Colorado Department of Public Health and Environment

CENTRAL CITY/CLEAR CREEK SUPERFUND SITE

Amendment to the Operable Unit 4

Record of Decision

for the Active Treatment of the

National Tunnel, Gregory Incline and Gregory Gulch

Prepared in Cooperation with the United States Environmental Protection Agency

Region VIII

Denver, Colorado

DECLARATION

SITE NAME AND LOCATION

The Central City/Clear Creek Superfund Site (Site) is located approximately 30 miles west of Denver, Colorado within Clear Creek and Gilpin counties. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site Identification Number is COD980717557. The Central City/Clear Creek area was one of the most heavily mined areas in Colorado during the late 1800s, producing large quantities of metals such as gold, silver, copper, lead, nickel and zinc. The Study Area for the Site is located within the Clear Creek watershed, which spans approximately 400 square miles. The U.S. Environmental Protection Agency (EPA) listed the Site on the National Priorities List (NPL) in 1983.

STATEMENT OF BASIS AND PURPOSE

This decision document amends the Record of Decision (ROD) for the Central City/Clear Creek Superfund Site, Operable Unit 4 (OU4), signed Sept. 29, 2004. The Colorado Department of Public Health and Environment (CDPHE) as lead agency on the Site, and EPA have jointly selected the amended remedy.

This ROD amendment has been developed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC §9601 *et. seq.,* as amended by the Superfund Amendments and Reauthorization Act (collectively, CERCLA) and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), 40 CFR Part 300. Upon signature, this decision document will become part of the Administrative Record for the Central City/Clear Creek Superfund Site.

This ROD Amendment was prepared to change the water treatment component of the remedy from a combination of passive treatment and active treatment at a privately owned facility to active treatment of all waters at a new water treatment plant.

ASSESSMENT OF THE SITE

The response action selected in this ROD amendment protects public health and the environment from actual or threatened releases of hazardous substances into the environment. Such release, or threat of release, may present an imminent and substantial endangerment to public health or welfare or the environment.

The remains of historical mining operations in the Central City/Clear Creek Superfund Site include mine drainages that discharge acidic, metal-laden water into the North Fork of Clear Creek. The high concentrations of metals adversely impact aquatic life and potentially pose a risk to water supplies in Clear Creek and the North Fork of Clear Creek.

DESCRIPTION OF THE SELECTED REMEDY

The amended remedy for OU4 changes the location of active water treatment for the Gregory Incline and Gregory Gulch alluvial ground water, and replaces passive treatment of the National Tunnel discharge with active treatment. A new water treatment plant will be constructed to treat these sources. The sediment control remedy selected in the OU4 ROD will not change.

The major components of the *amended* OU4 selected remedy include: the collection, conveyance and active treatment of the Gregory Incline discharge, Gregory Gulch ground water, and the National Tunnel discharge at a new water treatment plant.

STATUTORY DETERMINATIONS

The selected remedy attains the mandates of CERCLA Section 121 and, to the extent practical, the NCP. Specifically, the amended remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate for the remedial action, is cost effective, and utilizes permanent solutions. The selected remedy in this amendment satisfies the statutory preference for treatment as a principal element. Because surface water restoration is a component of the remedy, the water treatment plant will be subject to Long-Term Response Action provisions.

The remedies will result in hazardous substances or pollutants or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, therefore a statutory review will be conducted within five years after initiation of the remedial action and every five years thereafter to ensure that the remedies continue to provide adequate protection of human health and the environment. In addition, institutional controls, identified in the OU4 ROD, are included as requirements to ensure the integrity of the remedy.

AUTHORIZING SIGNATURES

Gary W. Baughman

4/21/2010

Gary W. Baughman
Director
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment

Date

Eddie A. Sierra

04/29/2010

Eddie A. Sierra
Acting Assistant Regional Administrator
Office of Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

Date

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1.0 INTRODUCTION

This amendment to the Operable Unit (OU) 4 Record of Decision (ROD) for the Central City/Clear Creek Superfund Site (Site) modifies the water treatment component of the remedy by selecting active treatment at a new water treatment plant in lieu of the previously selected combination of passive treatment and active treatment at an existing facility. This amendment presents the rationale for the change to full active treatment and identifies a preferred location.

The Central City/Clear Creek Site is located in Clear Creek and Gilpin counties, approximately 30 miles west of Denver. The Superfund study area is within the 400-square-mile drainage basin of Clear Creek, which has been affected by numerous inactive precious-metal mines. The Superfund cleanup efforts to date have focused on OU1 and OU2 priority mine drainage tunnels and OU3 and OU4 priority mine tailings and waste rock piles that have a high potential to erode and impact surface water quality. OU4 remedial design and remedial action efforts are under way.

The Colorado Department of Public Health and Environment (CDPHE) and United States Environmental Protection Agency (EPA) work as a team on the Site with CDPHE acting as the lead agency since 1988. The CDPHE and EPA are issuing this ROD amendment as part of their responsibilities under Section 117 of CERCLA, as amended by the Superfund Amendment and Reauthorization Act of 1986, and pursuant to the National Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Section 300.435 (c)(2)(ii).

The OU4 ROD, signed by CDPHE and EPA on Sept. 29, 2004, selected a combination of active and passive treatment of acid mine drainage discharges. The Bates Hunter Mine water treatment plant, a privately owned active water treatment plant in Central City, was to treat the discharge from the Gregory Incline and the Gregory Gulch alluvial ground water. Passive treatment in the form of Sulfate Reducing Bioreactor (SRBR) cells and a free water system (FWS) cell would be used to treat the National Tunnel discharge.

CDPHE and EPA select treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge at a new active water treatment plant as the preferred remedy for the water treatment component of OU4 of the Central City/Clear Creek Site.

The amended remedy will actively treat the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge at a new water treatment plant. The OU4 remedies for waste piles and sediment control will not change.

The construction of a new water treatment plant for the active treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge will provide a protective, efficient and effective opportunity to clean up mining-impacted waters. It will provide greater protection to human health and the environment than the water treatment response actions originally intended to be implemented under the OU4 ROD.

This amendment to the OU4 ROD will become a part of the Administrative Record in accordance with § 300.825(a)(2) of the NCP. The Administrative Record for the Site is located at the CDPHE and EPA:

Hazardous Materials and Waste
Management Division
4300 Cherry Creek Drive South
Room B 215
Denver, Colorado 80246-1530
(303) 692-3331

EPA Superfund Records Center
1595 Wynkoop Street
OCPI Suite 300
Denver, Colorado 80202
(303) 312-6961

Key documents from the administrative record are also available at the following Site information repositories:

Clear Creek Watershed Foundation
2060 Miner Street
2nd Floor
Idaho Springs, Colorado 80452
(303) 567-2699

Please call for an appointment

Gilpin County Court House
203 Eureka Street
2nd Floor
Central City, Colorado 80427

2.0 SITE LOCATION, CONTAMINATION AND SITE-WIDE REMEDY

The Superfund Study Area covers the 400-square mile drainage basin of Clear Creek (refer to Figure 1). The water quality of the watershed is compromised by several diverse sources of metals contamination including: acid mine drainage from historic mine tunnels, ground water associated with flooded historic underground mine workings and sediment eroded from mine waste rock piles and tailings piles. As a result, the EPA included the Site on National Priorities List in 1983. In June 1988, the EPA transferred the lead role of the Site to CDPHE. The CDPHE and EPA have jointly selected the amended remedy.

