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OCT 24 2012

Received
OCT 26 2012
Water Quality Control

Ref: 8EPR-EP

Mr. Steve Gunderson
Director
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Re: TMDL Approvals
Iowa Gulch, COARUA08b, for Cd, Pb & Zn

Dear Mr. Gunderson:

We have completed our review of the total maximum daily loads (TMDLs) as submitted by your office for the waterbody listed in the enclosure to this letter. In accordance with the Clean Water Act (33 U.S.C. 1251 *et. seq.*), we approve all aspects of the TMDLs as developed for the water quality limited waterbody as described in Section 303(d)(1). Based on our review, we feel the separate elements of the TMDLs listed in the enclosed table adequately address the pollutants of concern as given in the table, taking into consideration seasonal variation and a margin of safety.

Thank you for submitting these TMDLs for our review and approval. If you have any questions, the most knowledgeable person on my staff is Julie Kinsey and she may be reached at 303-312-7065.

Sincerely,

Martin Hestmark
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

Enclosures 1 & 2

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TOTAL MAXIMUM DAILY LOAD ASSESSMENT
Iowa Gulch (HUC 11020001)
Lake County, COLORADO
Public Notice DRAFT

TMDL SUMMARY

Waterbody Name/ Segment Number	Mainstem of Iowa Gulch from a point immediately below the ASARCO water supply intake to a point immediately below the headgate of the Paddock #1 Ditch (Iowa Ditch); COARUA08b.
Pollutant/Condition Addressed	Cadmium, Lead, Zinc
Affected Portion of Segment	Iowa Gulch
Use Classification/ Waterbody Designation	Cold Water Aquatic Life Class 2, Recreation Class E Existing Primary Contact Use, and Agriculture.
Waterbody Designation	Use Protected
Water Quality Target	Attainment of the acute and chronic Aquatic Life Use-based dissolved cadmium, dissolved lead, and dissolved zinc water quality standards **Cadmium** Acute (tr) = (1.136672-[ln(hardness)x (0.041838)])* $e^{0.9151[\ln(hardness)]-3.6236}$ Chronic = (1.101672-[ln(hardness) x(0.041838)])* $e^{0.7998[\ln(hardness)]-4.4451}$ **Lead** Acute = (1.46203-[ln(hardness)*(0.145712)])* $e^{(1.273[\ln(hardness)]-1.46)}$ Chronic = (1.46203-[ln(hardness)*(0.145712)])* $e^{(1.273[\ln(hardness)]-4.705)}$ **Zinc** Acute = 0.978 $e^{(0.8525[\ln(hardness)]+1.0617)}$ Chronic = 0.986 $e^{(0.8525[\ln(hardness)]+0.9109)}$
TMDL Goal	Attainment of the acute and chronic Aquatic Life Use-based dissolved cadmium, dissolved lead, and dissolved zinc water quality standards.

EXECUTIVE SUMMARY

Iowa Gulch, segment COARUA08b, was identified as water-quality impaired for metals in 1993, 1994 and 1998 (specifically for zinc in 1998). The segment returned to the 303(d) list in 2008 for dissolved cadmium, dissolved lead, and dissolved zinc. The area is located southeast of Leadville, and was subject to mining activity for most of the past century. The segmentation of Iowa Gulch (8a and 8b) is due to the location of the Black Cloud Mine which produced lead and zinc ore, thus contributing to the stream impairment. The upper stream segment (COARUA08a) is attaining standards. The Water Quality Control Commission, in 1982, re-segmented Iowa

Gulch to differentiate between the headwaters portion (COARUA08a) and the lower, impaired portion (COARUA09bThis TMDL derives load reductions and allocations for dissolved cadmium, dissolved lead, and dissolved zinc necessary to attain the currently adopted Aquatic Life Use-based table value standards. In regards to cadmium, the Water Quality Control Commission has adopted two separate acute equations; one for waters that have trout and one for waters that do not support trout. For the case of segment COARUA08b, the more stringent acute (tr) standards apply. The sources of pollutants in this watershed are primarily from mining activity generated by the Black Cloud facilities.

Segment #	Segment Description	Portion	303(d) Listed Contaminants
COARUA08b	Mainstem of Iowa Gulch from a point immediately below the ASARCO water supply intake to a point immediately below the headgate of the Paddock #1 Ditch (Iowa Ditch)	All	Cd, Pb, Zn

Table 1. Impaired segment identification.

I. INTRODUCTION

Section 303(d) of the federal Clean Water Act requires states to identify water bodies or stream segments which are water quality limited. Those water quality limited segments currently identified in Colorado are identified on the 2012 303(d) list. A water-quality impaired segment does not meet the standards for its assigned use classification. This list of impaired water bodies is referred to as the "303(d) List". The List is adopted by the Water Quality Control Commission (WQCC) as Regulation No. 93.

For water bodies and streams on the 303(d) list a Total Maximum Daily Load (TMDL) is used to determine the maximum amount of a pollutant that a water body may receive and still maintain water quality standards. The TMDL is the sum of the Waste Load Allocation (WLA), which is the load from point source discharge, Load Allocation (LA) which is the load attributed to natural background and/or non-point sources, and a Margin of Safety (MOS) (Equation 1).

(Equation 1) $$TMDL=WLA+LA+MOS$$

Alternatively, a segment or pollutant may be removed from the list if the applicable standard is attained, if implementation of cleanup activities via an alternate means will result in attainment of standards, if the original listing decision is shown to be in error, or if the standards have been changed as the result of a Use Attainability Analysis (UAA) approved by the Water Quality Control Commission, or other EPA approved method.

Iowa Gulch (Arkansas River Basin segment COARUA08b) was identified on Colorado's 2012 303(d) list as impaired for dissolved cadmium, dissolved lead, and dissolved zinc.

Mining in the Iowa Gulch area, located southeast of Leadville, Colorado, began prior to 1900. The most prominent, and most recent, mining operation, located on Iowa Gulch, began operations as the Black Cloud Mine in 1971 as a joint venture between American Smelting and Refining Company (ASARCO) and Resurrection Mining Company (Newmont). According to the URS Greiner Woodward Clyde closure plan document from February 2001, the Black Cloud Mine facilities include the mine, waste, and structures from Black Cloud Mine, Hellena Mine, Julia Fisk Mine, Irene Mine, and Eclipse Mine. The Iowa Gulch tailings pond and water treatment facilities are also included in the overall facilities. The Eclipse and Irene mines, though included in the list of facilities, are actually located north of California Gulch and Iowa Gulch.

The Sherman Mine is located at the upper reach of Iowa Gulch and is included in a different, upstream stream segment (COARUA08a). The Sherman Mine is known for producing silver, with most of the production between 1968 and 1982; however, lead and zinc were also produced from this mine. Despite the location of the Sherman Mine within segment COARUA08a, the segment is in attainment of assigned water quality standards.

The 2007 Discharge Permit issued for the Sherman Mine indicates mining operations are currently in cessation. The current permit was in effect until June 2012, but was administratively continued. The Division of Reclamation, Mining, and Safety (DRMS) has indicated that Julia Fisk has been fully reclaimed and vegetation is established (DRMS, email corr. 2012). In addition to reclamation of the Julia Fisk mine, the Helena Mine waste rock dump has been fully excavated and placed into the Black Cloud tailing impoundment.

Woodward Clyde Engineers indicated in their 1996 Groundwater Study to ASARCO that the Black Cloud Mine and Mill were constructed in 1971 and are producers of lead-zinc concentrate. Waste rock is produced as a by-product of their underground mining operation. The waste rock is hauled to the surface, and placed on the waste rock dump adjacent to the mill and office facilities. Tailings are also produced as a by-product of their milling process and are separated into coarse and fine fractions using cyclone separators. The coarse tailing is used as backfill in the mine. The fine tailing is stored in a dam located south of the Black Cloud Mine and Mill in Iowa Gulch. The coarse and fine tailing are both discharged to the tailing impoundment when mine backfill is not needed (WCE, 1996).

The Woodward Clyde Groundwater Study (1996) also indicates a correlation between the groundwater flow and concentrations of constituents to that of the surface water, and its corresponding constituents. Heavy spring runoff, characteristic of higher elevation in Colorado, provides a dilution effect to both the groundwater and surface water flows. The Woodward Clyde Study indicated that surface water quality at monitoring point SW-5 exhibited elevated levels of cyanide, dissolved lead, dissolved manganese, sulfates, total dissolved solids, and dissolved zinc. These data were not, however, included in the WQCD's 303(d) listing assessment.

Since the Black Cloud Mine tailings pond is constructed in the Iowa Gulch stream pathway, a diversion was constructed to allow the natural flow to bypass active mining features. Additionally, a seepage and pumpback system was installed to treat flow that may reach Iowa Gulch untreated. Decant water, with pH adjustment methods, also addresses potential seepage flows. Note that the aforementioned items are mentioned in the 1996 Study, but at this time these facilities are no longer on site.

