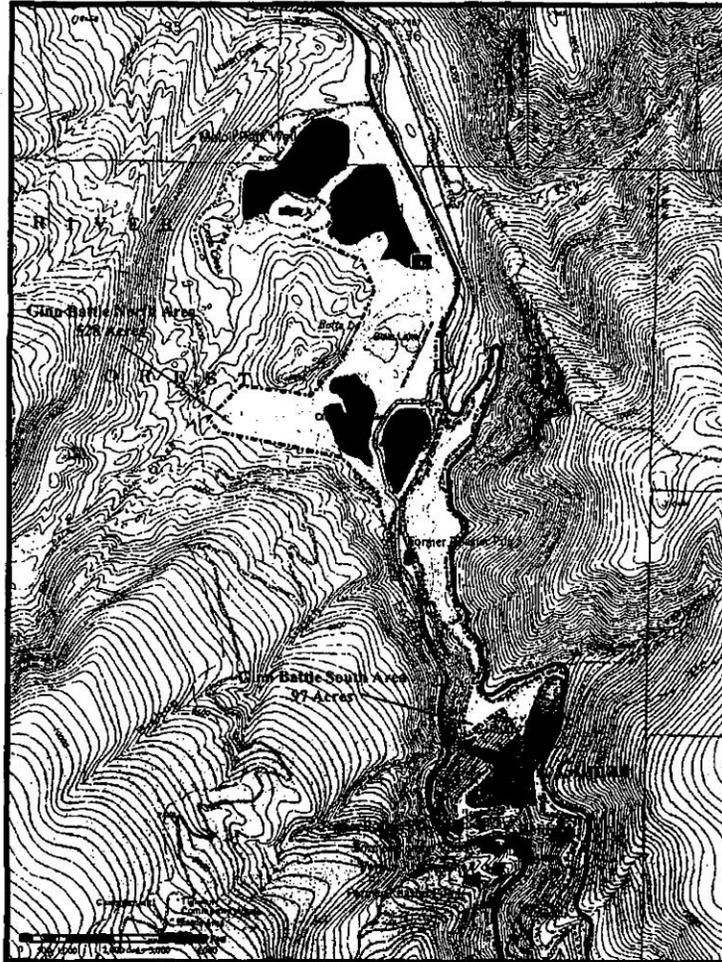


Upgradient groundwater diversion trench controls

# Appendix F: Detailed Property Parcel Information

1025027 - R8 SDMS  
1025027

*handout from  
Ginn Co for  
12-14-04 meeting*



**Legend**

- Approximate Eagle Mine Superfund Site - OU 1 = 170.8 Acres
- Approximate Eagle Mine Superfund Site - OU 2 (Gilman) = 51.0 Acres
- Highway 24
- Pipeline Trestle
- Water Treatment Plant
- Mintum Middle School

**NOTE:**  
All areas are approximate

**SOURCE IMAGERY:**  
Topographic maps from Map Man consisting of  
Mintum 1976, Photo Revised 1987  
Panda 1976, Photo Revised 1987  
Rad CSD 1990, Photo Revised 1987

ERL: CSD/Figure 1 Subject Property

**Privileged and Confidential**  
Prepared at the request of Attorney

**Figure 1 - Subject Property**

**ERM**  
Environmental Remediation Management  
3000 S. Wilson Drive, Suite 200  
Greenwood Village, CO 80111

Released by:

Date: 5-10-10

**Exhibit A**  
**Legal Description of Battle Mountain North**

**PARCEL C1**

A parcel of land located in Sections 1, 11 and 12, Township 6 South, Range 81 West of the Sixth Principal Meridian, with the bearings described hereon based on a bearing of N89°58'30"E for the south line of Section 36, Township 5 South, Range 81 West of the Sixth Principal Meridian, between the Southwest Section Corner, being a 2 1/2 inch brass G.L.O. monument found in place and the South Quarter Corner, being a 2 1/2 inch brass G.L.O. monument found in place, said parcel being more particularly described as follows:

Commencing at the West Quarter Corner of Section 18, Township 6 South, Range 80 West of the Sixth Principal Meridian; thence N39°18'01"W, 6381.01 feet to a point on the westerly right-of-way for Highway 24 being the true Point of Beginning; thence departing said right-of-way S77°23'47"W, 354.90 feet along the 3-4 line of the Coolidge Lode (MS #20293) and the 1-2 line of the Cave Lode (MS #20293) to Corner No. 3 of said Coolidge Lode also being Corner No. 2 of said Cave Lode; thence N45°28'28"W, 357.90 feet to a point on the easterly right-of-way for the Denver and Rio Grande Western Railroad; thence along said right-of-way the following thirty (30) courses:

- 1) N77°25'00"E, 89.29 feet;
- 2) N35°15'53"W, 67.25 feet;
- 3) N25°44'53"W, 237.58 feet;
- 4) N16°13'53"W, 6.62 feet;
- 5) S77°25'00"W, 75.15 feet;
- 6) N16°13'53"W, 477.59 feet;
- 7) N16°50'51"W, 123.71 feet;
- 8) N77°25'00"E, 75.27 feet;
- 9) N18°53'02"W, 301.82 feet;
- 10) S77°25'00"W, 50.47 feet;
- 11) N21°09'37"W, 563.64 feet;
- 12) N32°50'52"W, 150.75 feet;
- 13) N08°55'55"W, 432.48 feet;
- 14) N09°29'46"E, 214.86 feet;
- 15) N18°46'01"E, 189.39 feet;
- 16) N32°08'16"E, 42.96 feet;
- 17) N90°00'00"E, 58.63 feet;
- 18) N31°50'40"E, 69.78 feet;
- 19) S90°00'00"W, 28.69 feet;
- 20) N32°07'49"E, 39.90 feet;
- 21) N30°58'34"E, 282.81 feet;
- 22) S04°42'30"W, 158.17 feet;
- 23) N30°58'34"E, 337.16 feet;
- 24) N27°42'40"E, 229.87 feet;
- 25) N85°17'30"W, 86.91 feet;
- 26) N27°42'40"E, 36.37 feet;
- 27) N30°16'07"E, 143.36 feet;
- 28) N21°48'40"E, 251.73 feet;

**Exhibit A**  
**Legal Description of Battle Mountain North**

- 29) N15°10'48"E, 313.68 feet;
- 30) N14°06'56"E, 341.08 feet;

thence departing said railroad right-of-way S54°58'20"E, 29.79 feet to a point on the right-of-way for said Highway 24; thence along said right-of-way the following twenty-two (22) courses:

- 1) along a non-tangent curve to the right having a length of 264.70 feet, a radius of 636.20 feet, a tangent of 134.29 feet, a delta of 23°50'18" and a chord of 262.79 feet that bears S01°53'09"E;
- 2) S83°05'55"E, 153.03 feet;
- 3) along a non-tangent curve to the left having a length of 161.76 feet, a radius of 756.20 feet, a tangent of 81.19 feet, a delta of 12°15'23" and a chord of 161.45 feet that bears N03°54'18"E;
- 4) S55°44'00"E, 103.56 feet;
- 5) N57°43'00"E, 210.50 feet;
- 6) N27°35'00"E, 278.60 feet;
- 7) N00°52'00"E, 276.80 feet;
- 8) N37°45'00"E, 426.80 feet;
- 9) S61°40'00"E, 114.11 feet;
- 10) S16°06'00"W, 568.70 feet;
- 11) S48°20'00"W, 175.20 feet;
- 12) S09°32'00"W, 533.20 feet;
- 13) S47°34'00"W, 672.00 feet;
- 14) S16°32'23"W, 631.02 feet;
- 15) S42°45'37"E, 206.60 feet;
- 16) S10°14'37"E, 389.38 feet;
- 17) S47°16'47"E, 351.19 feet;
- 18) S13°19'47"E, 237.58 feet;
- 19) S47°16'13"W, 354.68 feet;
- 20) S16°22'41"W, 394.99 feet;
- 21) S06°58'30"E, 606.53 feet;
- 22) S22°17'14"E, 841.76 feet;

to the true Point of Beginning.