EPA has organized work at the Site into separate working units known as Operable Units. The Central City/Clear Creek Superfund Site includes four Operable Units that were designated to address heavy-metals contamination associated with historic mining activity in the Clear Creek drainage basin. The EPA and the CDPHE have published four Records of Decision that call for a variety of remedial actions under OUs 1, 2, 3 and 4.

OU1 focused on acid mine drainage from five tunnels: the National, Gregory Incline, Quartz Hill, Argo and Big Five. The ROD was signed in September 1987. The ROD selected passive treatment of the discharging acid mine water. The OU 1 ROD was later amended by the OU 3 ROD.

OU2 addressed mine tailings and waste rock associated with the five discharging tunnels. The ROD was signed in March 1988.

Further investigation based on a watershed approach expanded the list of tunnels and tailings/waste rock piles being addressed, and the OU3 ROD included: capping or other controls of certain waste rock piles and tailings piles; treatment of the Argo Tunnel and Burleigh Tunnel discharges; assessment, collection and treatment of Virginia Canyon ground water; and collection and piping of the Gregory Incline, National Tunnel and Quartz Hill tunnel discharges. A decision as to whether or not to treat the Gregory Incline, National Tunnel and Quartz Hill discharges was deferred to the OU4 ROD pending further investigation. The Quartz Hill Tunnel discharges into Gregory Gulch and is a component of the Gregory Gulch alluvial

ground water. The OU3 ROD was signed on Sept. 30, 1991. In 2003, the OU3 ROD was amended from passive treatment of the Burleigh Tunnel discharge to No Further Action, with monitoring.

OU4 focused on the watershed of the North Fork of Clear Creek. Components of the OU4 ROD included: capping/removal of priority tailings/waste rock piles in the North Fork of Clear Creek drainage; treatment of discharges from the Quartz Hill, Gregory Incline and National tunnels; collection and treatment of surface water and ground water in Gregory Gulch; and sediment control in the North Fork of Clear Creek and its tributaries. The OU4 ROD was signed on Sept. 29, 2004. The OU4 ROD was amended in 2006 to add an on-site repository for consolidating mine waste rock, sediment and water-treatment solids generated by the Site response actions.

The OU4 ROD included the following specific remedy components for water treatment:

1. An interceptor trench at the base of the Gregory Gulch alluvium near the upstream entrance of the Gregory Gulch box culvert.
2. A sump and pump station on the upgradient side of the Gregory Gulch interceptor trench, and a pipeline connecting to the Bates Hunter Mine water treatment plant.
3. A pump station and pipeline connecting the Gregory Incline discharge to the Bates Hunter Mine water treatment plant.
4. A gravity pipeline configured as full-pipe flow conveying the National Tunnel discharge downstream to the passive treatment system location.
5. A passive treatment system consisting of Sulfate Reducing Bioreactor (SRBR) cells. The effluent from the SRBR cells would flow to a Free Water System (FWS) cell for polishing prior to discharge to the North Fork of Clear Creek.

3.0 BASIS FOR THE AMENDMENT

CDPHE and EPA have pursued the use of the Bates Hunter Mine water treatment plant for treatment of the Gregory Incline and the Gregory Gulch alluvial ground water as required by the OU4 ROD. The Bates Hunter Mine water treatment plant is a privately owned treatment plant that recently has been used to treat water from dewatering of the Bates Hunter Mine in

support of potential future mining operations. Following the OU4 ROD, the mine owner, CDPHE and EPA agreed to pursue an arrangement to operate the plant for the mutual benefit of the mining company and the agencies. The owners of the Bates Hunter Mine water treatment plant would like to resume mining, and therefore anticipate needing to treat water from their mining operations. A capacity analysis of the Bates Hunter Mine water treatment plant concluded that the plant does not have the capacity to support both mine dewatering and CERCLA remedial action activities. Additionally, CDPHE and EPA have become aware of Colorado Department of Transportation (CDOT) plans to reconstruct State Highway 119 from the southern edge of Black Hawk downstream to the intersection with Highway 6. The overlapping boundary of the highway improvements with OU4 CERCLA activities provides an opportunity for the agencies to work cooperatively with CDOT. Cooperative efforts will include installation of a conveyance pipeline and construction of a new water treatment plant in CDOT owned right of way.

3.1 BATES HUNTER MINE WATER TREATMENT PLANT CAPACITY STUDY

In 2007, CDPHE contracted with an engineering consulting firm to determine the rate of flows to be treated, to design appropriate collection and conveyance systems, and to assess the capacity and value of the Bates Hunter Mine water treatment plant.

A hydrologic assessment was performed and documented in a draft memorandum dated May 24, 2007. This assessment was conducted to determine the appropriate design flow rates for treatment of water from the National Tunnel, Gregory Incline and Gregory Gulch. The assessment concluded the appropriate flow rates to use for design of the remedy were a combined flow of 446 gallons per minute (gpm) from Gregory Incline and Gregory Gulch, and 47 gpm from the National Tunnel.

An analysis of the treatment capacity of the existing Bates Hunter Mine water treatment plant was conducted and documented in a memorandum dated June 12, 2007 and supplemented Jan. 21, 2008. The assessment concluded that the capacity of the Bates Hunter Mine water treatment plant was approximately 140 gpm. Treatment of the Gregory Incline and Gregory Gulch waters at the Bates Hunter Mine water treatment plant at the design flows would require a capacity of at least 450 gpm. If the private owners of the plant wanted to resume mining

operations, they would require an additional capacity of 100 gpm in order to dewater their underground mine workings. Therefore, to be used for the CERCLA response actions as anticipated in the OU4 ROD, the Bates Hunter Mine water treatment plant would need to have a minimum capacity of 550 gpm. Given the current capacity of 140 gpm, the plant would require significant upgrades to obtain the necessary treatment capacity.

The consultant prepared a construction budget opinion analysis for both upgrading the Bates Hunter Mine water treatment plant and constructing a new water treatment plant. The consultant also estimated operation and maintenance costs at both facilities. The budget estimates were presented in a memorandum dated Feb. 9, 2010.

The amended remedy will be similar in cost to the selected remedy. The construction of a new water treatment plant is estimated to cost approximately $13,310,000, including the construction of collection and conveyance systems. The current estimated capital cost for the construction of the selected remedy (active treatment at the Bates Hunter water treatment plant and passive treatment of the National Tunnel discharge) is $12,360,000. The difference in capital costs would be offset by reduced annual operation and maintenance costs, estimated at $1,000,000 for the new active water treatment plant versus $1,300,000 for the combined Bates Hunter Mine Water Treatment Plant and the passive National Tunnel discharge system. The costs are presented in Table 1.