ASARCO was released from the Colorado Mine Land Reclamation Board permit in December 2008, and Resurrection Mining has assumed responsibility for the land and facilities along with the reclamation process. ASARCO has yielded all interest in facilities, equipment, and property related to the Black Cloud Mine as of November 2008.

Reclamation began in 2009 (the plan was approved in 2008 and 2009 is considered year one of the plan) which includes the tailing pond adjacent to Iowa Gulch. The Colorado DRMS indicates Resurrection Mining Company is entering year four of a five year reclamation project at Black Cloud under the terms of a court ordered consent decree. Additionally, Black Cloud will be fully reclaimed, with the exception of vegetation establishment, by the end of 2013. Since the products of the mines operating in Iowa Gulch constitute two of the three parameters that have impaired the condition of Iowa Gulch, it is assumed that the reclamation plan will have a significant impact on the remediation of the stream segment.

This water body was listed on the 303(d) list in 1993 and 1994 for metals, and again appeared in the list for cadmium, lead, and zinc in 2008, 2010, and 2012. This TMDL assessment addresses the constituents of dissolved cadmium, dissolved lead, and dissolved zinc. The monitoring data for station SW-5, as provided by the reclamation monitoring requirements for the Black Cloud Mine, are included in the analysis for this report. Station SW-5 is located immediately downstream of the Black Cloud tailings pond and its discharge point.

1.1 Segment Description

This TMDL assessment addresses the impairment of the mainstem of Iowa Gulch from a point immediately below the ASARCO water supply intake to a point immediately below the headgate of the Paddock #1 Ditch (Iowa Ditch), with a stream segment ID of COARUA08b. This segment is located in the Arkansas River basin and Upper Arkansas River sub-basin. The entire segment is considered impaired. This segment was listed on the 303(d) list in 1993 and 1994 for metals, and again appeared on the list for cadmium, lead, and zinc in 2008, 2010, and 2012. For cadmium and lead, the segment is in exceedance of chronic Aquatic Life Use-based standards. For zinc, the segment is in exceedance of chronic and acute Aquatic Life Use-based standards. The segment is in attainment of assigned Water Supply, Agriculture, and Recreation Use-based standards.

II. GEOGRAPHICAL EXTENT

The impaired segment is the lower portion of Iowa Gulch located southeast of Leadville, Colorado. Iowa Gulch is located immediately south of California Gulch, which is a designated Superfund site.

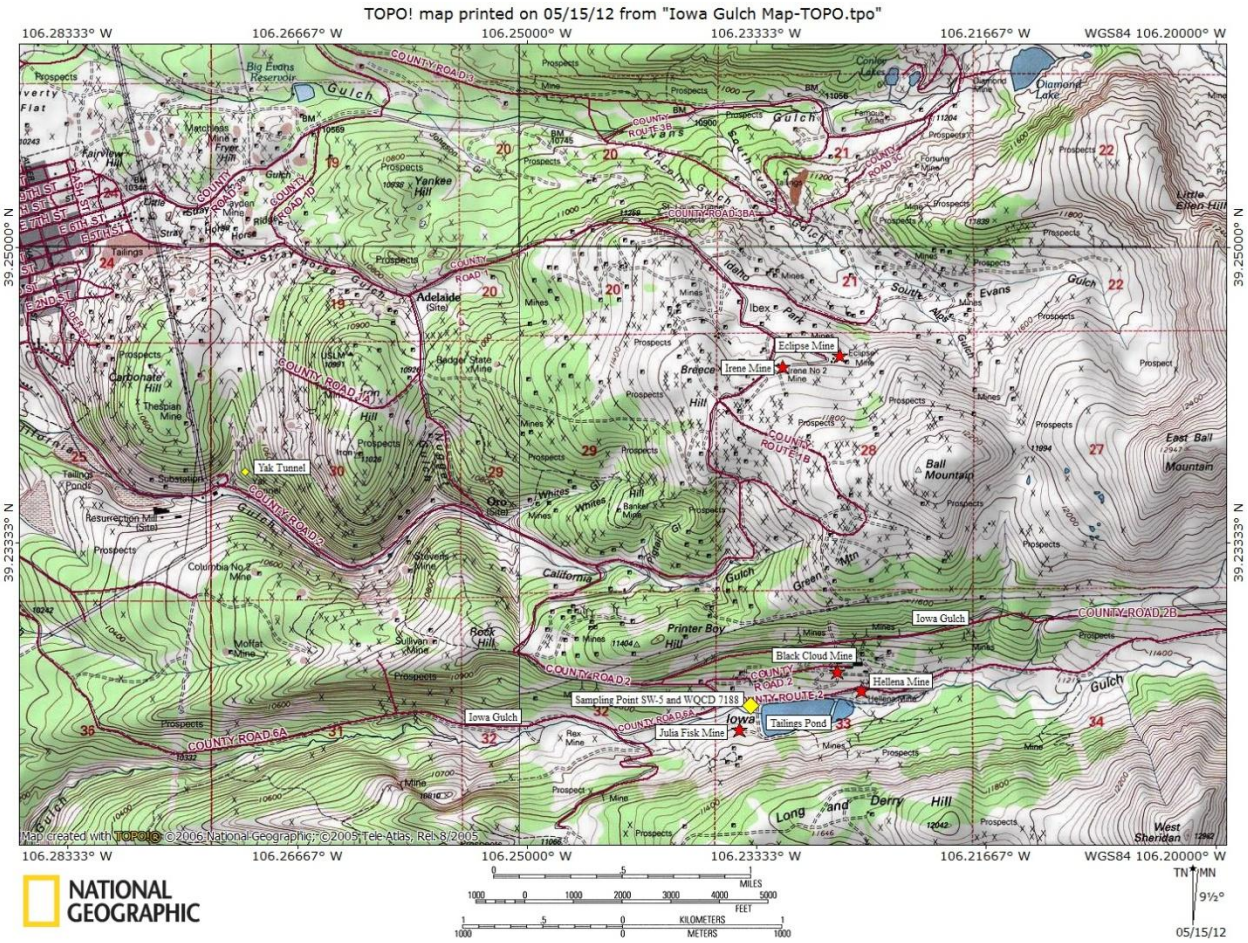

Figure 1. Vicinity Map of Iowa Gulch, southeast of Leadville, Colorado.

The Iowa Gulch watershed area is approximately 8.9 square miles. The upper end of the watershed consists of two (2) amphitheaters, Dyer Amphitheater and Iowa Amphitheater. The Iowa Amphitheater originates between Mount Sherman and Dyer Mountain. The Dyer Amphitheater originates northwest of the Iowa Amphitheater and is located between East Ball Mountain and Dyer Mountain. The two (2) streams converge at approximately the 2 mile mark from the Iowa Amphitheater origin to become Iowa Gulch. The length of the gulch is approximately 10 miles from the origin to the convergence with the Arkansas River. Along the approximate 10 mile route, the elevation change is approximately 3,400 feet.

The upper portion of Iowa Gulch is typical mountain terrain, with exposed rock, forests, and meadows. The upper portion of Iowa Gulch (segment ID COARUA08a) is not currently listed as impaired, but contributes to the impairment of the lower, impaired, portion. The impaired Iowa Gulch segment includes similar geologic features as the upper portion, but also includes wetlands and meadows at the lower end as the segment nears the next segment and the confluence with the Arkansas River. Segment COARUA09 is the lower end of Iowa Gulch and begins approximately at the wetlands location. The lower end of Iowa Gulch extends to the confluence with the Arkansas River.

The impaired segment of Iowa Gulch begins immediately upstream of the Black Cloud Mine tailings pond. The Black Cloud mine facilities are located at an elevation of approximately 11,000 feet.

III. WATER QUALITY STANDARDS

Waterbodies in Colorado are divided into discrete units or "segments". The Colorado Basic Standards and Methodologies for Surface Water, Regulation 31(WQCC 2012b), discusses segmentation of waterbodies in terms of several broad considerations:

31.6(4)(b)…Segments may constitute a specified stretch of a river mainstem, a specific tributary, a specific lake or reservoir, or a generally defined grouping of waters within the basin (e.g., a specific mainstem segment and all tributaries flowing into that mainstem segment.

(c) Segments shall generally be delineated according to the points at which the use, physical characteristics or water quality characteristics of a watercourse are determined to change significantly enough to require a change in use classifications and/or water quality standards.

As noted in paragraph 31.6(4)(c), the use or uses of surface waters are an important consideration with respect to segmentation. In Colorado there are four categories of beneficial use which are recognized. These include Aquatic Life Use, Recreational Use, Agricultural Use and Water Supply Use.