Said parcel containing 70.892 acres, more or less.

TOGETHER WITH:

PARCEL C2

A parcel of land located in Sections 11 and 12, Township 6 South, Range 81 West of the Sixth Principal Meridian with the bearings described hereon based on a bearing of N89°58'30"E for the south line of Section 36, Township 5 South, Range 81 West of the Sixth Principal Meridian, between the Southwest Section Corner, being a 2 1/2 inch brass G.L.O. monument found in

**Exhibit A**  
**Legal Description of Battle Mountain North**

place and the South Quarter Corner, being a 2 1/2 inch brass G.L.O. monument found in place, said parcel being more particularly described as follows:

Commencing at the Southwest Corner of said Section 36; thence S20°44'31"E, 7851.43 feet to a point on the intersection of the right-of-way for the Denver and Rio Grande Western Railroad being the true Point of Beginning at; thence along said right-of-way the following eight (8) courses:

- 1) along a non-tangent curve to the left having a length of 167.36 feet, a radius of 3869.72 feet, a tangent of 83.69 feet, a delta of 02°28'40" and chord of 167.34 feet that bears S08°36'27"W;
- 2) along a non-tangent curve to the left having a length of 325.84 feet, a radius of 653.16 feet, a tangent of 166.39 feet, a delta of 28°35'00" and chord of 322.48 feet that bears S06°55'23"E;
- 3) S21°12'53"E, 749.30 feet
- 4) along a curve to the right having a length of 365.44 feet, a radius of 5679.19 feet, a tangent of 182.79 feet, a delta of 03°41'13" and chord of 365.38 feet that bears S19°22'17"E;
- 5) N77°25'00"E, 25.09 feet;
- 6) S16°52'08"E, 126.91 feet;
- 7) S16°13'53"E, 474.41 feet;
- 8) S74°08'57"W, 74.95 feet

to Corner No. 2 of the Peru Lode (MS #5712); thence along the 1-2 line of said Peru Lode N11°30'03"W, 304.32 feet to Corner No. 1, also being Corner No. 5 of the Rosa M. Lode (MS #5712); thence along the 5-6 line of the said Rosa M. Lode N12°25'00"W, 301.25 feet to Corner No. 6, also being Corner No. 4 of the Brooklyn Placer (MS #19500); thence along the 4-5 line of said Brooklyn Placer S77°37'53"W, 329.31 feet; thence N36°28'58"W, 47.70 feet to a point on said railroad right-of-way; thence along said right-of-way the following seven (7) courses:

- 1) N14°56'18"W, 547.42 feet;
- 2) N13°03'41"W, 357.80 feet;
- 3) N04°05'15"W, 138.92 feet;
- 4) N04°24'03"E, 128.75 feet;
- 5) N13°30'08"E, 126.00 feet;
- 6) N26°02'26"E, 241.06 feet;
- 7) N23°58'23"E, 84.28 feet;

to said true Point of Beginning.

Said parcel containing 9.209 acres, more or less.

TOGETHER WITH:

**Exhibit A**  
**Legal Description of Battle Mountain North**

**PARCEL C3**

A parcel of land located in Section 36, Township 5 South, Range 81 West and Sections 1, 2, 11 and 12, Township 6 South, Range 81 West, all in the Sixth Principal Meridian, with the bearings described herein, based on a bearing of N89°58'30"E for the south line of said Section 36 between the Southwest Section Corner, being a 2 1/2 inch brass G.L.O. monument found in place and the South Quarter Corner, being a 2 1/2 inch brass G.L.O. monument found in place, said parcel being more particularly described as follows:

Commencing at the Southwest Section Corner of said Section 36 being the true Point of Beginning; thence N00°19'28"W, 99.97 feet along the west section line of said Section 36; thence departing said line N28°14'06"E, 715.12 feet to a 3 1/4 inch aluminum USDA monument found in place; thence N57°25'05"E, 557.63 feet to a 3 1/4 inch aluminum USDA monument found in place; thence N70°47'03"E, 761.45 feet to a 3 1/4 inch aluminum USDA monument found in place; thence N89°57'20"E, 307.51 feet to the West line of a parcel of land described in Book 126 at Page 192; thence along said parcel the following three (3) courses:

- 1) S10°00'00"W, 89.49 feet;
- 2) S80°00'00"E, 125.00 feet;
- 3) N10°00'00"E, 111.63 feet;

thence departing said parcel N89°57'20"E, 57.17 feet to a 3 1/4 inch aluminum USDA monument found in place, also being a point on the westerly right-of-way of Highway 24; thence along said right-of-way the following five (5) courses:

- 1) along a non-tangent curve to the left having a length of 5.39 feet, a radius of 756.30 feet, a tangent of 2.69 feet, a delta of 00°24'29" and a chord of 5.39 feet that bears S32°43'45"E;
- 2) S32°56'00"E, 199.00 feet;
- 3) along a non-tangent curve to the right having a length of 228.37 feet, a radius of 2825.00 feet, a tangent of 114.24 feet, a delta of 04°37'54" and a chord of 228.30 feet that bears S30°36'57"E;
- 4) S28°18'00"E, 1133.08 feet;
- 5) S00°01'30"W, 78.73 feet;

to said South Quarter Corner of Section 36; thence continuing along said right-of-way the following seven (7) courses:

- 1) N89°55'30"E, 42.40 feet;
- 2) S28°18'00"E, 97.26 feet;
- 3) S27°40'00"E, 834.17 feet;
- 4) S21°45'36"E, 1187.40 feet;
- 5) N59°22'34"E, 103.21 feet;
- 6) S24°31'00"E, 322.73 feet;

**Exhibit A**  
**Legal Description of Battle Mountain North**

- 7) along a non-tangent curve to the right having a length of 430.88 feet, a radius of 915.00 feet, a tangent of 219.51 feet, a delta of 26°58'52" and a chord of 426.91 feet that bears S11°01'26"E;

thence departing said right-of-way N53°54'26"W, 71.36 feet; thence S21°45'36"E, 135.40 feet to a point on said right-of-way; thence continuing along said right-of-way the following eight (8) courses:

- 1) along a non-tangent curve to the right having a length of 271.00 feet, a radius of 915.01 feet, a tangent of 136.50 feet, a delta of 16°58'10" and a chord of 270.01 feet that bears S16°12'58"W;
- 2) S24°42'01"W, 211.28 feet;
- 3) S35°46'25"W, 205.45 feet;
- 4) S14°35'55"W, 532.15 feet;
- 5) S01°16'40"E, 429.57 feet;
- 6) S01°26'17"W, 268.56 feet;
- 7) S33°57'06"W, 246.94 feet, to a stone monument found in place;
- 8) S08°01'44"E, 378.04 feet;

to a point on the northerly boundary of a parcel described in Book 102 at Page 119; thence along said parcel S75°31'09"W, 201.81 feet; thence continuing along said parcel S08°05'00"E, 685.00 feet to a point on the boundary of a parcel of land described in Book 702 at Page 120; thence along said parcel S51°29'28"W, 289.30 feet; thence continuing along said parcel S58°30'32"E, 279.14 feet to Corner No. 6 of the River Bend Mill Site (MS #19856); thence along the 6-7 line of said River Bend Mill Site N19°51'23"E, 500.06 feet to Corner No. 7, a stone monument found in place; thence along the 7-8 line of said River Bend Mill Site N07°44'32"W, 283.91 feet to Corner No. 8; thence along the 8-9 line of said River Bend Mill Site N72°57'00"E, 114.55 feet to Corner No. 9; thence along the 1-9 line of said River Bend Mill Site N00°00'03"W, 101.14 feet; thence departing said 1-9 line S54°58'20"E, 95.23 feet to a point on the 3-4 line of said River Bend Mill Site; thence along said 3-4 line S10°57'09"W, 390.94 feet to Corner No. 4; thence along the 4-5 line of said River Bend Mill Site S22°32'25"W, 2.99 feet; thence departing said 4-5 line S78°26'14"E, 1.49 feet to a point on the westerly right-of-way for the Denver and Rio Grande Western Railroad; thence along said right-of-way the following six (6) courses:

- 1) S15°10'48"W, 289.39 feet;
- 2) S21°48'39"W, 243.16 feet;
- 3) S30°16'07"W, 140.01 feet;
- 4) S27°42'40"W, 65.41 feet;
- 5) N85°17'30"W, 81.52 feet;
- 6) S04°42'30"W, 69.09 feet;

to a point on the 1-2 line of the Brooklyn Placer (MS #19500); thence along said 1-2 line S19°50'01"W, 268.43 feet to a point on said Railroad right-of-way; thence along said right-of-way the following nine (9) courses:

- 1) S31°32'13"W, 533.60 feet;

**Exhibit A**  
**Legal Description of Battle Mountain North**

- 2) S33°39'54"W, 140.23 feet;
- 3) S23°58'23"W, 151.92 feet;
- 4) S26°02'26"W, 245.65 feet;
- 5) S13°30'08"W, 135.47 feet;
- 6) S04°24'03"W, 136.44 feet;
- 7) S04°05'15"E, 146.56 feet;
- 8) S13°03'41"E, 60.00 feet;
- 9) N21°23'46"W, 307.48 feet;

to a point on the 5-6 line of said Brooklyn Placer; thence along said 5-6 line N16°10'31"W, 271.77 feet to Corner No. 6; thence along the 6-7 line of said Brooklyn Placer N12°26'20"W, 500.60 feet to Corner No. 3 of the Mars Mill Site (MS #20745), a 4 1/2 inch aluminum monument found in place; thence along the 2-3 line of said Mars Mill Site N45°48'07"W, 1087.10 feet to Corner No. 2, a 4 1/2 inch aluminum monument found in place, also being a point on the 5-6 line of the Homestead Entry Survey (H.E.S.) 41; thence along said 5-6 line N79°07'29"W, 2659.38 feet to Corner No. 5, a 2 1/2 inch iron pipe in concrete found in place; thence along the 4-5 line of said H.E.S. 41 N38°47'02"W, 387.01 feet to Corner No. 4, a stone monument found in place; thence along the 3-4 line of said H.E.S. 41 N44°15'33"E, 992.55 feet to Corner No. 3, a stone monument found in place; thence along the 2-3 line of said H.E.S. 41 S82°16'20"E, 1508.13 feet to Corner No. 2, a 2 1/2 inch iron pipe in concrete found in place; thence along the 1-2 line of said H.E.S. 41 N39°26'18"E, 1104.36 feet to Corner No. 1, a stone monument found in place, also being Corner No. 5 of the Homestead Entry Survey (H.E.S.) 40; thence along the 5-6 line of said H.E.S. 40 N23°20'28"E, 1564.32 feet to Corner No. 6, a stone monument found in place; thence along the 6-7 line of said H.E.S. 40 N25°05'49"W, 706.80 feet to Corner No. 2 of the Gold Star Mill Site (MS #20712), a 4 1/2 inch aluminum monument found in place; thence along the 2-3 line of said Gold Star Mill Site N67°56'53"W, 968.68 feet to Corner No. 3, a 4 1/2 inch aluminum monument found in place, also being Corner No. 3 of the Treasury Vault Lode (MS #20712); thence along the 3-4 line of said Treasury Vault Lode N67°54'55"W, 401.48 feet to Corner No. 4, a 4 1/2 inch aluminum monument found in place, also being a point on the 3-4 line of Homestead Entry Survey (H.E.S.) 46; thence along said 3-4 line N69°12'30"E 553.35 feet to a point on the boundary of a parcel described at Reception No. 733099; thence along said boundary N34°20'33"E, 268.78 feet to a 1 1/2 inch aluminum monument, LS #11204, found in place; thence N33°44'17"W, 346.86 feet to a 1 1/2 inch aluminum monument, LS #11204, found in place; thence N59°38'05"W, 743.66 feet to a 1 1/2 inch aluminum monument, LS #20695, found in place; thence N00°04'55"E, 459.57 feet to a point on said southerly line of said Section 36, a 3 1/4 inch brass monument found in place, marking Corner No. 1 of the RE50J Lease; thence along said southerly line S89°58'30"W, 420.19 feet to the true Point of Beginning.

Said parcel containing 448.782 acres, more or less.

**Exhibit A**  
**Legal Description of Battle Mountain South**

**PARCEL B**

A parcel of land located in Sections 12 and 13, Township 6 South, Range 81 West of the Sixth Principal Meridian, with the bearings described hereon based on a bearing of N89°58'30"E for the south line of Section 36, Township 5 South, Range 81 West of the Sixth Principal Meridian, between the Southwest Section Corner, being a 2 1/2 inch brass G.L.O. monument found in place and the South Quarter Corner, being a 2 1/2 inch brass G.L.O. monument found in place, said parcel being more particularly described as follows:

Commencing at the West Quarter Corner of Section 18, Township 6 South, Range 80 West of the Sixth Principal Meridian; thence N39°18'01"W, 6381.01 feet to a point on the right-of-way for Highway 24 being the true Point of Beginning; thence along said right-of-way the following twenty-two (22) courses:

- 1) S22°17'14"E, 259.35 feet;
- 2) S46°50'14"E, 295.81 feet;
- 3) S12°34'14"E, 369.84 feet;
- 4) S08°48'49"W, 423.80 feet;
- 5) S12°11'11"E, 306.78 feet;
- 6) S64°21'38"E, 315.84 feet;
- 7) N75°27'54"E, 291.12 feet;
- 8) N48°58'55"E, 374.05 feet;
- 9) N61°48'55"E, 853.98 feet;
- 10) S63°58'05"E, 292.11 feet;
- 11) S18°06'55"W, 625.08 feet;
- 12) S03°39'05"E, 526.41 feet;
- 13) S20°13'40"W, 384.58 feet;
- 14) S21°49'40"W, 405.57 feet;
- 15) along a non-tangent curve to the left having a length of 106.76 feet, a radius of 1004.43 feet, a tangent of 53.43, a delta of 06°05'23" and a chord of 106.71 that bears S18°14'35"W;
- 16) along a non-tangent curve to the left having a length of 321.63 feet, a radius of 1004.43 feet, a tangent of 162.20, a delta of 18°20'49" and a chord of 320.26 feet that bears S02°28'12"W;
- 17) S05°29'20"E, 354.30 feet;
- 18) S44°24'20"E, 487.82 feet;
- 19) S77°48'10"E, 504.78 feet;
- 20) S50°36'52"E, 207.86 feet;
- 21) S15°28'19"W, 522.91 feet;
- 22) S03°11'21"W, 77.19 feet;

to the intersection of said right-of-way and the south line of the Mamie Lode (MS #781); thence departing said point N89°59'46"W, 235.36 feet; thence continuing the following seventeen (17) courses:

- 1) N29°19'42"E, 292.78 feet;