Table 1. Comparison of Costs (millions of dollars)			
Factor	**Bates Hunter**	**New Plant**	**Difference**
Site Development	1.15	1.15	0
WTP Construction	6.61	8.56	1.95
Passive System Construction	0.8	0	-0.8
Gregory Gulch Collection Construction	1.0	1.0	0
Property Acquisition	0.7	0	-0.7
Conveyance Pipeline	2.1	2.6	0.5
Total Capital	**12.36**	**13.31**	**0.95**
Annual O&M WTP	1.2	1.0	-0.2
Annual O&M Passive System	0.1	0	-0.1
Total Annual O&M	**1.3**	**1.0**	**-0.3**
10 Year PV O&M (7%)	**9.13**	**7.02**	**-2.11**
Total Cost	**21.49**	**20.33**	**-1.16**

3.2 PREFERRED LOCATION

Since the signing of the OU4 ROD, CDPHE and EPA became aware of CDOT plans to reconstruct State Highway (SH) 119 from the southern edge of Black Hawk downstream to the intersection with Highway 6. The overlapping boundary of the highway improvements with North Fork sediment control and water treatment activities provides an opportunity for the agencies to work cooperatively with CDOT to construct the site remedies.

CDPHE has identified the CDOT right-of-way as a highly favorable location to install a pipeline to convey mine water and to construct a new water treatment plant. The agencies and CDOT have signed a memorandum of understanding agreeing to coordinate efforts (refer to Figure 2).

The preferred treatment plant site currently is on and adjacent to SH 119, which will become available during the SH 119 project. If the preferred location cannot be used, another location downstream of the discharge points will be used.

3.3 STATEMENT OF BASIS AND PURPOSE

This decision document amends the OU4 ROD and selects active water treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge at a new water treatment plant. This ROD amendment has been developed in accordance with the requirements of CERCLA, 42 U.S.C. 9601 *et seq.* as amended, and to the extent practicable, the NCP, 40 CFR Part 300. The response actions selected in the OU4 ROD are necessary to protect human health and the environment from actual or threatened releases of hazardous substances into the environment. This amendment to the OU4 ROD will provide greater protection of human health and the environment than the response actions selected in the original OU4 ROD. The treatment of all the waters at an active water treatment plant will enhance the water quality in the North Fork of Clear Creek. CDPHE and EPA, therefore select active treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge at a new water treatment plant located downstream of the discharge locations as the remedial action component for water treatment.

The preferred treatment plant site location is a parcel of land currently on and adjacent to Highway 119, to become available during road work conducted by the Colorado Department of Transportation. If the preferred location cannot be utilized, another location downstream of the discharge points in the canyon will be used, likely one to two miles downstream of Black Hawk.

4.0 OU4 REMEDY DESCRIPTION

The amended remedy differs from the previously selected remedy in the water treatment component only. The sediment control remedy selected in the OU4 ROD will remain unchanged. A summary and comparison of the water treatment components of the two remedies is provided in Table 2.

Table 2 Summary and Comparison of Remedies	
Original OU4 Selected Remedy	Amended OU4 Remedy
the collection, conveyance and active treatment of the Gregory Incline discharge and Gregory Gulch ground water at the Bates Hunter Mine water treatment plant	the collection, conveyance and active treatment of the Gregory Incline discharge and Gregory Gulch ground water at a new water treatment plant
the collection, conveyance and passive treatment of the National Tunnel discharge	the collection, conveyance and active treatment of the National Tunnel discharge at the new water treatment plant

The amended remedy replaces the water treatment component of the previously selected OU4 remedy. The original OU4 remedy included active treatment of the Gregory Incline discharge and Gregory Gulch ground water at the privately owned Bates Hunter Mine water treatment plant and passive treatment of the National Tunnel discharge. The amended remedy includes active treatment of the National Tunnel and Gregory Incline discharges, and the Gregory base flows (including the Quartz Tunnel discharge) at a new water treatment plant. The treated water will be returned to the North Fork of Clear Creek. This approach benefits the North Fork by increasing water hardness and alkalinity, which slightly reduces the metals' aquatic toxicity.

Major components of the revised water collection, conveyance and treatment remedy include:

1. An alluvial ground water collection system in Gregory Gulch.
2. A pipeline conveying the collected ground water, the Gregory Incline discharge and the National Tunnel discharge to the new water treatment plant.
3. A new active water treatment plant located downstream of the discharges.

4.1 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) provide a general description of the intended purpose of the cleanup. This ROD Amendment does not change the established OU4 RAOs, which are as follows:

Surface Water Remedial Action Objectives

1. Reduce in-stream metals concentrations and sediment transport to minimize water quality and habitat impacts and to maximize reasonably attainable water uses of the North Fork of Clear Creek. These actions also will support the survival of a reproducing brown trout population in the North Fork of Clear Creek.
2. Reduce in-stream metals concentrations and sediment transport in North Clear Creek with the purpose of reducing adverse water quality and habitat impacts on the main stem of Clear Creek, to protect aquatic life and to support a viable reproducing brown trout population in the main stem of Clear Creek.
3. Ensure that in-stream metals concentrations do not degrade drinking water supplies diverted from the main stem of Clear Creek.
4. Reduce the toxicity to benthic aquatic organisms living at the surface water/sediment interface or in sediment to levels that are protective of aquatic life.

Tailings/Waste Rock Remedial Action Objectives

1. Control and/or reduce run-on and runoff from tailings/waste rock piles to minimize generation of contaminated runoff and/or ground water, and to reduce sediment loading of streams.
2. Reduce exposure to arsenic and lead from incidental ingestion of surface tailings/waste rock and other mine wastes to minimize the potential threat to human health.

Ground Water Remedial Action Objectives

1. Control and/or reduce metals loading from ground water to reduce in-stream metals concentrations.
2. Ensure that contaminated ground water does not adversely impact human health.

Air Remedial Action Objective

1. Control airborne metals contaminants in residential areas.

4.2 SUMMARY OF SITE RISKS

CDPHE and EPA assessed potential human health and ecological risks associated with the existing contamination within the Clear Creek Study Area. The most significant environmental impacts associated with the Site are the impacts on the Clear Creek stream system that include a reduced fishery and significant impacts to other aquatic life and habitat. Acidic mine water that drains from many mines contains various heavy metals, and mine wastes such as tailings and waste rock contribute to the non-point source impacts to the basin. Clear Creek is a drinking water source for more than one-quarter million people living in the Denver area, and is a favored place for kayaking, rafting, fishing, wildlife watching and gold panning. A surface water remedial action objective is to ensure that in-stream metals concentrations do not degrade drinking water supplies diverted from the main stem of Clear Creek.

Human Health Risks: Historic mining, milling and smelting operations resulted in contamination of the environment with a number of metals that were the objective of historic mining and refining activities (copper, lead, silver, zinc), as well as a variety of other metals that exist in the ore body (arsenic, aluminum, cadmium, chromium, fluoride, iron, manganese, mercury, nickel). Essentially, all of these metals occur at elevated concentrations (compared to background) in Site soils, mine wastes, surface water and ground water. Arsenic and lead pose the majority of human health risk at the site and are considered contaminants of concern (COCs).