The Colorado Basic Standards and Methodologies for Surface Water, Regulation 31, identifies standards applicable to all surface waters statewide (WQCC, 2012b). The pollutants of concern for this TMDL assessment are dissolved cadmium, dissolved lead, and dissolved zinc. The specific numeric standards assigned to the listed stream segments are contained in Regulation 32, the Classifications and Numeric Standards for the Arkansas River Basins (WQCC, 2012c). There are temporary chronic standard modifications (type I) listed for cadmium, lead, and zinc that will expire December 31,

2013. However, TMDL calculations are based upon attainment of the underlying Table Value Standards.

Aquatic Life Use-based standards are two-part, and include both acute and chronic criteria. Chronic and acute standards are designed to protect against different ecological effects of pollutants (long term exposure to relatively lower pollutant concentrations vs. short term exposure to relatively higher pollutant concentrations). Acute standards are intended to protect against outright mortality. Chronic standards represent the level of pollutants that protect 95 percent of the genera from chronic toxic effects of metals. Chronic toxic effects include but are not limited to demonstrable abnormalities and adverse effects on survival, growth, or reproduction (WQCC 2006).

This segment, COARUA08b – "Mainstem of Iowa Gulch from a point immediately below the ASARCO water supply intake to a point immediately below the headgate of the Paddock #1 Ditch (Iowa Ditch)," is a Use-Protected segment and classified as Aquatic Life Cold Water 2, Recreation E, and Agriculture (Table 3.1). The relevant standards addressed in this document are the Aquatic Life Use-based table value standards, which vary based on hardness. Because the toxicity of these metals is ameliorated at higher hardness values, the calculated standard increases as hardness is increased. The highest hardness values, and therefore more lenient standards, occur during low flow, which helps to offset the lack of dilution available at these times.

From 2012 Current Approved 303(d) list:		
WBID	**Segment Description**	**Designated Uses & Impairment Status**
COARUA08b	Mainstem of Iowa Gulch from a point immediately below the ASARCO water supply intake to a point immediately below the headgate of the Paddock #1 Ditch (Iowa Ditch)	Aquatic Life *Cold II: Impaired* Recreation E: *Not Impaired* Agriculture: *Not Impaired*
	Impaired Designated Use	**Applicable Water Quality Criteria and Status**
	Aquatic Life *Cold II*	*Dissolved Cadmium / Not Attained* *Dissolved Lead / Not Attained* *Dissolved Zinc/ Not Attained*
Applicable State or Federal Regulations: (1) Classifications and Numeric Standards for Arkansas River Basin (Regulation 32)		

Table 3.1. Impairment details for stream segment COARUA08b.

IV. PROBLEM IDENTIFICATION

4.1 Discharge Permits and Property Ownership

Discharge permits are assigned to two (2) entities within Iowa Gulch. The Black Cloud

Mine (CO 0000591) has a discharge permit that applies to the tailings pond. The mine is undergoing a reclamation plan managed by the Resurrection Mining Company. The Sherman Mine (CO 0027014) permit is applicable to discharge upstream from the Black Cloud Mine, and applies to a separate stream segment. The permit information is listed in Table 4.1.

Segment	Dischargers	NPDES ID	SIC DESC	Design Capacity, mgd
COARUA08a	Sherman Mine	CO 0027014	Industrial-Mining	51.2
COARUA08b	Black Cloud Mine	CO 0000591	Industrial-Mining	1.42

Table 4.1. Discharge permit information.

4.2 Background

Mining activity in Iowa Gulch has occurred sporadically since before 1900. In the 1970s through 1990s, lead and zinc ore were mined from the Black Cloud Mine located in stream segment COARUA08b.

Accidental leak instances at this site were common in the 1990s, including a leak in the tailings embankment in 1992 (ASARCO, 1992), a sulfuric acid spill in 1993 (DMG, 1993), and a tailings spill in 1997 (DMG, 1997). All of the response actions were deemed satisfactory and immediate remediation was considered successful; however, fines for these spills were given at maximum allowable since the mine operations were in frequent violation.

Mine processes may be responsible for the various types of pollutants including acid drainage, concentrations of heavy metals, and sediments derived from the erosion of tailings and waste rock piles. The instances listed above may also contribute to the water quality of Iowa Gulch. Data from the monitoring stations, located just downstream from the Black Cloud Mine tailings pond, indicate ongoing exceedances for cadmium and zinc, while lead exceedances are sporadic.

The following figures (Figures 2, 3, and 4) illustrate the standards in relation to the collected data. Though it was calculated, the lead (Pb) acute standard was not included in the figure since the values would amplify the figure and the collected data did not violate acute standards. By including the acute data, the detail of the chronic data is lost when comparing to the standard, since acute and chronic values vary by degrees of magnitude. The information gathered for cadmium and lead prior to August 2003 were not used since the detection limit used by the analyzing laboratory was higher than the associated standard; thus, determination of impairment could not be completed accurately. After analyzing the data, it appears that the segment may not be impaired for lead, due to the

occurrence of only two (2) recorded violations. A total of thirty-three (33) lead samples were analyzed in this TMDL assessment, with two (2) violations, resulting in a violation approximately 6% of the time. Non-attainment of chronic standards occurs when the exceedance occurs more frequently than 15% of the time (WQCD, 2011). Data for the most recent period of record indicates that the chronic lead standard is attained.

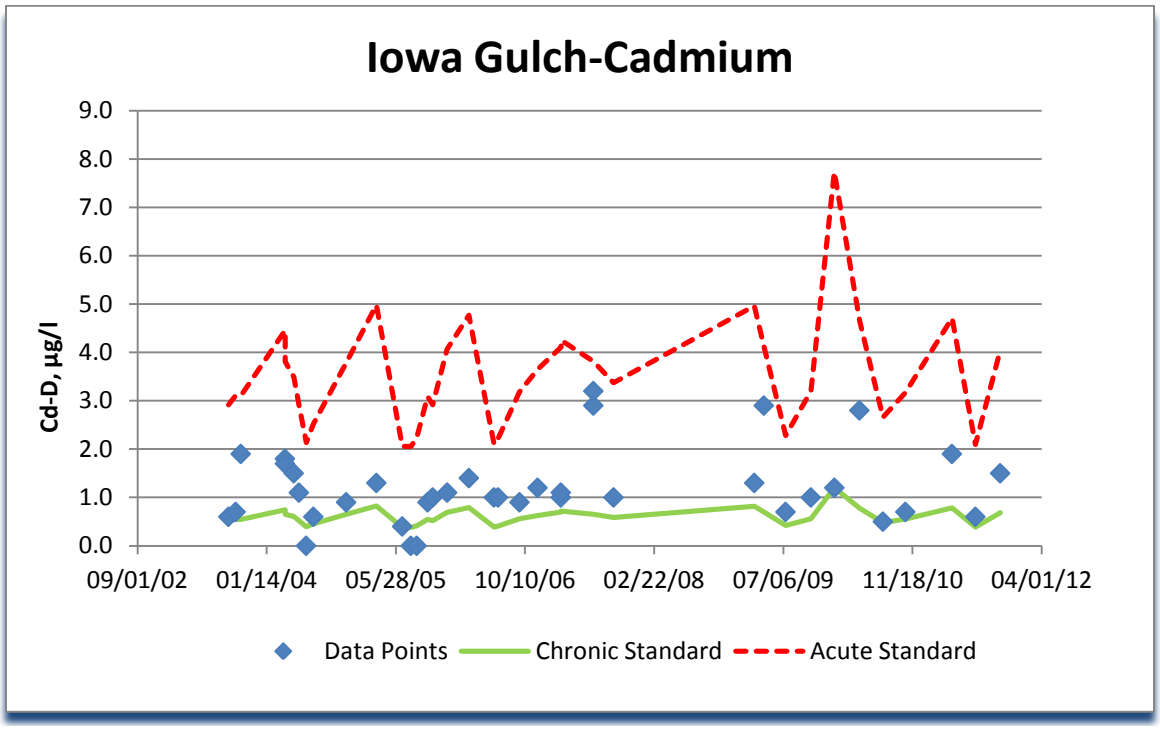

Figure 2. Observed dissolved cadmium concentrations with underlying acute and chronic standards. The acute standard (Ac-Tr) was used.