**Exhibit A**

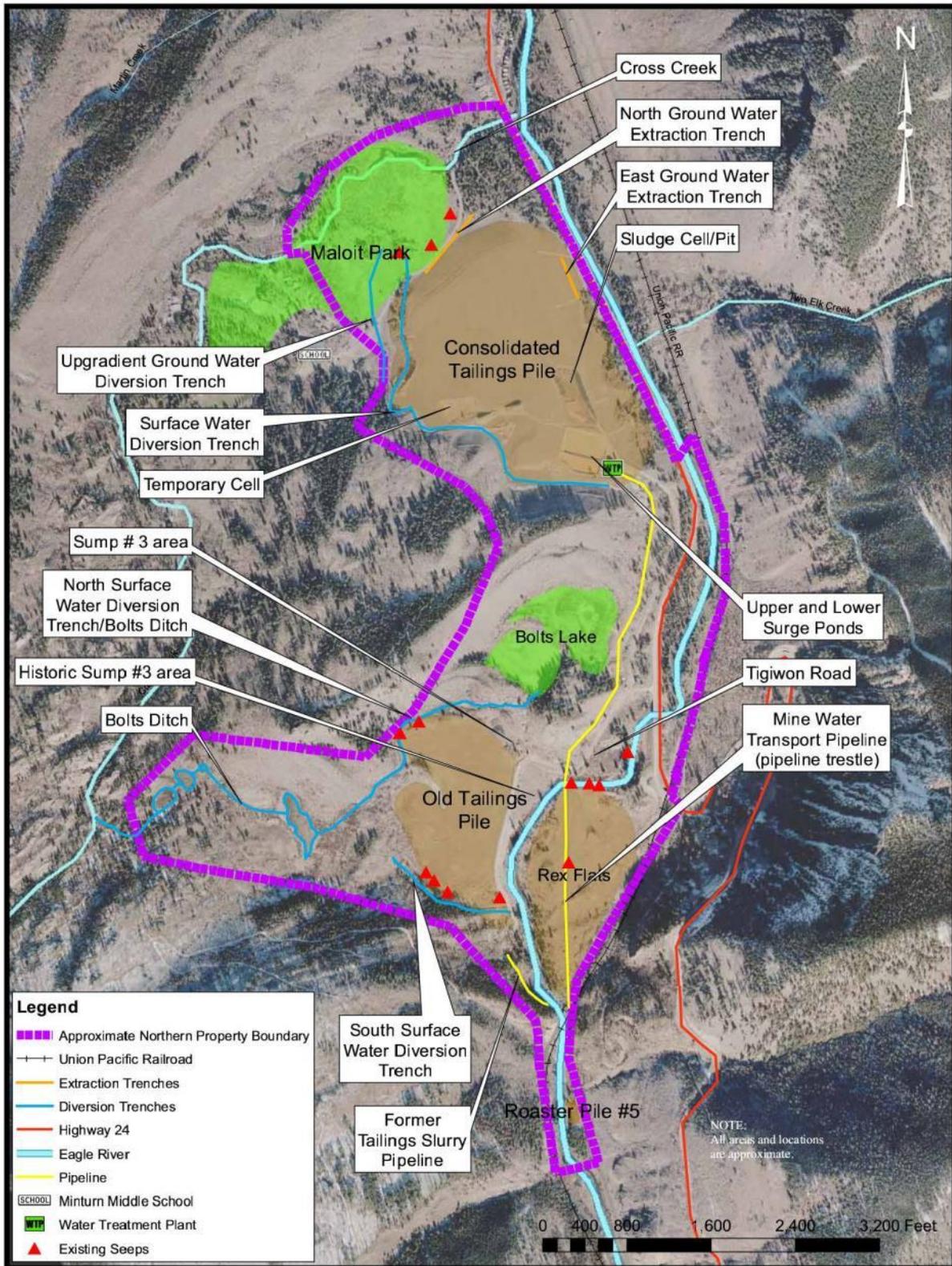
**Legal Description of Battle Mountain South**

- 2) N04°25'19"E, 426.96 feet;
- 3) N79°00'28"W, 794.51 feet;
- 4) N04°14'46"W, 361.07 feet;
- 5) S67°19'25"W, 625.51 feet;
- 6) S81°36'54"W, 568.62 feet;
- 7) S69°36'59"W, 701.04 feet;
- 8) N20°18'48"W, 200.21 feet;
- 9) N00°13'11"E, 306.77 feet;
- 10) N47°03'56"E, 1042.50 feet;
- 11) N42°10'02"E, 887.51 feet;
- 12) N35°25'23"W, 673.89 feet;
- 13) S54°06'55"W, 973.81 feet;
- 14) N08°45'24"W, 393.18 feet;
- 15) N14°15'34"E, 1012.63 feet;
- 16) N28°35'48"W, 240.85 feet;
- 17) N02°57'34"W, 239.46 feet;

to Corner No. 2 of the Coolidge Lode (MS #20293); thence along the 2-3 line of the said Coolidge Lode N45°28'28"W, 713.90 feet to Corner No. 3 of said Coolidge Lode also being Corner No. 2 of the Cave Lode (MS #20293); thence along the 3-4 line of said Coolidge Lode also being the 1-2 line of said Cave Lode N77°23'47"E, 354.90 feet to the true Point of Beginning.

Said parcel containing 99.165 acres, more or less.

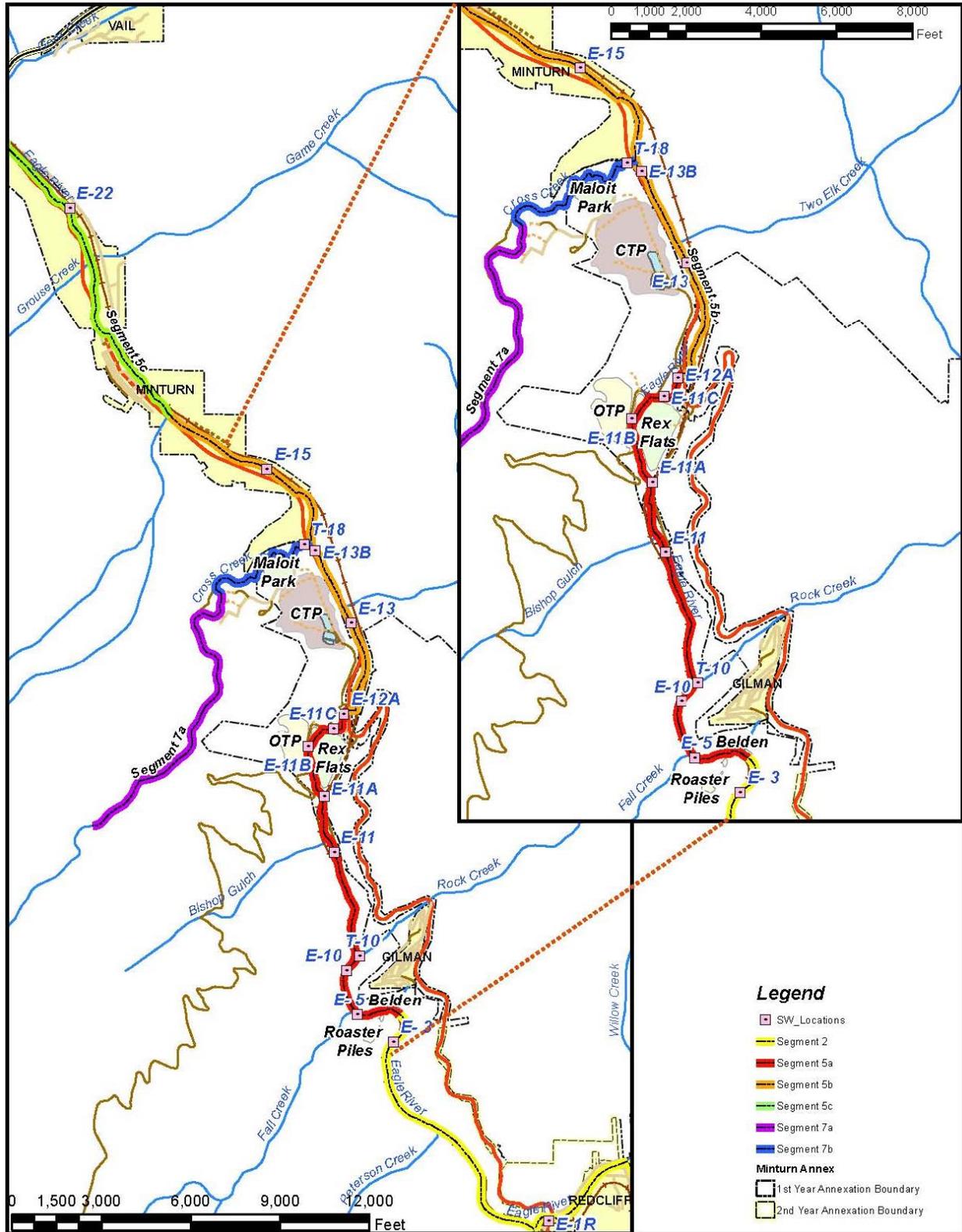
# Appendix G: OU3 Map (from 2007 Feasibility Study)