The risks to human health through contact with COCs in surface water/sediment, tailings/waste rock, ground water, fish and air were evaluated. Risks to human health are not expected from ingestion of surface water (based on municipal diversions) when used as drinking water, ingestion of surface water while swimming, or ingestion of fish based on the exposure scenarios evaluated in the risk assessment. There are potential risks associated with ingestion of contaminated ground water, incidental ingestion of tailings and inhalation of airborne dust. Arsenic contributes most significantly to potential human health risk from ground water and tailings. The metals evaluated for the inhalation pathway, when assessed together, pose

potential risks to human health. The combined excess carcinogenic risk range for inhalation of all contaminants is four cancer incidences per 100,000 people and nine cancer incidences per 100,000 people for the average and maximum exposure scenarios, respectively. The greatest proportion of total inhalation excess cancer risk is attributed to chromium. Metals data for mine waste rock piles show that both arsenic and lead would be expected to occur in some of the OU4 mine waste piles at concentrations that pose a potential risk to human health. Lead exposures from ingestion of soil and dust pose potential risks to children.

The Site clean-up objectives are to prevent possible human ingestion of untreated mine drainage; reduce exposure to arsenic and lead from incidental ingestion of mine wastes; and ensure that in-stream metals concentrations do not degrade drinking water supplies diverted from the main stem of Clear Creek.

Ecological Risks: The risk assessment identified the impact of mine waste contamination on aquatic organisms within the Clear Creek Study Area. Copper, zinc, cadmium and manganese were identified as COCs for aquatic life.

Aquatic organisms, mainly trout and macroinvertebrates, are the primary populations at risk within the North Fork and main stem of Clear Creek. This risk is due to the organisms' constant direct contact with contaminated surface water and stream sediments and their low tolerance for metals-contaminated water. The fish species that were evaluated include rainbow, cutthroat, brook and brown trout.

Metals concentrations are significantly elevated within the North Fork of Clear Creek, and there is a clear risk of adverse reproductive effects to trout, and at certain times of the year, to trout survival. Tributaries of the North Fork, including Gregory Gulch, Russell Gulch and Chase Gulch, have metals concentrations that also pose risks to trout. Macroinvertebrates are severely affected in the main stem of North Fork and Gregory Gulch. Tunnel discharges within the North Fork (Gregory Incline, National Tunnel, Quartz Hill Tunnel) are expected to be acutely toxic to trout and macroinvertebrates. While the metals concentrations in Clear Creek are lower than in the North Fork of Clear Creek, the concentrations in Clear Creek impair trout reproduction.

The Ecological Risk Summary was confirmed by Colorado Division of Wildlife (CDOW) monitoring and assessments. No fish have been found during past CDOW monitoring in the North Fork of Clear Creek downstream of Black Hawk. The CDOW also has found that trout populations in the main stem of Clear Creek are smaller than would be present if metals concentrations were reduced. Macroinvertebrate sampling has documented that abundance and diversity of macroinvertebrates is lower than would be expected in non-impacted streams for both the North Fork of Clear Creek and the main stem of Clear Creek.

The Site clean-up actions are intended to reduce in-stream metals concentrations and sediment transport. Remediation goals are to improve stream water quality, promote brown trout survival in the North Fork of Clear Creek and allow for a viable reproducing brown trout population in Clear Creek.

5.0 EVALUATION OF ALTERNATIVES

This section of the amendment profiles the relative performance of each alternative using the nine CERCLA criteria, noting how the amendment alternative — active treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge at a new water treatment plant — compares with the originally selected OU4 alternative.

The nine criteria are:

1. Overall protection to human health and the environment: addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated or reduced;

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): addresses whether or not a remedy will meet all federal and state environmental laws or regulations;

3. Long-term effectiveness and permanence: refers to expected residual risk and the ability of a remedy to provide reliable protection of human health and the environment over time;

4. Reduction in toxicity, mobility or volume of contaminants: refers to the preference for a remedy that reduces health hazards, the movement of contaminants, and the quantity of contaminants at the Site;

5. Short-term effectiveness: addresses the period of time needed to complete the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy;

6. Implementability: refers to the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services, administrative feasibility and coordination with other government entities also are considered;

7. Cost: evaluates the estimated capital, operation and maintenance costs. Cost estimates are expected to be accurate within a range of plus 50 to minus 30 percent;

8. Supporting agency acceptance: indicates whether the supporting agency agrees with, opposes or has no comment; and

9. Community acceptance: includes determining which components of the alternative interested persons in the community support, have reservations about or oppose.

The comparison between the selected alternative of the OU4 ROD and the amended remedy — active treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge at a new water treatment plant — is summarized in Table 3. The first two cleanup evaluation criteria, overall protection of human health and the environment and

compliance with Applicable or Relevant and Appropriate Requirements (ARARs), are threshold criteria that must be met by the selected remedial action. The remaining criteria are used to help select the preferred remedy.

TABLE 3. COMPARISON OF REMEDIAL ALTERNATIVES BASED ON THE NATIONAL CONTINGENCY PLAN EVALUATION CRITERIA

CRITERIA	**OU4 Selected Alternative** (Combination of active treatment of the Gregory Incline and Gregory Gulch alluvial ground water at Bates Hunter Mine water treatment plant and passive treatment of National Tunnel discharge)	**Amended Remedy** (Active treatment of Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge at new water treatment plant)
Overall Protection	*Protective.* Reduces the concentrations of COCs in North Fork surface water, through point- and non-point source treatment, to an extent that enables brown trout to survive along the North Fork and that supports a reproducing brown trout fishery along the main stem of Clear Creek.	*Protective*. Reduces the concentrations of COCs in North Fork surface water, through point- and non-point source treatment, to an extent that enables brown trout to survive along the North Fork and that supports a reproducing brown trout fishery along the main stem of Clear Creek. Concentrations of COCs in North Fork may be reduced to a greater extent.
Compliance with ARARs	*Complies* with action-, chemical- and location-specific ARARs.	*Complies* with action-, chemical- and location-specific ARARs.
Long-Term Effectiveness and Permanence	*Minimal-moderate residual risk.* Relies on passive treatment system, of which long-term effectiveness is not well documented. Relies on private-public cooperative agreement.	*Minimal residual risk.* Utilizes a State-owned water treatment plant. Reliable to effectively treat the water year round.
Reduction in Toxicity, Mobility or Volume	*Reduces toxicity and mobility.* Contaminants are removed from a liquid phase and converted to a solid phase.	*Reduces toxicity and mobility.* Contaminants are removed from a liquid phase and converted to a solid phase. Active treatment removes contaminants to a lower concentration than passive treatment.
Short-Term Effectiveness	*High level of short term effectiveness*. Relies on existing water treatment plant, therefore treatment could begin quickly after collection and conveyance system constructed.	*Moderate level of short term effectiveness*. Relies on the construction of new water treatment plant. Once plant is operating, the impact will be immediate.
Implementability	*Implementable.* Requires construction of collection and conveyance systems. Requires acquisition of property to site the passive water treatment system. Requires purchase of or long-term lease with the owner of the Bates Hunter Mine water treatment plant. Requires modifications to the Bates Hunter Mine water treatment system.	*Implementable*. Requires construction of collection and conveyance systems. Requires acquisition of property to site the new water treatment plant. Requires construction of water treatment plant.
Cost	*High*. Long-term operation and maintenance costs required.	*High*. Long-term operation and maintenance costs required. Costs similar to selected remedy.