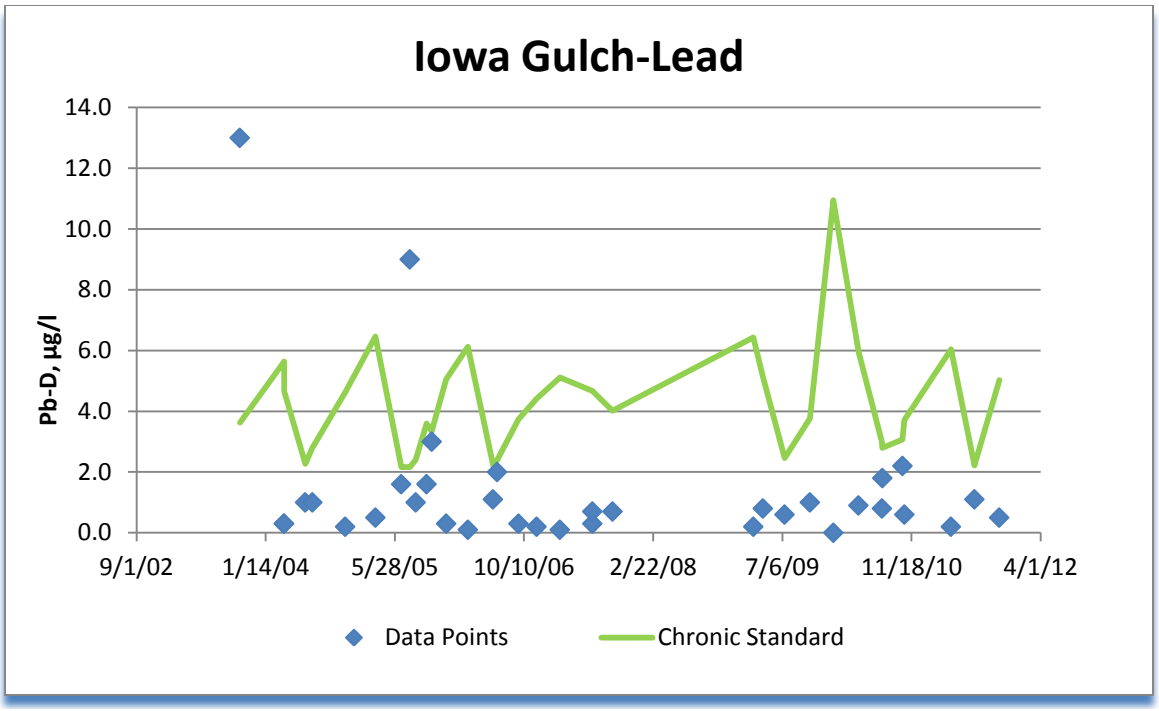

Figure 3. Observed dissolved lead concentrations with underlying chronic standards.

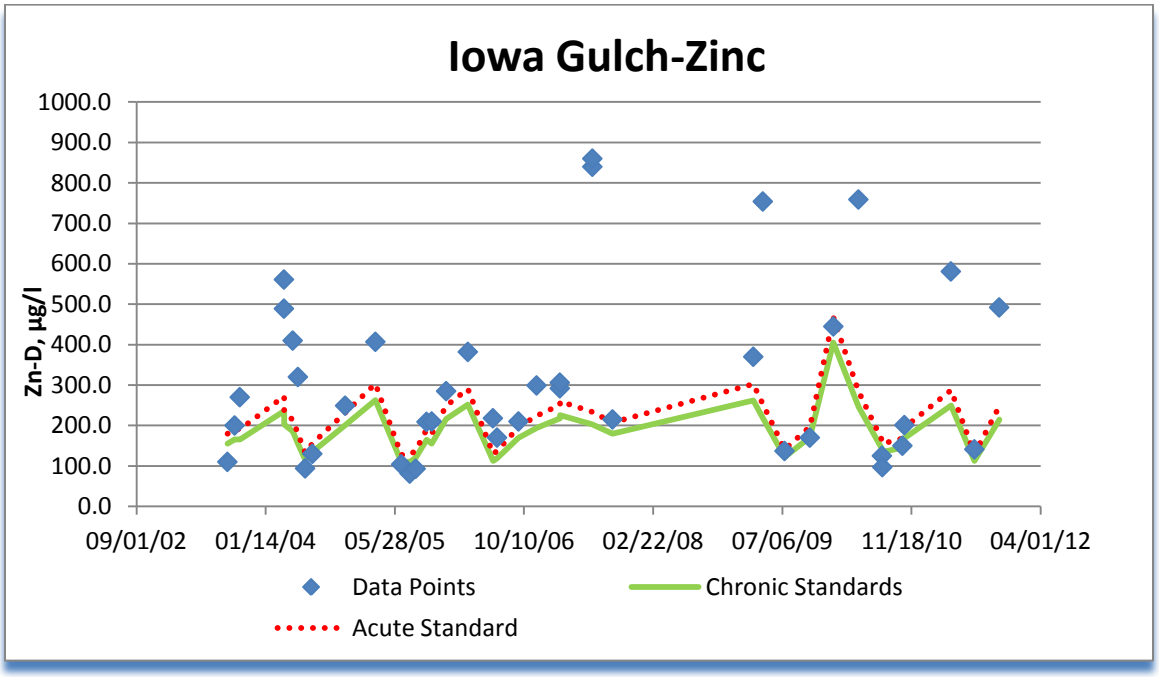

Figure 4. Observed dissolved zinc concentrations with underlying acute and chronic standards.

V. WATER QUALITY GOALS

The Colorado Basic Standards and Methodologies for Surface Water, Regulation 31, identifies standards potentially applicable for any surface water statewide (WQCC, 2012). The WQCC assigns specific numeric standards to a given water body based upon that water's designated uses. The segmentation of waters in the Arkansas River basin, and the relevant assigned numeric standards, is detailed in *Classifications and Numeric Standards for Arkansas River Basin*, Regulation 32 (WQCC, 2012). Typically the assigned standard is unchanged from the Table Value Standard (TVS) identified in the *Basic Standards and Methodologies for Surface Water*.

The pollutants of concern for the Iowa Gulch watershed include dissolved cadmium, dissolved lead, and dissolved zinc. Aquatic Life Use-based criteria for the metals are expressed as the dissolved fraction of those metals. Aquatic Life Use-based standards are two part, and include both acute and chronic criteria. Chronic and acute standards are designed to protect against different ecological effects of pollutants (long term exposure to relatively lower pollutant concentrations vs. short term exposure to relatively higher pollutant concentrations). Acute standards are intended to protect against outright mortality. Chronic standards represent the level of pollutants that protect 95 percent of the genera from chronic toxic effects of metals. Chronic toxic effects include, but are not limited to, demonstrable abnormalities and adverse effects on survival, growth, or reproduction (WQCC 2006).

Per the Section 303(d) Listing Methodology, 2012 Listing Cycle (WQCD 2011), attainment of Aquatic Life Use-based chronic metals standards, when expressed as the dissolved fraction, is determined by comparison of the 85th percentile value of the ranked data against the standard, based on an average hardness value. Attainment of Aquatic Life Use-based acute standards is evaluated by comparison of the sample specific acute standard against the sample value. In other words, the acute standard is calculated for each individual sample and the sample result is compared to the calculated acute standard. The *Section 303(d) Listing Methodology, 2012 Listing Cycle* indicates that multiple exceedances of acute standards (for a given parameter) within a three year period are evidence of impairment. Additionally, most Aquatic Life Use-based metal standards, including all of those included in this TMDL assessment, are hardness based. Because the toxicity of these metals is ameliorated at higher hardness values, the calculated standard increases as hardness is increased.

The water quality target and goal for this TMDL is attainment of the current dissolved cadmium, dissolved lead, and dissolved zinc water quality standards in Iowa Gulch, thereby improving water quality to ensure that it is safe and protective of aquatic life (i.e., fish, invertebrates, macroinvertebrates, etc.). All other numeric standards, including Water Supply and Agriculture Use-based standards, are attained for cadmium, lead, and zinc. The following table (Table 5.1) lists the water quality standards for Iowa Gulch Segment 8b from the Water Quality Control Commission's Regulation No. 32.

Water quality standards for Iowa Gulch Segment 8b (COARUA08b)			
Stream Segment Description	Classification	METALS ug/l	Temporary Modifications
Mainstem of Iowa Gulch from a point immediately below the ASARCO water supply intake to a point immediately below the headgate of the Paddock #1 Ditch (Iowa Ditch)	Aquatic Life Cold 2 Recreation E Agriculture	Cd(ac)=TVS(tr) Cd(ch)=TVS Pb(ac/ch)=TVS Zn(ac/ch)=TVS	Temporary modifications (type i): Cd(ch)=1.3 Pb(ch)=6 Zn(ch)=295 Expiration date of 12/31/2013.

Table 5.1. Water quality standards for Regulation no. 32, segment COARUA08b.

The current reclamation plan for Black Cloud Mine requires quarterly monitoring. These quarterly reports can illustrate whether further action is required to achieve water quality in Iowa Gulch. The reclamation plan is scheduled for completion in 2013.

VI. INSTREAM CONDITIONS

6.1 Hydrology

The Iowa Gulch watershed area is approximately 8.9 square miles. The upper end of the watershed consists of two (2) amphitheaters, Dyer Amphitheater and Iowa Amphitheater. The Iowa Amphitheater originates between Mount Sherman and Dyer Mountain. The Dyer Amphitheater originates northwest of the Iowa Amphitheater and is located between East Ball Mountain and Dyer Mountain. The two (2) streams converge at approximately the 2 mile mark from the Iowa Amphitheater origin to become Iowa Gulch. The length of the gulch is approximately 10 miles from the origin to the convergence with the Arkansas River. Along the approximate 10 mile route, the elevation change is approximately 3,400 feet.