## Appendix H: ARAR Review for Surface Water COCs

Surface Water COC	Segment <sup>a</sup>	Standard at Time of 1993 ROD (µg/L) <sup>b</sup>		Current Standard (µg/L) <sup>c</sup>	
		Acute	Chronic	Acute	Chronic
Zinc	5a	117	106	$0.978 \times e^{0.8537[\ln(\text{hardness})] + 2.1302}$	$0.986 \times e^{0.8537[\ln(\text{hardness})] + 1.9593}$
	5b, 7b			January 1 through April 30th: $0.978 \times e^{0.8537[\ln(\text{hardness})] + 2.1302}$	January 1 through April 30th: $0.986 \times e^{0.8537[\ln(\text{hardness})] + 1.9593}$
	5c			May 1 through December 31st: $0.978 \times e^{0.8537[\ln(\text{hardness})] + 1.4189}$	May 1 through December 31st: $0.986 \times e^{0.8537[\ln(\text{hardness})] + 1.2481}$
Cadmium	all	3.9	1.1	$(1.136672 - [\ln(\text{hardness}) \times (0.041838)]) \times e^{0.9151[\ln(\text{hardness})] - 3.6236}$	$1.101672[(\ln(\text{hardness}) \times 0.041838)] \times e^{(0.7998 [\ln(\text{hardness})] - 3.1725)}$
Copper	5a	18	12	$0.96 \times e^{0.9801[\ln(\text{hardness})] - 1.1073}$	$0.96 \times e^{0.5897[\ln(\text{hardness})] - 0.0053}$
	5b, 5c, 7b			$0.96 \times e^{0.9801[\ln(\text{hardness})] - 1.5865}$	$0.96 \times e^{0.5897[\ln(\text{hardness})] - 0.4845}$
Lead	all	96	4	$(1.46203 - [(\ln \text{hardness}) \times (0.145712)]) \times e^{(1.273[\ln(\text{hardness})] - 1.46)}$	$(1.46203 - [(\ln \text{hardness}) \times (0.145712)]) \times e^{(1.273[\ln(\text{hardness})] - 4.705)}$
Silver	all	2	0.08	$1/2e^{(1.72[\ln(\text{hardness})] - 6.52)}$	$e^{(1.72[\ln(\text{hardness})] - 10.51)}$
<p><i>Notes:</i></p> <p>a) See Figure H-1</p> <p>b) Calculated assuming a hardness of 100 mg/L</p> <p>c) The current standards are from Regulation #33 (Classifications and Numeric Standards for Upper Colorado River Basin and North Platte River (Planning Region 12) (amended 6/13/11, effective 1/1/12)), available at <a href="http://www.colorado.gov/cs/Satellite/CDPHE-WQCC/CBON/1251590910618">http://www.colorado.gov/cs/Satellite/CDPHE-WQCC/CBON/1251590910618</a>, accessed 5/6/2013. These standards will be identified as the Site's cleanup goals in a future EPA decision document.</p>					

Figure H-1: Surface Water Monitoring Locations and Eagle River Basin Segments



(Source: "Eagle Mine Annual Report – 2012")

## **Appendix I: CDPHE Biological Data Review**

### **Biological Data Review for the 2013 Eagle Mine 5-Year Review**

Biological investigations at the Site have been conducted since 1990 using a variety of different sampling locations and methodologies. This five-year review provides only a summary of the available biological data. More detailed information about the biological monitoring data is available in both Hazardous Material and Waste Management Division and Environmental Protection Agency (EPA) files. This summary was prepared by the Colorado Department of Public Health and Environment and provided to EPA for inclusion in the 2013 5-Year Review report.

#### **Macroinvertebrate Data**

Macroinvertebrate samples have been collected at the Site over many years using a variety of different sampling methodologies. Interpretation of the vast array of data is difficult without a comprehensive framework for evaluating the data. Originally, interpretation of macroinvertebrate data followed the recommendations in EPA's report entitled "Development and Application of a Biological Index to Assess the Influence of Heavy Metals on Stream Invertebrates in Mineralized Areas of Colorado" dated March 2001. The report set forth a methodology for determining a Benthic Index of Biotic Integrity (or B-IBI) based on results of fall sampling for macroinvertebrates using a Hess Sampler. The Potentially Responsible Party's (PRP) commitment to conduct the biological sampling expired in 2005. In addition, it was determined that biological metrics could not be used in the context of water quality standard setting in a direct manner, therefore the use of the B-IBI to interpret the data ceased in 2005.

In 2010, the Colorado Department of Public Health and Environment's Water Quality Control Division (WQCD) developed a methodology for the interpretation of macroinvertebrate data known as the Multi-Metric Index (MMI). In a manner very similar to the B-IBI, the MMI is composed of separate indices calibrated to respond to stressors affecting aquatic communities. The MMI is used statewide, so locations are separated into one of the three defined biotypes. A biotype is an aggregation of macrobenthos sites that have similar community composition. MMIs are calibrated for each biotype. Information about the MMI is available in Water Quality Control Commission Policy Statement 10-1 "Aquatic Life Use Attainment, Methodology to Determine Use Attainment for Rivers and Streams," October 2010.

Each index is composed of several metrics selected to represent categories of community characteristics including richness, composition, functional feeding group, mode of locomotion, and pollution tolerance. Metrics were chosen on the basis of their ability to discriminate between reference and stressed sites, represent multiple metric categories, are ecologically meaningful, and are not redundant with other metrics in the index. The MMI is designed to detect environmental stresses that result in alteration of the biological community. No specific stressors are identified because the intent is to have a generalized tool that responds to a wide range of potential stressors. In other words, the MMI tool cannot determine if the stressor is a specific pollutant, pollution or habitat limitation (including flow). Once impairment is identified, however, other tools are available to identify the likely cause of impairment.

Determining biological condition involves the steps of determining the site’s biotype, calculating the MMI for the site and comparing the MMI score to a threshold. To calculate an MMI a representative macroinvertebrate sample is collected from the appropriate habitat(s). Field sampling is typically followed by preservation, laboratory identification and enumeration, and entry into a biological database capable of calculating the MMI.

The requirements for aquatic life use attainment and impairment are as follows:

<b><u>Biotype</u></b>	<b><u>Attainment Threshold</u></b>	<b><u>Impairment Threshold</u></b>
Transition (Biotype 1)	52	42
Mountains (Biotype 2)	50	42
Plains & Xeric (Biotype 3)	37	22

Sites that fall within the “grey zone” between attainment and impairment require additional metrics to determine their status for supporting aquatic life. If a site produces a Shannon Diversity value above the given threshold and a Hilsenhoff Biotic Index (HBI) value below the given threshold, the site is considered in attainment for aquatic life use. A Shannon Diversity value below the given threshold or a HBI value above the given threshold results in the site being considered not in attainment. The requirements for Biotype 1 and 2 auxiliary metrics are as follows:

<b><u>Biotype</u></b>	<b><u>HBI</u></b>	<b><u>Diversity</u></b>
Transition (Biotype 1)	5.4	2.4
Mountains (Biotype 2)	5.1	3.0

As shown in Figure 1, six locations within and downstream of the former mine site (Belden, Bishop Gulch, Two Elk, Boneyard, Minturn and Arrowhead) have been sampled along with two upstream reference locations (Red Cliff and Above Belden). Reference locations were selected to be representative of ecologically similar conditions to the Site, but are located outside of (e.g. upstream of) environmental influences from the Site. Historically, the majority of the macroinvertebrate samples collected as part of the Eagle Mine Superfund Project were collected using a device known as a Hess Sampler. The WQCD’s MMI was developed for use with data collected using kick nets. Therefore, the kick net data includes a footnote to indicate that a different sampling methodology was used. Direct correlation between the two methods is not possible.