5.1 OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT

The amended remedy will provide protection of human health and the environment through active treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge. The amended remedy will continue to protect human health and the environment by treating the National Tunnel, Gregory Incline and Gregory Gulch waters.

The amended remedy will reduce the concentrations of contaminants of concern in North Fork surface water to a point that enables brown trout to survive along the North Fork and that supports a reproducing brown trout population along the main stem of Clear Creek. The amended remedy will also use active treatment for National Tunnel discharge. Active treatment technologies are more effective than passive treatment.

The amended remedy is protective.

5.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The amended remedy will continue to comply with federal and state ARARs. No changes to the ARARs are necessary due to this amendment. A complete list of all ARARs identified for the OU4 remedial actions are included in the Record of Decision.

The amended remedy complies with ARARs.

5.3 LONG-TERM EFFECTIVENESS AND PERMANANCE

The amended remedy will provide a high level of long-term effectiveness and permanence. The amended remedy is slightly more effective than the previously selected remedy. Below the confluence with the North Fork of Clear Creek, both alternatives should be equally effective. Active treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge provides greater long-term effectiveness and permanence than the selected remedy due to the increased reliability of a water treatment plant to effectively treat water year

round. Passive treatment systems generally show seasonal variation in effectiveness. The agencies would own the plant instead of it being privately owned, providing for more control of the facility. Long-term monitoring and maintenance will ensure effectiveness.

The amended remedy is more effective in the long-term than the originally selected remedy for OU4.

5.4 REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT

The amended remedy will significantly reduce toxicity, mobility and volume of contaminants through the use of active water treatment for the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge. The effectiveness of an active treatment plant is greater than that of a passive treatment system, which was proposed in the selected remedy for treatment of the National Tunnel discharge.

Conventional water treatment processes produce solids. The amended remedy would produce slightly more solids than the selected remedy because more water is being treated. However, the materials in the National Tunnel sulfate reducing bioreactor in the selected remedy would require infrequent replacement and disposal.

The amended remedy represents the maximum extent to which permanent solutions and treatment technologies can be incorporated into Superfund response actions to address acid mine drainages.

The amended remedy provides a reduction of toxicity, mobility or volume through treatment to a greater extent than the originally selected OU4 remedy.

5.5 SHORT-TERM EFFECTIVENESS

The amended remedy will require a similar time for implementation as the selected remedy. Both remedies require the design and construction of collection and conveyance systems. Provided the agencies could reach an agreement with the owner of the Bates Hunter Mine

water treatment plant, design and implementation of improvements would be required for the originally selected remedy. Both remedies require the acquisition of property. The amended remedy requires design and construction of a new water treatment plant. The availability of land for construction of the plant relies on the CDOT SH 119 project moving forward or the agencies acquiring other property. Once either remedy is implemented, it will have an immediate impact on water quality in the North Fork and main stem of Clear Creek.

The amended remedy is less effective in the short-term than the originally selected remedy for OU4.

5.6 IMPLEMENTABILITY

The amended remedy and the original ROD remedy are technically and administratively feasible. Both remedies require the installation of conveyance pipelines through Black Hawk and along SH 119 below Black Hawk. Both remedies require the acquisition of land, which would be used in the previously selected remedy for the passive treatment system for the National Tunnel discharge. In the amended remedy, a new water treatment plant, a proven technology, would be located there instead. The previously selected remedy requires purchase of the Bates Hunter Mine water treatment plant or negotiation of a long-term lease with the owner.

The amended remedy is more implementable than the originally selected remedy for OU4.

5.7 COST

Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility or volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The amended remedy will be similar in cost to the selected remedy. The construction of a new water treatment plant is estimated to cost approximately $13,310,000, including the construction of collection and conveyance systems. The current estimated capital cost for the construction of the selected remedy (active treatment

at the Bates-Hunter water treatment plant and passive treatment of the National Tunnel discharge) is $12,360,000. The difference in capital costs would be offset by reduced operation and maintenance costs, estimated at $1,000,000 for the new active water treatment plant versus $1,300,000 for the combined Bates Hunter Mine water treatment plant and the passive National Tunnel discharge system.

The amended remedy has a higher capital construction cost than the originally selected remedy for OU4. However, due to lower operation and maintenance costs, the amended remedy has a lower 10 year present value cost.

5.8 SUPPORTING AGENCY ACCEPTANCE

EPA assisted the CDPHE in preparation of the Proposed Plan and this ROD Amendment and concurs with the modification of the water treatment component of the remedy to a new water treatment plant in lieu of the previously selected combination of passive treatment and active treatment at an existing facility.

5.9 COMMUNITY ACCEPTANCE

A Proposed Plan describing the proposed change to the OU 4 ROD was issued in December 2009 and made available to the public and Clear Creek and Gilpin counties for review and comment. Public comments were accepted from Jan. 4, 2010 until Feb. 3, 2010. CDPHE and EPA conducted a public meeting on Jan. 19, 2010, at the Gilpin County Courthouse to present the Proposed Plan and to provide an opportunity for interested community members to give oral comments. A presentation concerning the Proposed Plan was also made to the Upper Clear Creek Watershed Association (UCCWA) on Jan. 14, 2010.

The City of Black Hawk, the Upper Clear Creek Watershed Association, the Silver Dollar Metropolitan District and several community members expressed support for the amended remedy. One comment was received in opposition to the water treatment plant by a citizen who urged the agencies to consider a passive bioreactor to treat all of the contaminated water related to OU 4.

Specific written comments received and agency responses are included in Appendix A. This appendix also includes a summary of community outreach activities.

6.0 SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the comparison of the original OU4 remedy to the amended remedy and public comments, CDPHE and EPA have decided to modify the water treatment component of the remedy by selecting active treatment at a new water treatment plant instead of the previously selected combination of passive treatment and active treatment at an existing facility.

Active water treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel discharge was selected based upon the following reasons:

- As required, the amended remedy meets the threshold clean-up evaluation criteria (overall protection of human health and the environment, and compliance with ARARs).

- The amended remedy will achieve remedial action objectives and reduce the toxicity, mobility and volume of contaminants through treatment. Active treatment of the National Tunnel discharge versus passive treatment provides a higher degree of contaminant reduction.

- The new active water treatment plant will provide protection to human health and the environment.

- The new active water treatment plant is anticipated to reduce operations and maintenance costs. It makes use of proven technology that will be protective over the long term.

Treating the mining impacted waters in a new water treatment facility will be more effective and efficient than treating with either a passive treatment system (as previously selected for the

National Tunnel discharge) or at the existing private Bates Hunter Mine water treatment plant, retrofitted to handle the Gregory Incline discharge and Gregory Gulch ground water.