Iowa Gulch is located south of Leadville, Colorado in a high elevation, mountainous region. The climatic conditions of Leadville are generally cool and dry; however, the area during winter months is often covered in snow. The climate of the area around Leadville is profoundly affected by differences in elevation, and to a lesser degree, by the orientation of mountain ranges and valleys with respect to general air movements. Precipitation patterns are largely controlled by mountain ranges and elevation. Precipitation increases with elevation both winter and summer but the elevation effect is greatest in mid winter when winds at mountain top level are typically strongest. High peaks and mountain ranges generally receive the majority of their precipitation during winter months. Snow accumulates without melting in shaded or level areas at elevations above about 8,000 feet (Iowa Gulch originates at approximately 12,800 feet and converges with the Arkansas River at approximately 9,377 feet). When it melts in the spring, this snow is the primary source of water for most of the southeastern portion of

the state and provides water for extensive irrigation. Most of the mountain snow melts during May and June when rivers reach their peak for the year (Colorado Climate Center, 2012).

Climate information for this region, as shown below, is taken from the Western Region Climate Center and the National Climatic Data Center (Division of NOAA).

Average annual precipitation: 12.29"
Month of highest precipitation: August
Month of lowest precipitation: May
Average annual temperature: 49.9º
Month of highest average temperature: July
Month of lowest average temperature: January
(Source: http://www.wrcc.dri.edu/summary/climsmco.html and http://www.ncdc.noaa.gov)

There are two (2) USGS sample locations on this segment; USGS 391332106130300 (IOWA GL AT UPPER STATION NR LEADVILLE, CO.) and USGS 391321106143300 (IOWA GULCH BYPASS NR LEADVILLE, CO.). However, between the 2 sample locations, only 3 sample events, from 1972 and 1973, have occurred. While the concentration data is obsolete, and not used within this assessment, one of the samples confirms the flow estimation for Iowa Gulch.

Extensive flow data was not available for Iowa Gulch. The watershed immediately north is California Gulch, and data from this watershed was used to estimate flow rates for Iowa Gulch using a basin ratio approach. The California Gulch basin is approximately 6.7 square miles and the Iowa Gulch basin is approximately 8.9 square miles. The flow data used for the ratio methodology is from USGS gage station 07081800 (CALIFORNIA GULCH AT MALTA, CO.) from July 13, 1991 to September 30, 1992, as well as additional data collected by various agencies in relation to the monitoring of the California Gulch Superfund site. The period of record for the additional flow data (provided by EPA) is April 1994 to July 2011. All of the available flow data for California Gulch was used to ensure that a proper representation of seasonal variances is included within this assessment. The individual days that were repeated were averaged. The data was then multiplied by the ratio of (8.9/6.7) to obtain approximate flow for Iowa Gulch. The Division believes this approach is reasonable due to the proximity of the watersheds to each other and their similar size.

The average monthly flows were calculated and used for the assessment of TMDLs for Iowa Gulch. The calculated flows are shown in tables 7.1, 7.21, 7.31, and 7.41. The average monthly flow hydrographs (Figures 5 and 6) illustrate expected flow behavior for this area of Colorado. The flow increases during April and May, representing spring runoff, and decreases later during the fall months. Figure 5 includes the calculated flow (from basin ratio) for the period of record listed above. The flows range from a minimum of 0.61 cfs to 22.9 cfs. The calculated mean/average monthly flow, as shown in Figure 6,

ranges from 2.02 cfs to 3.20 cfs. Diversions exist along this segment, but are sporadic. The diversions have included the Black Cloud Mine, and the use for diversions may be eliminated once the reclamation plan is complete.

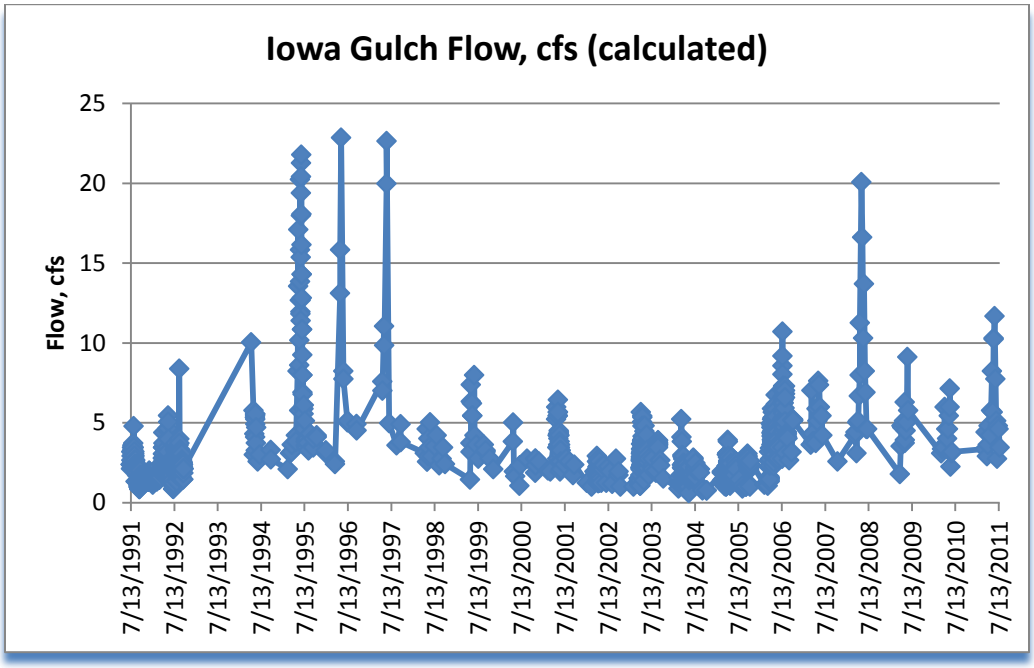

Figure 5. Flow data for Iowa Gulch. Data shown is calculated from basin ratio methodology.

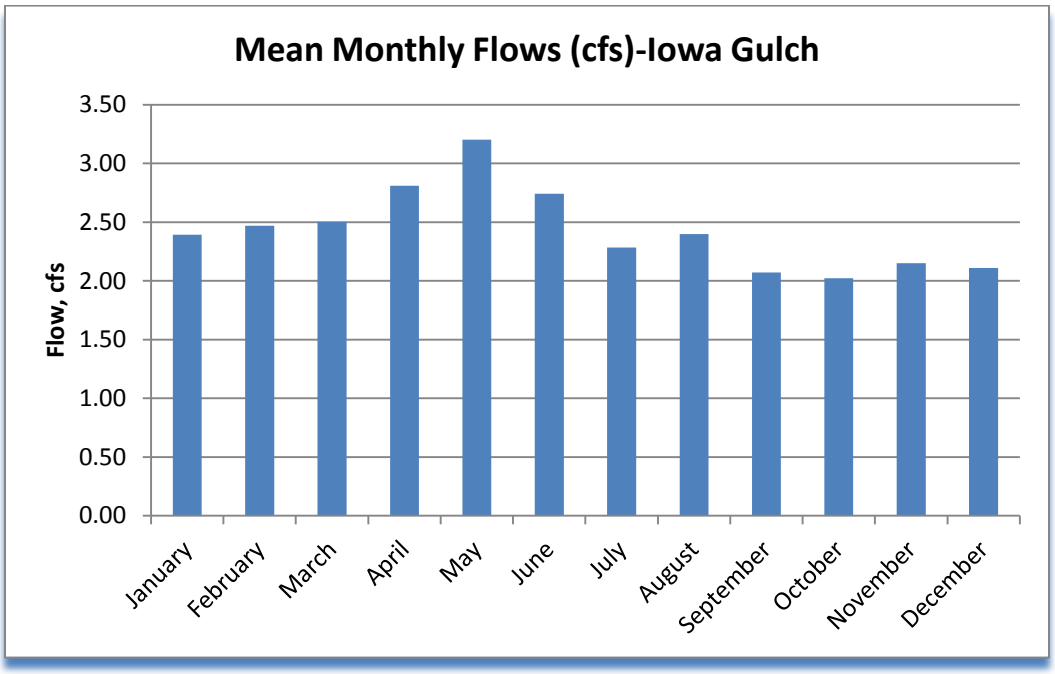

Figure 6. Mean monthly flows for Iowa Gulch. Data shown is calculated from basin ratio methodology.