The MMI values for sites sampled near the Eagle Mine are shown in Table 1. Table 1 shows how the MMI scores vary from year to year and site to site. The majority of the samples have met the threshold criteria. This indicates that these segments of the Eagle River are considered “in attainment” of the biological criteria established by the WQCD. Because so many of the data points indicate attainment, the secondary indices of Diversity and HBI are not included herein. The Arrowhead location is not in attainment for several of the samples. Given that this location is approximately 13 miles downstream of the Eagle Mine, and that sites immediately downstream of the Eagle Mine are in attainment, other environmental stressors (besides metals concentrations related to the mine) are most likely responsible for non-attainment at the Arrowhead location.

## Fish Data

Fish population monitoring was conducted annually at the Site through a cooperative effort between the PRP and the State of Colorado. In 2005, the PRPs requirement under the Consent Decree to conduct the fish sampling ended. The Colorado Division of Wildlife, now Colorado Parks and Wildlife, has voluntarily conducted fish monitoring when flow and weather conditions allowed, resuming in 2007. Fish sampling data are analyzed to evaluate a variety of population parameters including density (number of fish per acre), relative weight and species diversity. Fish monitoring reaches are identified in Figure 1. Fish monitoring occurs in the spring, usually around April 1<sup>st</sup>.

The abundance of brown trout (fish per acre) at each reach over time is summarized in Table 2 and depicted in Figure 2. For brown trout, three of the sampling locations are considered “reference sites”: Red Cliff, Above Belden, and Arrowhead. The reference sites are identified in blue and the “mine impacted sites” are identified in red on Figure 2. The Minturn reach is shown in green on the graph because it is far enough away from the mine that it may experience impacts from sources in addition to the Eagle Mine, including storm water impacts from the more urbanized areas. In addition, it is also located within an area that was subject to a rehabilitation project in 2009 to improve the habitat and river function. Based on these variables, the Minturn reach is not considered solely a “mine impacted site”.

Brown trout population size (density) has increased as metals concentrations have been mitigated in and around the Eagle Mine. Prior to 2000, the majority of the mine impacted reaches had population estimates of less than 200 fish per acre. Since that time, all mine impacted populations have increased to more than 200 fish per acre. The reach showing the slowest improvement is Bishop Gulch, while the greatest increase in brown trout numbers has occurred at Belden. Not only has density increased to over 200 fish/acre since 2000, in recent years, density has often been greater at the mine sites than at the reference sites. Separating the data into three separate time periods, the mean density for all reference sites from 1993-1999 was 397 compared to 214 for the mean of all mine sites. From 2000-2005 values were 440 for reference sites and 508 for mine sites. From 2007 to 2011 data values were 329 for reference and 446 for mine sites.

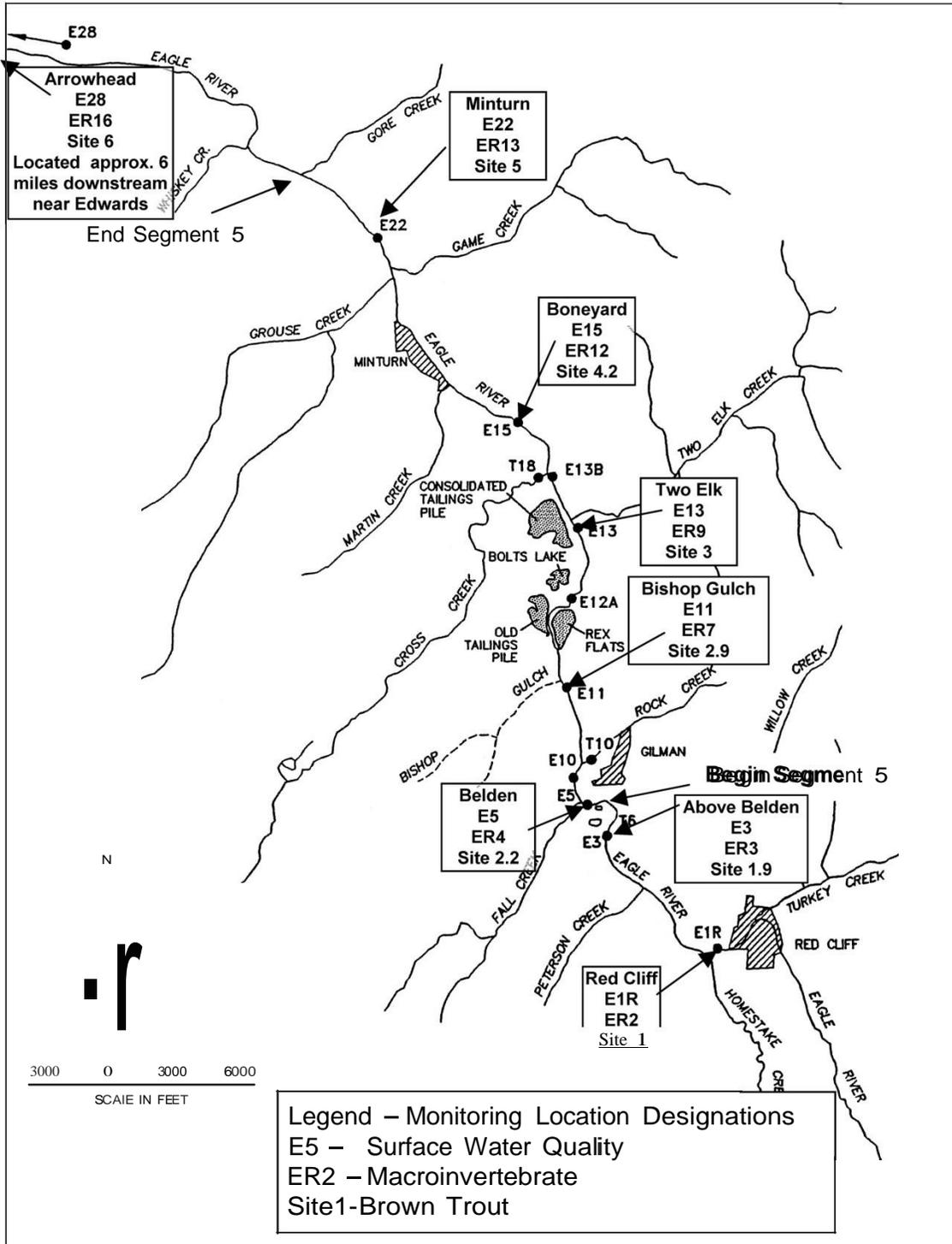
Brown trout growth and body condition continue to be suppressed at the mine impacted sites. Adult trout rarely exceed 300mm (11-inches), whereas greater numbers of large adult trout are observed at Arrowhead, Above Belden, and Red Cliff. From 2007 – 2011, relative weight (Wr), a measure of “plumpness” that is a unit-less condition factor accounting for weight and length, was calculated for trout collected. For the mine impacted sites, brown trout average Wr was < 90 or what would be considered good condition (Wr = 88, 83, 87, 84 at Minturn, Above Minturn, Bishop Gulch, and Belden, respectively). The reference sites, on the other hand, had brown trout in good condition, with an average Wr > 90 (Wr = 93, 94, and 93 at Arrowhead, Above Belden, and Red Cliff, respectively). A test for significance was not conducted between the data sets.

Furthermore, species diversity is still significantly impacted at all of the mine impacted sites, including the Minturn reach, as shown in Table 3. In 2010 (the only year that CPW provided species data for the mine sites), sculpin and other trout species that are more sensitive to metals than brown trout were rare to absent at these sites. The reference sites, on the other hand, have robust sculpin populations; as well, rainbow and brook trout are present in addition to brown trout.