The preferred location for the new water treatment plant is a parcel of land currently on and adjacent to Highway 119, to become available during road work conducted by the Colorado Department of Transportation. If the preferred location cannot be utilized, another location downstream of the discharge points in the canyon will be used, likely one to two miles downstream of Black Hawk.

7.0 STATUTORY DETERMINATIONS

Under CERCLA 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (ARARs) (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions to the extent practicable. In addition, CERCLA includes a preference for remedies employing treatment that permanently and significantly reduces the volume, toxicity or mobility of hazardous wastes as a principal element and a bias against off site disposal of untreated wastes. The following sections discuss how the selected remedy meets these statutory requirements. The CDPHE and EPA believe that the amended remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria.

7.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The amended remedy will continue to protect human health and the environment by actively treating the National Tunnel, Gregory Incline and Gregory Gulch waters. The remedy will reduce the concentrations of COCs in North Fork surface water through point-source treatment to an extent that enables brown trout to survive along the North Fork and that supports a reproducing brown trout fishery along the main stem of Clear Creek. The remedy will prevent human exposure to untreated mining-impacted waters.

7.2 COMPLIANCE WITH ARARs

The amended remedy will comply with the federal and state ARARs that have been identified. A complete list of all ARARs identified for remedial actions at OU4 can be found in the Record of Decision. No waiver of any ARARs is being sought for the amended remedy. Monitoring will be conducted, and the five-year reviews will be used to confirm compliance with ARARs upon implementation of the amended remedy. ARARs specific to this amended remedy are identified in Table 4. All other ARARs included in the original OU4 ROD remain unchanged.

7.3 COST-EFFECTIVENESS

The amended remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: “A remedy shall be cost-effective if its costs are proportional to its overall effectiveness (NCP 300.430(f)(1)(ii)(D)).” This determination is accomplished by evaluating the “overall effectiveness” of those alternatives that satisfied the threshold criteria (i.e. were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. Proportional to costs, the newly selected remedy provides the best overall effectiveness of the alternatives considered. The selected remedy will achieve remedial action objectives and reduce toxicity, mobility and volume of contaminants. The remedy makes use of proven technology that will be protective over the long term.

7.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The amended remedy represents the maximum extent to which permanent solutions and treatment technologies can be practicably used at the Site.

7.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The remedy selected in the amendment satisfies the statutory preference for treatment as a principal element. Active water treatment will be utilized for the treatment of the National Tunnel, Gregory Incline and Gregory Gulch alluvial ground water.

7.6 FIVE-YEAR REVIEW REQUIREMENT

Because this amended remedy will result in hazardous substances or pollutants or contaminants remaining above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after construction and implementation of remedial action and every five years thereafter to ensure that the remedy remains protective of human health and the environment.

8.0 REFERENCES

Colorado Department of Public Health and Environment and the United States Environmental Protection Agency, Region VIII. September 29, 2004. Record of Decision. Operable Unit 4 Clear Creek/Central City Superfund Site.

Colorado Department of Public Health and Environment and the United States Environmental Protection Agency, Region VIII. September 25, 2006. Amendment to the Operable Unit 3 and Operable Unit 4 Records of Decision for the Addition of an On-Site Repository. Clear Creek/Central City Superfund Site.

Colorado Department of Public Health and Environment and the United States Environmental Protection Agency, Region VIII. December 2009. Proposed Plan to Amend the Operable Unit 4 Record of Decision for the Active Treatment of the National Tunnel, Gregory Incline and Gregory Gulch. Clear Creek/Central City Superfund Site.

Industrial Facilities Engineering, Inc. May 24, 2007. *Hydrologic Assessment – Gregory Gulch, National Tunnel, and Gregory Incline. Project P-8609-T NCC Mine Water Conveyance and Consulting.* Memorandum from Tim Holbrook to Ron Abel, CDPHE.

Industrial Facilities Engineering, Inc. January 21, 2008. *Bates Hunter Mine Water Treatment Plant – Additional Source Characterization and Capacity Testing.* Memorandum from Tim Holbrook to Ron Abel, CDPHE.

Industrial Facilities Engineering, Inc. February 9, 2010. *FINAL Construction Budget Opinion – Upgrade for Bates Hunter Water Treatment Plant and New Mine Water Treatment Plant.* Memorandum from Tim Holbrook to Steve Laudeman, CDPHE.

TABLE 4 - ARARs

Chemical Specific ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comments
FEDERAL				
Clean Water Act Federal Water Quality Criteria	40 CFR Part 131 Quality Criteria for Water, 1986, pursuant to 33 USC § 1314	Sets criteria for water quality based on toxicity to aquatic organisms and human health.	Applicable	
National Primary Drinking Water Regulations (MCLs)	40 CFR Part 141, Subpart B pursuant to 42 USC §§ 300g-1 and 300j-9	Regulates drinking water quality.	Relevant and Appropriate	
National Secondary Drinking Water Regulations (SMCLs)	40 CFR Part 143, pursuant to 42 USC §§ 300g-1(c) and 300j-9	Sets standards for drinking water based on health and aesthetics.	Relevant and Appropriate	National Secondary Drinking Water Regulations (SMCLs)
National Primary Drinking Water Regulation Goals (MCLGs)	40 CFR Part 141, Subpart F, pursuant to 42 USC 300g-1	Establishes health based goals for public water systems	Relevant and Appropriate	
STATE				
Colorado Primary Drinking Water Standards	5 CCR 1003-1, pursuant to CRS §§ 25-1.5-203	Establishes health-based standards for public water systems.	Relevant and Appropriate	Main Stem Clear Creek classified for water supply use.
Basic Standards and Methodologies for Surface Water: WQCD Reg. No. 31	5 CCR 1002-31, pursuant to CRS §§ 25-8-101 to 703	Provides basic standards, antidegradation rule, implementation process, and system for classifying surface water, assigning water quality standards and review of classifications and standards, as determined by the Colorado WQCC.	Applicable	
Colorado Classification and Numeric Standards for South Platte River Basin: WQCD Reg. No. 38	5 CCR 1002-38, Regulation No. 38, pursuant to CRS §§ 25-8-203 and 204	Classification and numeric standards for the South Platte River Basin, including tributaries and standing bodies of water. Classification identifies actual beneficial uses of water and allowable concentrations of various parameters.	Applicable	
Basic Standards for Groundwater: WQCD Reg. No. 41	5 CCR 1002-41, pursuant to CRS §§ 25-8-101 to 703	Sets standards for contaminants in groundwater.	Applicable	
Provisional Implementation Guidance for Determining Sediment Deposition Impacts to Aquatic Life in Streams and Rivers	Colorado Water Quality Control Commission Policy 98-1, June 1998, revised May 2002	Guidance for assessing impacts to aquatic life and habitat conditions caused by human induced erosion and deposition of materials in aquatic systems.	TBC	