6.2 Ambient Water Quality Data

To identify exceedances of the assigned water–quality standards, the eighty-fifth percentile concentrations of metals were calculated using the most current available data from the Colorado Department of Public Health and Environment (CDPHE). The sampling location was WQCD site 7188-Iowa Gulch Below Black Cloud Treatment Plant. The metals concentrations (in addition to acute and chronic standards) are expressed as "dissolved" concentrations in micrograms per liter (µg/L). Technically, the term "dissolved" metals refers to samples that were filtered through a 0.45-micrometer filter before analysis.

Water quality data were collected by the Colorado Department of Public Health and Environment (CDPHE) in Iowa Gulch from 2003 to 2006. Monitoring was required of Black Cloud Mine facilities, and these data have been collected on a quarterly basis since 1995 and reported to the Division of Reclamation, Mining, and Safety (DRMS). Monitoring data included cadmium, lead, and zinc in its inventory; however, due to the level of reporting, or analytical detection limit, required by the Division, monitoring data prior to August 2003 were not included. Samples from Iowa Gulch taken at, or near, this location on forty (40) occasions between 2004 and 2011, resulted in the 303(d) listing. The sampling set includes data collected from WQCD and the monitoring data reported to DRMS.

Ambient concentrations and table-value standards of the impairment constituents are expressed in the tables below.

For cadmium and lead, the ambient water quality exceeds chronic standards only. For zinc, the chronic and acute standards are exceeded. Note, however, that the zinc reduction necessary for attainment of chronic standards allows attainment of acute standards as well.

	Avg. Hardness	Cd-D, TVS (µg/L)	85th % Cd-D (µg/L)	Difference	% Reduction
Jan	400	1.204	1.200	-0.004	0%
Feb	197	0.71	1.09	0.38	35%
Mar	220	0.77	1.74	0.97	56%
Apr	201	0.72	2.86	2.14	75%
May	130	0.52	1.10	0.58	53%
Jun	91	0.39	1.00	0.61	61%
Jul	100	0.425	2.975	2.550	86%
Aug	113	0.47	0.60	0.13	22%
Sep	144	0.56	0.96	0.40	41%
Oct	150	0.57	1.66	1.09	65%
Nov	176	0.65	1.16	0.51	44%
Dec	191	0.69	1.10	0.41	37%

Table 6.1. Ambient water quality for COARUA08b (dissolved cadmium). Concentrations listed are the 85% values.

	Avg. Hardness	Pb-D, TVS (µg/L)	85th % Pb-D (µg/L)	Difference	% Reduction
Jan	400	10.94	0.00	-10.94	0%
Feb	197	5.22	0.10	-5.12	0%
Mar	220	5.86	0.38	-5.48	0%
Apr	201	5.33	0.86	-4.47	0%
May	130	3.34	0.00	-3.34	0%
Jun	91	2.26	1.82	-0.44	0%
Jul	100	2.52	1.77	-0.76	0%
Aug	113	2.87	0.85	-2.02	0%
Sep	144	3.74	1.20	-2.55	0%
Oct	150	3.89	5.50	1.61	29%
Nov	176	4.63	0.20	-4.43	0%
Dec	191	5.05	0.30	-4.75	0%

Table 6.2. Ambient water quality for COARUA08b (dissolved lead). Concentrations listed are the 85% values. As shown in the table, January and May demonstrated dissolved lead less than the detection limit and are reported as 0 µg/L per 2012 303(d) Listing Methodology. A monitoring sample from January 1998 indicates 27.0 µg/l of lead, but is not included as stated in section 4.2 above (the high detection limit eliminates the inclusion of this period of record).

All pollutant sources must be considered, and contributions from significant sources quantified, in order to determine the reduction in pollutant loading which must be achieved in order to meet numeric targets and, ultimately, in stream water quality standards. Sources may include discreet discharges of a pollutant from a pipe or other discharge structure ("Point Source Discharges") or diffuse discharges across a broad

reach of stream ("Nonpoint Source Discharge"). Effective implementation of the TMDL will typically require that an appropriate degree of waste load and/or load reduction is apportioned to all significant pollutant sources.

	Avg. Hardness	Zn-D, TVS (µg/L)	85th % Zn-D (µg/L)	Difference	% Reduction
Jan	400	405.3	445.0	39.7	9%
Feb	197	221.6	303.9	82.3	27%
Mar	220	243.3	517.8	274.5	53%
Apr	201	225.2	756.8	531.6	70%
May	130	155.5	320.0	164.5	51%
Jun	91	114.2	196.4	82.2	42%
Jul	100	124.5	805.1	680.5	85%
Aug	113	138.0	107.5	-30.5	0%
Sep	144	169.9	212.8	42.9	20%
Oct	150	175.2	325.5	150.3	46%
Nov	176	201.3	291.5	90.2	31%
Dec	191	215.8	285.0	69.2	24%

Table 6.3. Ambient water quality for COARUA08b (dissolved zinc). Concentrations listed are the 85% values. The standard listed is chronic, though the reduction necessary to attain the chronic standard also addresses the acute standard.

Sources of impairment of the Iowa Gulch water quality include the Black Cloud Mine facilities and the upstream Sherman Mine. The contributions from the upstream segment of Iowa Gulch (COARUA08a) are considered background levels (and are included in the Load Allocation term of the TMDL calculation); however, since the Sherman Mine is a permitted discharger, the facility is included in this TMDL assessment as a point source. Cadmium, lead, and zinc have standards based on the hardness level of the water. Due to this relationship, the standards and required reductions follow the same pattern, with the highest reduction levels peaking in April, July, and October. However, this does not apply to lead since the required reduction applies only to October.

VII. TECHNICAL ANALYSIS

7.1 TMDL ANALYSIS

A TMDL is comprised of the Load Allocation (LA), which is that portion of the pollutant load attributed to natural background or the non-point sources, the Waste Load Allocation (WLA), which is that portion of the pollutant load associated with point source discharges, and a Margin of Safety (MOS). The TMDL may be expressed as the sum of the LA, WLA and MOS.

$$TMDL = WLA + LA + MOS$$

TMDL = Sum of Waste Load Allocations + Sum of Load Allocations + Margin of Safety

Load Allocations "(LA)":

The Sherman Mine (CDPHE permit CO 027014) is located in the upper reach of Iowa Gulch and upstream from the Black Cloud facilities. Although the upper reach (COARUA08a) is not currently included on the 2012 303(d) list, and the mine does not regularly discharge, natural precipitation events induce constituent loading and contribute to the impairment of the lower Iowa Gulch segment. Therefore, the contribution from the Sherman Mine, and its waste load allocation, were determined from sampling data in conjunction with drainage basin precipitation modeling.

Data from the Sherman Mine discharge were recorded in August 2002 and July, August, and September 2004. The August 2002 data were not included in the allocation calculation due to the exclusion of data prior to August 2003. Data prior to 2003 were not used for the Black Cloud facilities, and including data from Sherman prior to this date produces inaccurate comparisons. Due to the high rate of flow recorded in August 2002 for the Sherman Mine (51.2 mgd), it would be eliminated due to its statistical outlier status and does not represent the typical flow for this part of the upper reach of Iowa Gulch. The Division has previously discussed stream conditions in Iowa Gulch with the local water commissioner, and the determination is that the low flow is generally zero.

Using basin ratio methodology, the contributions of the upper and lower reaches of Iowa Gulch were determined. From this approach, the upper reach represents 54% of the area within the total watershed/basin area. Therefore, the upper basin area of Iowa Gulch is represented as 54% of the mean stream flow.

The load allocation is assigned to the background sources of the upstream segment (COARUA08a), while the Sherman Mine is considered a point source, and thus, assigned a waste load allocation.

Waste Load Allocations "(WLA)":

Iowa Gulch was segmented to address the impairment generated by the Black Cloud Mine facilities (WQCC 2012). The facilities include Black Cloud Mine, Julia Fisk Mine, and Hellena Mine and they are all within one-half mile of each other. The Division of Reclamation, Mining, and Safety has indicated that Julia Fisk has been fully reclaimed and vegetation is established. Also, the Hellena Mine waste rock dump has been fully excavated and placed into the Black Cloud tailing impoundment. The tailings pond, and its associated outfall, that serves these mine productions is the primary point source for the waste load allocation.

No information is available for the historical production rates of Julia Fisk and Hellena; however, since the centralized tailings pond addresses the discharge for these facilities, it is assumed that all allocations can be combined to the single point source. Therefore, the load allocations do not address Julia Fisk and Hellena separately, and all allocations for

the mines in this area are assigned to one point.

The Sherman Mine does not discharge regularly, but water quality data indicate that the mine contributes to the impairment of Iowa Gulch. Since a current permit exists, and the discharge is a point source, a waste load allocation is given to the mine for this TMDL assessment.