## **Summary**

The macroinvertebrate data indicate that the macroinvertebrate community within and immediately downstream of the Site is fairly healthy. The brown trout data show the recovery of the fishery after the most damaging mine wastes (roaster piles and tailings) were contained, the Consolidated Tailings Pile was capped and the Water Treatment Plant went on-line, post 1997. An investigative study conducted by the Colorado Division of Wildlife in 2005 concluded that variation in the brown trout population is caused in part by metals concentrations. Since the additional remediation necessary to meet the water quality standards has not yet been implemented, the degree of recovery of the brown trout population is still hampered by metals loading. As improvement in water quality occurs over time, it is expected that the MMI scores will also improve.

Figure 1 – Biological Sampling Locations



**Table 1 – Multi-Metric Index Results for Eagle Mine Sites**

	StationID	Location	Biotype	Attainment Threshold	Impairment Threshold	MMI Values									
						April 2000	October 2000	April 2001	October 2001	October 2002	October 2003	September 2009	September/ October 2010	October 2011	July 2012
Reference Sites	ER2 (Site 1)	Red Cliff above Homestake Creek (reference site)  Replicate	2	50	42		69.2	65.3	78.4	84.3	82.5		63**		69.4
											76.7				
	ER3 (Site 1.9)	Above Belden (reference site)  Replicate	2	50	42		73.2	69.7	84.2	79.4	87.8		53.1**		74.5
											84.3				
Mine Sites	ER4 (Site 2)	Belden Above Fall Creek	2	50	42		74.4	81.6	76.0	70.5			69**		56.7
	ER7 (Site 2.9)	Below Bishop Gulch	2	50	42		82.8	82.6	89.5	83.8			68.3**		51.3
	ER9 (Site 3)	Above Two Elk Creek  Replicate Replicate	2	50	42		62.5	84.4	71.7	70.9	58.5		69.6**		76.7
											80.1				
											48.1				
	ER12 (Site 4)	Below Cross Creek (FS Boneyard)	2	50	42		77.5	75.4	69.0	68.6			78.2**		85.2
ER13 (Site 5)	Below Minturn	2	50	42		78.9	71.7	62.1				78**	81.8	77.8	
ER16 (Site 6)	Arrowhead	1	52	42		63.7	42.8	57.7			42.4 ***	40.8 *	40.9 *	30.7 *	

\*Indicates samples collected with Kick Net. \*\*Indicates samples collected with Surber. All other samples collected with Hess Sampler.

\*\*\*Although the MMI was below the threshold, the auxiliary metrics HBI and Shannon Diversity indicate attainment.

Data from 2001-2003 collected by CBS.

Data from 2009-2011 collected by Eagle River Water and Sanitation District.

Data from October 2010 collected by U.S. Forest Service.

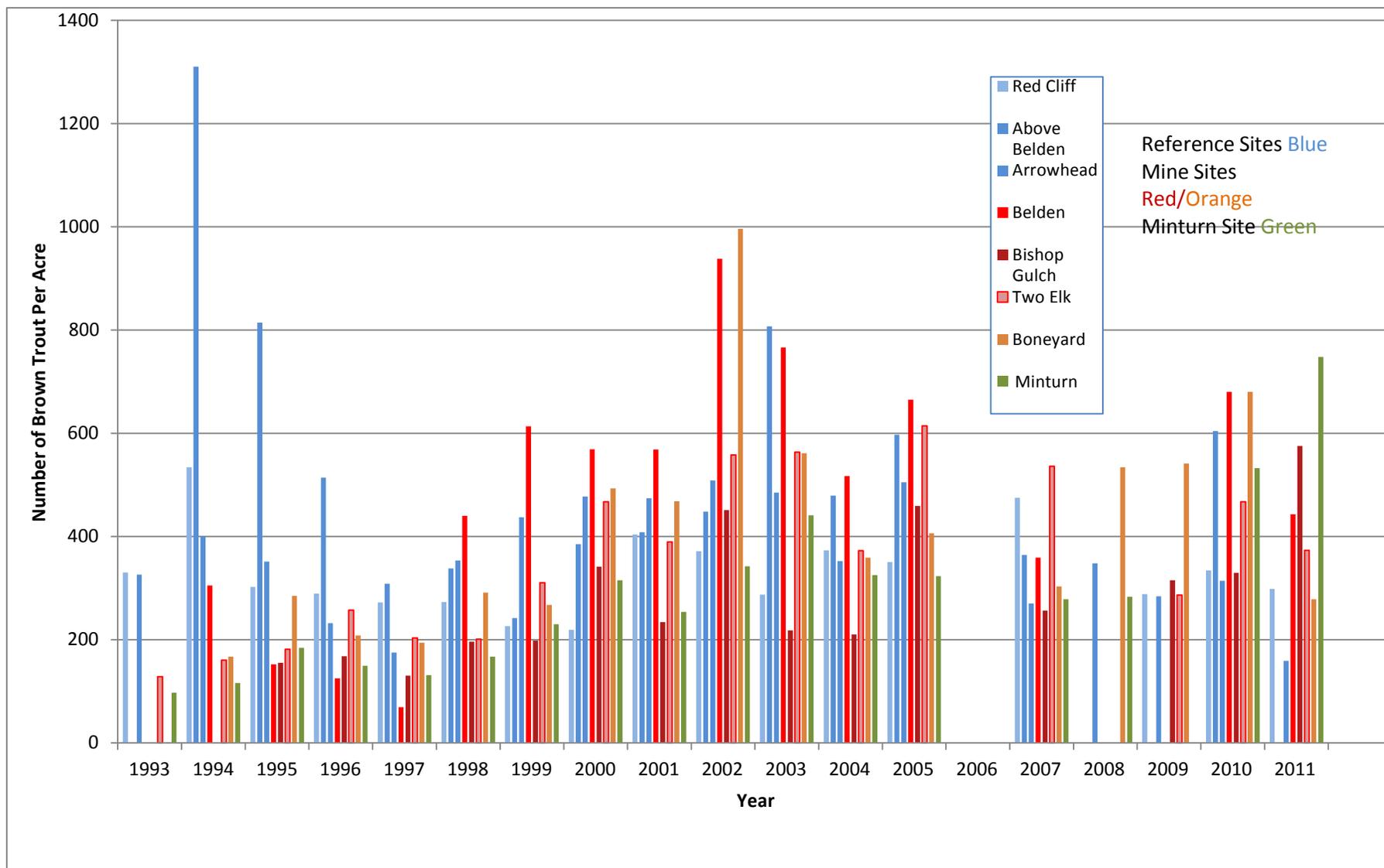
Data from 2012 collected by Colorado Department of Public Health and Environment.

**Table 2 – Brown Trout Population Estimates**

Year	Reference Location Data			Downstream Location Data				
	Red Cliff #/acre	Above Belden #/acre	Arrowhead #/acre	Belden #/acre	Bishop Gulch #/acre	Two Elk #/acre	Boneyard #/acre	Minturn #/acre
1993	330	NS	326	NS	NS	128	NS	97
1994	534	1310	400	305	NS	160	167	116
1995	302	814	351	152	155	181	285	184
1996	289	514	232	125	168	257	208	149
1997	272	308	175	69	130	203	194	131
1998	273	338	353	440	196	201	291	167
1999	226	242	437	613	198	310	267	230
2000	219	385	477	569	341	467	493	315
2001	404	408	474	568	234	390	468	254
2002	371	448	508	938	451	558	996	342
2003	287	807	485	766	218	563	561	441
2004	373	479	352	517	210	372	359	325
2005	350	597	505	665	459	614	406	323
2006	NO SAMPLING IN 2006							
2007	475	364	270	359	256	536	303	278
2008	NS	NS	348	NS	NS	NS	534	283
2009	288	NS	284	NS	315	286	541	NS
2010	334	604	314	680	329	467	680	532
2011	298	NS	159	443	575	373	278	748
2012	NO SAMPLING IN 2012							

NS= No Sample.