TABLE 4 - ARARs

Location Specific ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comments
FEDERAL				
National Historic Preservation Act	16 USC § 470 et seq. A portion of 40 CFR § 6.301 (b), 30 CFR Part 63, Part 65, Part 800	Regulates impacts to historic places and structures.	Applicable	
Archaeological and Historic Preservation Act	16 USC § 469; 40 CFR § 6.301(c)	Protects sites with archeological significance.	Applicable	
Historic Sites Act	16 USC §§ 461 *et.seq*.; 40 CFR § 6.301(a); 36 CFR § 62.6 (d)	Regulates designation and protection of historic places.	Applicable	
The Archaeological Resources Protection Act of 1979	16 USC §§ 470	Regulates removal of archeological resources from public or tribal lands.	Applicable	
Executive Order No. 11990 Protection of Wetlands	40 CFR § 6.302(a) and Appendix A	Minimizes impacts to wetlands.	Applicable	
Executive Order No. 11988 Floodplain Management	40 CFR § 6.302(b) and Appendix A	Requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent practicable, the adverse impacts associated with direct and indirect development of a floodplain.	Applicable	
Fish and Wildlife Coordination Act	16 USC § 661 *et. seq*.; 40 CFR § 6.302(g)	Requires coordination with Federal and State agencies to provide protection of fish and wildlife.	Applicable	
Endangered Species Act	16 USC §§ 1531-1543; 50 CFR Parts 17, 402; 40 CFR § 6.302(h)	Regulates the protection of threatened or endangered species.	Applicable	Only if threatened and endangered species or their habitats are identified
Migratory Bird Treaty Act	16 USC § 703-12	The act contains a requirement for agencies to examine proposed actions by the government relative to habitat impacts and impacts to individual organisms.	Applicable	
STATE				
Historic Places Register	CRS §§ 24-80.1-101 to 108	The State historic preservation officer reviews potential impacts to historic places and structures.	Applicable	
Colorado Noxious Weed Act and Regulations	CRS § 35-5.5-101-118; 8 CCR 1203-19	Addresses management of noxious weeds	Applicable	
Colorado Natural Areas	CRS § 33-33-104	Maintains a list of plant species of "special concern." Recommends coordination among Division of Parks and Outdoor Recreation.	Applicable	Only if appropriate plant species are present
Colorado Species of Special Concern and Species of Undetermined Status	Colorado Division of Wildlife Administrative Directive E-1, 1985, modified	Protects species listed on the Colorado Division of Wildlife generated list.	Applicable	Only if appropriate wildlife species are present
Colorado Wildlife Commission Regulations	2 CCR 405-0	Establishes specific requirements for protection of wildlife.	Applicable	
Colorado Non-game, Endangered, or Threatened Species Act	CRS §§ 33-2-101 to 108	Standards for regulation of non-game wildlife and threatened and endangered species.	Applicable	Only if appropriate species are present

TABLE 4 - ARARs

Action Specific ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comments
FEDERAL				
Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (RCRA Subtitle D)	40 CFR Part 257, Subpart A: § 257.3-1 Floodplains, paragraph (a); § 257.3-7 Air, paragraph (b)	Regulates the generation, storage, handling and disposal of solid waste.	Applicable	Solid wastes will be disposed of in accordance with Subtitle D.
RCRA Subtitle C	40 CFR Part 261, Part 262, Part 263	Regulates the generation, treatment, storage and disposal of hazardous wastes.	Applicable	Only if sludges generated at the water treatment plant fail TCLP.
Hazardous Materials Transportation Act, D.O.T. Hazardous Materials Transportation Regulations	49 USC §§ 1801-1813 49 CFR Parts 107, 171-177	Regulates the transportation of hazardous materials.	Relevant and Appropriate	Only if sludges generated at the water treatment plant fail TCLP.
National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122, 125, pursuant to 33 USC § 1342	Regulates the discharge of pollutants to waters of the U.S.	Applicable	Would apply to point source discharges
Dredge and Fill Requirements of Clean Water Act	40 CFR 230-233, 320-330, Section 404, pursuant to 33 USC § 1251-1376	Prohibits discharge of dredged of fill material into wetlands or navigable waters of the U.S. without permit.	Applicable	
STATE				
Colorado Solid Waste Disposal Sites and Facilities Act	6 CCR 1007-2, Parts 1 & 2, pursuant to CRS § 30-20-100.5, *et.seq*.	Establishes standards for the disposal of solid waste.	Applicable	Applicable to off-site disposal.
Colorado Hazardous Waste Regulations	6 CCR 1007-3, Parts 260-268	Regulates the generation, treatment, storage and disposal of hazardous wastes.	Applicable	Only if sludges generated at a water treatment plant fail TCLP.
Colorado Mined Land Reclamation Act	CRS 34-32-101 *et. seq*.; 2 CCR 407-1, Rule 3	Regulates all aspects of mining, including reclamation plans and socioeconomic impacts.	TBC	Only if mining materials are encountered.
Colorado Discharge Permit System	5 CCR 1002-61, pursuant to CRS § 25-8-501 to 509	Establishes program for permitting discharges of contaminants into waters of the United States within Colorado including discharges of stormwater during construction activities.	Applicable	Substantive requirements apply to point source discharges
Colorado Effluent Limitations	5 CCR 1002-62, pursuant to CRS § 25-8-205	Sets technology-based effluent limitations for point source discharges.	Applicable	
Protection of Fishing Streams	CRS 33-5-101 -107	Establishes requirements of notification to Colorado Division of Wildlife for modifications to streams.	Applicable	Fish are not present in Segment 13b of North Clear Creek but do exist in main stem Clear Creek
Colorado Air Pollution Prevention and Control Act	5 CCR 1001-3; Section III.D; Reg. 1, pursuant to CRS § 25-7-101 *et. seq.*	Regulates fugitive emissions during construction.	Relevant and Appropriate	Contemplated actions would not trigger permit requirements; however dust control will be required.
Colorado Noise Abatement Statute	CRS §§ 25-12-101, *et.seq.*	Establishes standards for controlling noise.	Applicable	In areas zoned residential, commercial or industrial

TABLE 4 - ARARs				
Action Specific ARARs				
Standard, Requirement, Criteria, or Limitation	**Citation**	**Description**	**Applicable or Relevant and Appropriate**	**Comments**
Colorado Environmental Real Covenants Act	CRS § 25-15-317 to 327	Requires environmental covenant whenever environmental remediation project results in less than unrestricted land use or uses an engineered structure or feature that requires monitoring, maintenance or operation to function or that will not function as intended if disturbed.	Applicable	