Table 7.1 illustrates the allocation approach based on a contributing water shed analysis. Reference the "Load Allocations" section for more detailed information regarding calculations for the percent contributions. The mean yearly flow for Iowa Gulch is approximately 2.43 cfs. Using the basin ratio analysis, the upstream watershed basin contributes 1.31 cfs of the total 2.43 cfs flow. Since the Sherman Mine is located in the upper basin, the impairment contributions (in lbs/day) were calculated from the upper basin flow. The remaining 1.12 cfs is attributed to the downstream Iowa Gulch area starting at the Black Cloud facilities.

	Upper Iowa Gulch (COARUA08a)	**Sherman Mine (COARUA08a)**	**Black Cloud Mine (COARUA08b)**	**Total**
Mean Flow*, cfs	1.31	1.31	1.12	2.43
Cd ug/l	1.20	0.44	1.29	2.93
Cd Load lbs/day	0.0085031	0.0031178	0.0078125	0.0194333
% contribution	**43.8%**	**16.0%**	**40.2%**	**100%**
Pb ug/l	5.30	2.00	1.26	8.56
Pb Load lbs/day	0.0376	0.0142	0.0076	0.0593
% contribution	**63.3%**	**23.9%**	**12.8%**	**100%**
Zn ug/l	64.60	56.60	310.90	432.10
Zn Load lbs/day	0.46	0.40	1.88	2.74
% contribution	**16.7%**	**14.7%**	**68.6%**	**100%**

Table 7.1-Source contributions. * Modeled mean yearly flow. This table uses the ratio established between the upper stream segment (COARUS08a) basin area and the impaired stream segment (COARUS08b) basin area, in addition to collected water quality data, to establish the contributions for the load allocations.

The upper portion of Iowa Gulch, at the headwaters to the Black Cloud Mine facility, is considered background and thus assigned the Load Allocation (LA) of this TMDL assessment. The Sherman Mine, also located in the upper basin of Iowa Gulch, is a point source and is assigned Waste Load Allocation 1 (WLA 1). The Black Cloud Mine facility is within the limits of the impaired segment COARUA08b and is assigned Waste Load Allocation 2 (WLA 2).

Margin of Safety:

According to the Federal Clean Water Act, TMDLs require a margin of safety (MOS) component that accounts for the uncertainty about the relationship between the pollutant loads and the receiving waterbody. This MOS is included to account for the uncertainty in the analysis of the relationship between the TMDL loading allocations and the desired water quality target.

7.2 TMDL ALLOCATION FOR DISSOLVED CADMIUM

TMDL for Cadmium for COARUA08b with a 10% Margin of Safety									
Month	Mean Flow (cfs)	Hardness, $CaCO_3$, mg/L	Cd-D TVS, ug/L	Cd TMDL lbs/day	Cd TMDL lbs/day with 10% MOS	Current Cd, ug/L	Current Cd Load lbs/day	Load Reduction	Percent Load reduction
January	2.4	400	1.20	0.0156	0.0140	1.2	0.016	-0.00005	0%
February	2.5	197	0.71	0.0094	0.0085	1.1	0.014	0.005	35%
March	2.5	220	0.77	0.0104	0.0093	1.7	0.024	0.013	56%
April	2.8	201	0.72	0.0109	0.0098	2.9	0.043	0.032	75%
May	3.2	130	0.52	0.0089	0.0081	1.1	0.019	0.010	53%
June	2.7	91	0.39	0.0058	0.0052	1.0	0.015	0.009	61%
July	2.3	100	0.42	0.0052	0.0047	3.0	0.037	0.031	86%
August	2.4	113	0.47	0.0060	0.0054	0.6	0.008	0.002	22%
September	2.1	144	0.56	0.0063	0.0056	1.0	0.011	0.004	41%
October	2.0	150	0.57	0.00628	0.00565	1.7	0.018	0.012	65%
November	2.2	176	0.65	0.0075	0.0068	1.2	0.013	0.006	44%
December	2.1	191	0.69	0.0079	0.0071	1.1	0.013	0.005	37%

Table 7.21. TMDL for dissolved cadmium for COARUA08b with a 10% Margin of Safety.

Attainment of the TMDL is based on the sampling point in Iowa Gulch just below the Black Cloud Treatment Plant and tailings pond. The average cadmium load reduction for Iowa Gulch (COARUA08b) based on chronic standards would be approximately 48%. The highest load reductions occur in the months of April, July, and October, with reductions ranging between 65% and 86%. Load reductions drop to as low as 22% in August and 35% in February. No reduction is necessary for January.

To attain water quality standards for Iowa Gulch, both acute and chronic standards must be addressed. For Tables 7.21, 7.22, and 7.23, attainment of the chronic standards addresses all water quality standards for dissolved cadmium. Background load allocations for this stream segment are attributed to the upper basin of Iowa Gulch, located upstream of this stream segment. Waste load allocations are assigned on the basis of the mining contribution to the dissolved cadmium load in Iowa Gulch. Sherman Mine (WLA 1) is assigned 16.0% of the total allocation based on the impairment contribution; with the Black Cloud Mine (WLA 2) receiving 40.2% of the total allocation based on the impairment contribution. See also Table 7.1.

Month	TMDL lbs/day	10% MOS	LA lbs/day (Background)	WLA 1 lbs/day	WLA 2 lbs/day
January	0.016	0.0016	0.0061	0.0022	0.0056
February	0.009	0.0009	0.0037	0.0014	0.0034
March	0.010	0.0010	0.0041	0.0015	0.0038
April	0.011	0.0011	0.0043	0.0016	0.0039
May	0.009	0.0009	0.0035	0.0013	0.0032
June	0.006	0.0006	0.0023	0.0008	0.0021
July	0.005	0.0005	0.0021	0.0008	0.0019
August	0.006	0.0006	0.0024	0.0009	0.0022
September	0.006	0.0006	0.0025	0.0009	0.0023
October	0.006	0.0006	0.0025	0.0009	0.0023
November	0.008	0.0008	0.0030	0.0011	0.0027
December	0.008	0.0008	0.0031	0.0011	0.0028

Table 7.22. Waste load and load allocations for dissolved cadmium for COARUA08b with a 10% Margin of Safety.

Month	Cadmium Load Reduction lbs/day	Cadmium Load Reduction LA lbs/day (Background)	Cadmium Load Reduction WLA 1 lbs/day	Cadmium Load Reduction WLA 2 lbs/day
January	0.000	0.000	0.000	0.000
February	0.005	0.002	0.001	0.002
March	0.013	0.006	0.002	0.005
April	0.032	0.014	0.005	0.013
May	0.010	0.004	0.002	0.004
June	0.009	0.004	0.001	0.004
July	0.031	0.014	0.005	0.013
August	0.002	0.001	0.000	0.001
September	0.004	0.002	0.001	0.002
October	0.012	0.005	0.002	0.005
November	0.006	0.003	0.001	0.002
December	0.005	0.002	0.001	0.002

Table 7.23. Dissolved cadmium load reductions (mine sources) in pounds per day for COARUA08b.

7.3 TMDL ALLOCATION FOR DISSOLVED LEAD

TMDL for Lead for COARUA08b with a 10% Margin of Safety									
Month	Mean Flow (cfs)	Hardness, $CaCO_3$, mg/L	Pb-D TVS, ug/L	Pb TMDL lbs/day	Cd TMDL lbs/day with 10% MOS	Current Pb, ug/L	Current Pb Load lbs/day	Load Reduction	Percent Load reduction
January	2.4	400	10.94	0.141	0.1273	0.0	0.000	-0.141	0%
February	2.5	197	5.22	0.070	0.0626	0.1	0.001	-0.068	0%
March	2.5	220	5.86	0.079	0.0713	0.4	0.005	-0.074	0%
April	2.8	201	5.33	0.081	0.0728	0.9	0.013	-0.068	0%
May	3.2	130	3.34	0.058	0.0521	0.0	0.000	-0.058	0%
June	2.7	91	2.26	0.033	0.0301	1.8	0.027	-0.006	0%
July	2.3	100	2.52	0.031	0.0280	1.8	0.022	-0.009	0%
August	2.4	113	2.87	0.037	0.0335	0.9	0.011	-0.026	0%
September	2.1	144	3.74	0.042	0.0377	1.2	0.013	-0.028	0%
October	2.0	150	3.89	0.043	0.0383	5.5	0.060	0.018	29%
November	2.2	176	4.63	0.054	0.0484	0.2	0.002	-0.051	0%
December	2.1	191	5.05	0.058	0.0518	0.3	0.003	-0.054	0%

Table 7.31. TMDL for dissolved lead for COARUA08b with a 10% Margin of Safety.

Attainment of the TMDL is based on the sampling point in Iowa Gulch just below the Black Cloud Treatment Plant and tailings pond. The average lead load reduction for Iowa Gulch (COARUA08b) based on chronic standards would be approximately 29%. October is the only month requiring a load reduction at this time.