### Figure 3 – Brown Trout Population Estimates



**Table 3 - Fish Species Diversity**

	Year	Brown Trout	Mottled Sculpin	Brook Trout	Rainbow Trout	White Sucker	Longnose Sucker	Cutthroat Trout
Site 1 - Red Cliff	2007	138	97	0	0	0	0	1
	2008	NS	NS	NS	NS	0	NS	NS
	2009	61	43	1	1	0	0	0
	2010	77	129	0	0	0	0	0
	2011	69	86	0	0	0	0	0
Site 1.9 -Above Belden	2007	80	13	0	3	0	0	0
	2008	NS	NS	NS	NS	NS	NS	NS
	2009	NS	NS	NS	NS	NS	NS	NS
	2010	135	39	4	7	0	0	0
	2011	NS	NS	NS	NS	NS	NS	NS
Site 2 - Below Belden	2007	56	0	10	2	0	0	0
	2008	NS	NS	NS	NS	NS	NS	NS
	2009	20	0	2	0	0	0	0
	2010	111	0	6	4	0	0	0
	2011	79	2	4	3	0	0	0
Site 2.9 - Bishop Gulch	2007	113	0	0	0	0	0	0
	2008	NS	NS	NS	NS	NS	NS	NS
	2009	117	0	0	0	0	0	0
	2010	106	0	1	0	0	0	0
	2011	140	0	0	0	0	0	0
Site 3 - Two Elk	2007	186	0	1	0	0	0	0
	2008	NS	NS	NS	NS	NS	NS	NS
	2009	116	0	1	0	0	0	0
	2010	186	1	1	0	0	0	0
	2011	134	0	0	0	0	0	1
Site 4 - Boneyard	2007	145	0	0	0	0	0	0
	2008	244	0	1	0	0	0	0
	2009	199	0	4	0	0	0	0
	2010	264	0	2	0	0	0	0
	2011	158	0	0	0	0	0	1
Site 5 - Below Minturn	2007	246	0	4	1	0	0	0
	2008	182	0	4	1	0	0	0
	2009	NS	NS	NS	NS	NS	NS	NS
	2010	492	0	4	0	0	0	0
	2011	346	0	4	1	0	0	0
Site 6 - Arrowhead	2007	166	53	0	4	0	3	1
	2008	204	69	0	14	0	2	1

	Year	Brown Trout	Mottled Sculpin	Brook Trout	Rainbow Trout	White Sucker	Longnose Sucker	Cutthroat Trout
	2009	179	4	0	22	2	1	1
	2010	219	164	0	34	0	2	2
	2011	153	107	0	29	0	0	0

## **Appendix J: Evaluation of Exposure Assumptions for Lead**

The 2008 FYR conducted a review of the human health risks at Gilman and the Minturn Middle School (see Attachment C of the 2008 FYR). This FYR reviewed the chronic toxicity values used in the 2008 review. The chronic toxicity values have not changed since the 2008 review with one exception; the exposure assumptions and methods for evaluating lead exposures have changed. Therefore the 2008 FYR conclusion that the levels of metals remaining in surface soil at the Minturn Middle School are protective of human health is valid for non-lead metals.

However, lead was re-evaluated to consider more current risk assessment methodology. For example, the 1997 risk assessment and the 2008 FYR utilized an older version of the adult lead model. Although EPA guidance<sup>5</sup> recommends the use of arithmetic average as the exposure point concentrations for residential exposure units, for much larger exposure units where the contaminant concentrations are heterogeneous EPA recommends the use of the UCL95 which is consistent with the assumption used in the 1997 risk assessment. However, the 1997 risk assessment assumed a trespasser exposure was for a 90 day period and averaged over a 9 month period or 270 days for lead and non-lead contaminants assuming ingestion rates of 50 mg per day and 100 mg per day. These exposure assumptions are more conservative than EPA's default recommended trespasser assumptions for exposure frequency of 52 days per year over 1 year (or 365 days) and an ingestion rate of 50 mg per day. As a result of the changes in guidance, lead exposure to soil at the Gilman area was re-evaluated using the 2009 version of the adult blood lead model, and the EPA recommended exposure assumptions for a trespasser.

The UCL95 soil lead concentration for the Gilman area was compared to risk-based concentration (RBC) derived from the more current version of the adult lead model. The UCL95 lead concentration in Gilman soil of 1,902 mg/kg is well below the RBC of 9,430 mg/kg (Table J-1). This result indicates that the concentrations of lead remaining in surface soil at Gilman are protective of human health based on the EPA recommended trespasser exposure assumptions evaluated.

Further, although the 1997 risk assessment indicated that trespasser exposure to lead in waste rock may result in risks above levels of concern, high uncertainties were identified in the analysis because exposure to contaminated waste rock is considered unlikely due to the nature of the waste rock and the WRPs (i.e., a person is unlikely to incidentally ingest rock as rock does not adhere to hands). Current human health risk assessment methods do not use data from waste rock to evaluate daily contact with soil. In order to evaluate waste rock for exposure, the waste rock would have to be present as particles less than 250 microns, since this size particle can adhere to hands and be inadvertently ingested. Thus, the Gilman soil data was used as the basis for estimating risk and developing cleanup levels.

Based on updated lead risk methods, the risks from lead in soil are below a level of concern for trespassers. Further, the levels of contaminants in surface soil at Minturn Middle School are protective of human health since the maximum detection lead concentration of 194 mg/kg is well

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<sup>5</sup> EPA, 2003. Assessing Intermittent or Variable Exposures at Lead Sites, EPA-540-R-03-008.

below EPA's May 2013 Regional Screening Level (RSL) of 400 mg/kg established for lead under a unrestricted use exposure scenario.

**Table J-1: Comparison of Exposure Parameters used in the Gilman Risk Assessment to Derive RBCs for Lead in Surface Soil**

Variable	Description	Units	1997	2013
			Value <sup>1</sup>	Value <sup>2</sup>
R	Fetal/maternal PbB ratio	unitless	0.9	0.9
GSD	Geometric standard deviation PbB	unitless	1.8	1.8
BKSF	Biokinetic Slope Factor	µg/dl	0.4	0.4
IR	Soil ingestion rate (including soil-derived indoor dust)	mg/day	50,100	50
AF	Absorption fraction	unitless	0.1	0.12
EF	Exposure frequency	days/year	90	52 <sup>3</sup>
PbBO (adult)	Baseline PbB	µg/dl	1.8	1.0
AT	Averaging time	days	270	365 <sup>3</sup>
PB 95 <sup>th</sup> (fetal)	95 <sup>th</sup> percentile PbB in fetus	µg/dl	10	10
Lead RBC	Risk-based concentration	mg/kg	3700/1800	9430
Exposure concentration of lead in OU2 soil	UCL95	mg/kg	1900 <sup>4</sup>	1900 <sup>3</sup>
<ol style="list-style-type: none"> <li>1. Final Eagle Mine OU2 Risk Assessment, prepared by Morrison Knudsen Corporation, February 11, 1997.</li> <li>2. EPA Transmittal of <i>Update a/the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters</i>, June 26, 2009; OSWER 9200.2-82.</li> <li>3. The 1997 risk assessment assumed 9 months however, EPA 2003 guidance on <i>Assessing Intermittent or Variable Exposures at Lead Sites</i> recommends a minimum central tendency exposure frequency of 52 days per year for a duration of 1 year.</li> <li>4. The 1997 human health risk assessment used a ninety fifth upper confidence limit (UCL95) on the mean which is consistent with EPA lead guidance for large areas of heterogenous contaminant concentrations (EPA, 2003).</li> </ol>				

The 1993 ROD called for removing surface soils with lead concentrations above 1,000 mg/kg. For surface soils with lead concentrations between 500 and 1,000 mg/kg, the ROD called for treating with lime. Most soils with lead concentrations greater than 500 mg/kg were excavated and consolidated in the CTP. The EPA's current screening levels for lead are 400 mg/kg for residential use and 800 mg/kg for industrial use. Therefore, the EPA will review sampling data to verify whether the residual soil lead levels are protective for the anticipated future land uses. The

current property owner is conducting a feasibility study to determine what additional actions may be required to place the Site in a condition that is consistent with residential land use. These actions will be documented under future decision documents.