To attain water quality standards for Iowa Gulch, acute and chronic standards must be addressed. For Tables 7.31, 7.32, and 7.33, all water quality standards are addressed with attainment of the chronic standards. However, Iowa Gulch only exceeds the chronic Aquatic Life Use-based standards for dissolved lead, and only in the month of October.

Background load allocations for this stream segment are attributed to the upper basin of Iowa Gulch, located upstream of this stream segment. Waste load allocations are assigned on the basis of the mining contribution to the dissolved lead load in Iowa Gulch. Sherman Mine (WLA 1) is assigned 23.9% of the total allocation based on the impairment contribution; with the Black Cloud Mine (WLA 2) receiving 12.8% of the total allocation based on the impairment contribution. See also Table 7.1.

Month	TMDL lbs/day	10% MOS	LA lbs/day (Background)	WLA 1 lbs/day	WLA 2 lbs/day
January	0.141	0.014	0.081	0.030	0.016
February	0.070	0.007	0.040	0.015	0.008
March	0.079	0.008	0.045	0.017	0.009
April	0.081	0.008	0.046	0.017	0.009
May	0.058	0.006	0.033	0.012	0.007
June	0.033	0.003	0.019	0.007	0.004
July	0.031	0.003	0.018	0.007	0.004
August	0.037	0.004	0.021	0.008	0.004
September	0.042	0.004	0.024	0.009	0.005
October	0.043	0.004	0.024	0.009	0.005
November	0.054	0.005	0.031	0.012	0.006
December	0.058	0.006	0.033	0.012	0.007

Table 7.32. Waste load and load allocations for dissolved lead for COARUA08b with a 10% Margin of Safety.

Month	Lead Load Reduction lbs/day	Lead Load Reduction LA lbs/day (Background)	Lead Load Reduction WLA 1 lbs/day	Lead Load Reduction WLA 2 lbs/day
January	0.000	0.000	0.000	0.000
February	0.000	0.000	0.000	0.000
March	0.000	0.000	0.000	0.000
April	0.000	0.000	0.000	0.000
May	0.000	0.000	0.000	0.000
June	0.000	0.000	0.000	0.000
July	0.000	0.000	0.000	0.000
August	0.000	0.000	0.000	0.000
September	0.000	0.000	0.000	0.000
October	0.01759	0.01114	0.00420	0.00225
November	0.000	0.000	0.000	0.000
December	0.000	0.000	0.000	0.000

Table 7.33. Dissolved lead load reductions mine sources in pounds per day for COARUA08b.

7.4 TMDL ALLOCATION FOR DISSOLVED ZINC

TMDL for Zinc for COARUA08b with a 10% Margin of Safety									
Month	Mean Flow (cfs)	Hardness, $CaCO_3$, mg/L	Zn-D TVS, ug/L	Zn TMDL lbs/day	Cd TMDL lbs/day with 10% MOS	Current Zn, ug/L	Current Zn Load lbs/day	Load Reduction	Percent Load reduction
January	2.4	400	405.3	5.2	4.7	445.0	5.7	0.51	9%
February	2.5	197	221.6	3.0	2.7	303.9	4.1	1.10	27%
March	2.5	220	243.3	3.3	3.0	517.8	7.0	3.71	53%
April	2.8	201	225.2	3.4	3.1	756.8	11.5	8.07	70%
May	3.2	130	155.5	2.7	2.4	320.0	5.5	2.85	51%
June	2.7	91	114.2	1.7	1.5	196.4	2.9	1.22	42%
July	2.3	100	124.5	1.5	1.4	805.1	9.9	8.40	85%
August	2.4	113	138.0	1.8	1.6	107.5	1.4	-0.40	0%
September	2.1	144	169.9	1.9	1.7	212.8	2.4	0.48	20%
October	2.0	150	175.2	1.9	1.7	325.5	3.6	1.64	46%
November	2.2	176	201.3	2.3	2.1	291.5	3.4	1.05	31%
December	2.1	191	215.8	2.5	2.2	285.0	3.2	0.79	24%

Table 7.41. TMDL for dissolved zinc for COARUA08b with a 10% Margin of Safety.

Attainment of the TMDL is based on the sampling point in Iowa Gulch just below the Black Cloud Treatment Plant and tailings pond. The average zinc load reduction for Iowa Gulch (COARUA08b) based on chronic standards would be approximately 38%. The highest load reductions occur in the months of April and July, with reductions ranging between 70% and 85%. Load reductions drop to as low as 9% in January and 0% in August.

To properly attain water quality standards for Iowa Gulch, acute and chronic standards must be addressed. For Tables 7.41, 7.42, and 7.43, all water quality standards are addressed with attainment of the chronic standards. As shown in Figure 4, this stream segment exceeds acute and chronic standards. However, the load reduction required to meet chronic standards also addresses the necessary load reduction to meet acute standards.

Background load allocations for this stream segment are attributed to the upper basin of Iowa Gulch, located upstream of this stream segment. Waste load allocations are assigned on the basis of the mining contribution to the dissolved zinc load in Iowa Gulch. Sherman Mine (WLA 1) is assigned 14.7% of the total allocation based on the impairment contribution; with the Black Cloud Mine (WLA 2) receiving 68.6% of the total allocation based on the impairment contribution. See also Table 7.1.

Month	TMDL lbs/day	10% MOS	LA lbs/day (Background)	WLA 1 lbs/day	WLA 2 lbs/day
January	5.2	0.52	0.79	0.69	3.23
February	3.0	0.30	0.44	0.39	1.82
March	3.3	0.33	0.49	0.43	2.03
April	3.4	0.34	0.51	0.45	2.11
May	2.7	0.27	0.41	0.35	1.66
June	1.7	0.17	0.25	0.22	1.04
July	1.5	0.15	0.23	0.20	0.95
August	1.8	0.18	0.27	0.24	1.10
September	1.9	0.19	0.29	0.25	1.17
October	1.9	0.19	0.29	0.25	1.18
November	2.3	0.23	0.35	0.31	1.44
December	2.5	0.25	0.37	0.32	1.52

Table 7.42. Waste load and load allocations for dissolved zinc for COARUA08b with a 10% Margin of Safety.

Month	Zinc Load Reduction lbs/day	Zinc Load Reduction LA lbs/day (Background)	Zinc Load Reduction WLA 1 lbs/day	Zinc Load Reduction WLA 2 lbs/day
January	0.51	0.09	0.08	0.35
February	1.10	0.18	0.16	0.75
March	3.71	0.62	0.54	2.54
April	8.07	1.35	1.18	5.54
May	2.85	0.48	0.42	1.95
June	1.22	0.20	0.18	0.84
July	8.40	1.41	1.23	5.76
August	0.00	0.00	0.00	0.00
September	0.48	0.08	0.07	0.33
October	1.64	0.27	0.24	1.13
November	1.05	0.18	0.15	0.72
December	0.79	0.13	0.12	0.54

Table 7.43. Dissolved zinc load reductions mine sources in pounds per day for COARUA08b.

VIII. RESTORATION PLANNING AND IMPLEMENTATION PROCESS

A reclamation plan is currently in effect for the Black Cloud Mine facilities. Several surrounding structures and facilities have recently been removed, and the surrounding area reclaimed. Resurrection Mining is scheduled to complete the reclamation plan by 2013.

As part of the reclamation plan, dewatering of the tailings pond will greatly enhance the water quality for Iowa Gulch. The water in the tailings pond, at the time of this assessment, is used to relieve possible blockages at the Yak Tunnel facility. This activity is not part of the reclamation plan, but provides a benefit for the Iowa Gulch region. With the facilities and tailings pond removed from the Iowa Gulch vicinity, the Division expects the water quality to achieve attainment within five (5) years. Monitoring at the point immediately below the tailings pond is a requirement for the Black Cloud reclamation, and the information gathered will assist in determining attainment of water quality standards.

IX. PUBLIC INVOLVEMENT

There has been a strong public participation in protecting and enhancing the water quality of the Leadville area. North of Iowa Gulch is California Gulch, a current EPA Superfund site. Reclamation is ongoing in Iowa Gulch, and water quality attainment is expected after reclamation is complete. The U.S. Environmental Protection Agency (Region 8), U.S. Forest Service (USFS), Colorado Division of Wildlife River Watch, the Colorado Division of Reclamation, Mining and Safety, and the Colorado Department of Public Health and Environment (CDPHE) have been actively involved in better understanding the water quality issues of the Iowa Gulch watershed in order to better deal with the legacy of historical mining.

The public has had an opportunity to be involved in the Water Quality Control Commission (WQCC) hearings. Opportunities have also been available through the 303(d) listing process which also has a public notice period for public involvement. The TMDL itself is subject to an independent public process. A draft of these TMDLs was provided for public review and comment in August 2012. No comments were received at that time. These TMDLs were, however, revised per comments subsequently provided by USEPA. Public participation will continue to promote future restoration of the watershed, as new remediation possibilities are explored.

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