Figure 1

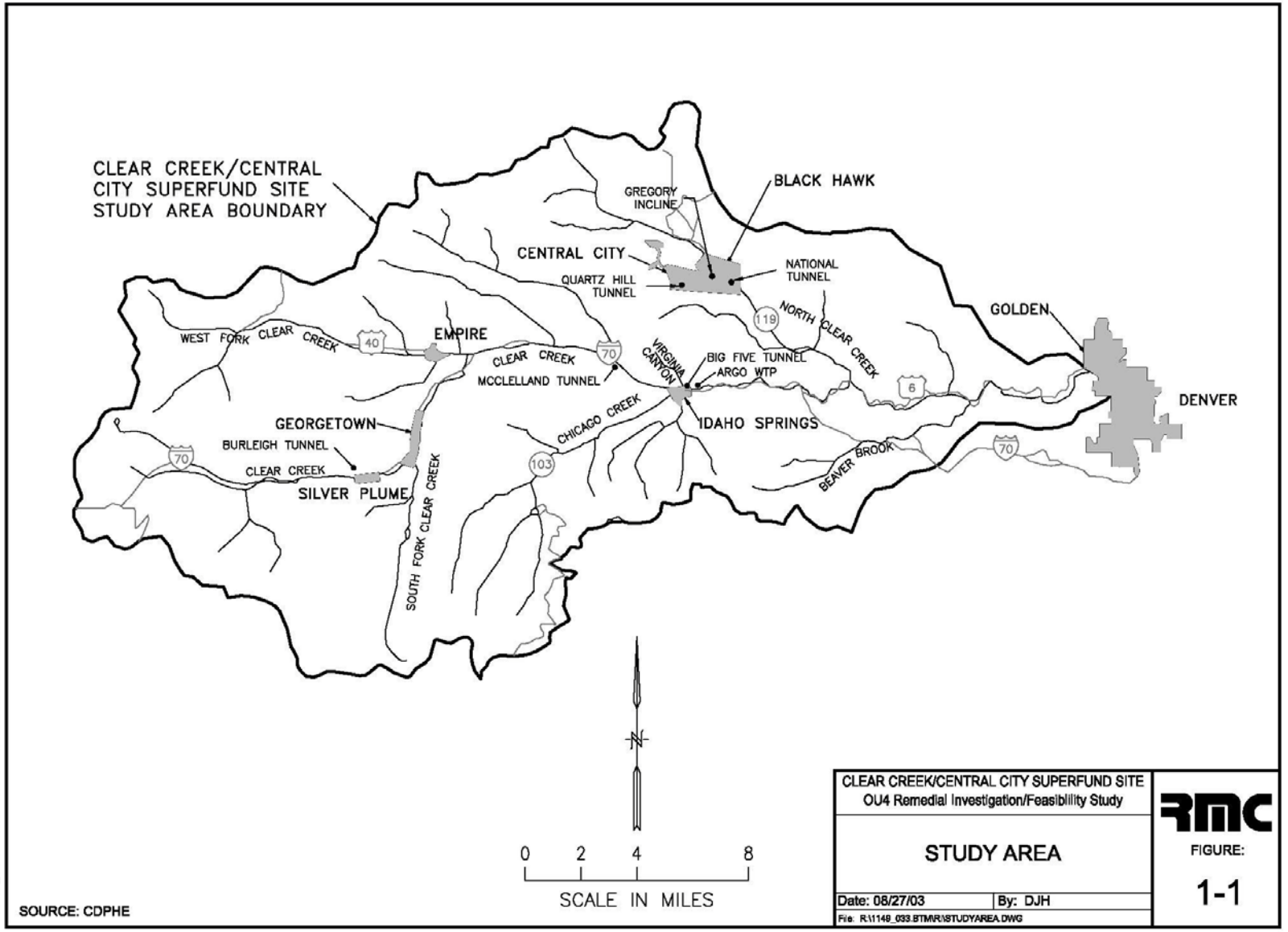
CLEAR CREEK/CENTRAL CITY SUPERFUND SITE STUDY AREA BOUNDARY
BLACK HAWK
GREGORY INCLINE
CENTRAL CITY
QUARTZ HILL TUNNEL
NATIONAL TUNNEL
GOLDEN
NORTH CLEAR CREEK
119
WEST FORK CLEAR CREEK
40
EMPIRE
CLEAR CREEK
70
VIRGINIA CANYON
BIG FIVE TUNNEL
ARGO WTP
MCCLELLAND TUNNEL
6
DENVER
GEORGETOWN
CHICAGO CREEK
IDAHO SPRINGS
BURLEIGH TUNNEL
70
CLEAR CREEK
103
BEAVER BROOK
70
SILVER PLUME
SOUTH FORK CLEAR CREEK
N
0 2 4 8
SCALE IN MILES
SOURCE: CDPHE
CLEAR CREEK/CENTRAL CITY SUPERFUND SITE
OU4 Remedial Investigation/Feasibility Study
STUDY AREA
Date: 08/27/03
By: DJH
File: R:\1149_033.BTM\R\STUDYAREA.DWG
RMC
FIGURE:
1-1
R:\1149_033.BTM\R\STUDYAREA.DWG, 07/08/2004 10:34:02 AM

Figure 2

Mine Drainage Tunnels and Preferred Treatment Plant Location

APPENDIX A

RESPONSIVENESS SUMMARY

This Appendix contains the responses of the Colorado Department of Public Health and Environment (CDPHE) Hazardous Materials and Waste Management Division (HMWMD) and U.S. Environmental Protection Agency (EPA) to comments received concerning the Proposed Plan to Amend the Operable Unit 4 Record of Decision for the Active Treatment of the National Tunnel, Gregory Incline and Gregory Gulch. This Appendix summarizes the questions and comments received and provides responses. The complete comments are available for public review at the Site information repositories located at the CDPHE and EPA ("the agencies"), as well as the local information repositories, located at:

Gilpin County Court House
203 Eureka Street
Central City, CO 80427

Clear Creek Watershed Foundation
2060 Miner Street
Idaho Springs, CO 80452
(303) 567-2699
Please call for an appointment.

A Proposed Plan describing the proposed change to the Operable Units (OU) 4 Record of Decision (ROD) was issued in December 2009 and made available to the public and Clear Creek and Gilpin counties for review and comment. The CDPHE distributed the Proposed Plan by mail to more than 200 addressees in the surrounding communities, placed copies in the Site information repositories and posted the plan on the Clear Creek/Central City Superfund Site website maintained by CDPHE. EPA also posted the plan on its website. A notice of availability of the Proposed Plan and announcement of a public meeting was published in the Weekly Register-Call on Dec. 31, 2009.

A public comment period was held from Jan. 4, 2010 until Feb. 3, 2010. During the public comment period, CDPHE accepted written comments by mail and electronic mail. CDPHE and EPA conducted a public meeting on Jan. 19, 2010, at the Gilpin County Courthouse to present the Proposed Plan and to provide an opportunity for interested community members to give oral comments. The proceedings of this meeting were recorded by a stenographer and are available for public review at the Site information repositories mentioned above. A presentation concerning the Proposed Plan was also made to the Upper Clear Creek Watershed Association (UCCWA) on Jan. 14, 2010.

The City of Black Hawk, the Upper Clear Creek Watershed Association, the Silver Dollar Metropolitan District and several community members expressed support for amending the OU4 ROD for the

construction of a dedicated, active water treatment plant. One comment was received in opposition to the water treatment plant. The citizen who spoke against active water treatment urged the agencies to consider a passive bioreactor to treat all of the contaminated water related to OU4.

CDPHE and EPA would like to thank all of the people who took the time to review and comment on the various documents related to the water treatment plant.

CLARIFYING QUESTIONS

QUESTION: Ms. Jeanne Nicholson, Gilpin County Commissioner – During the Jan. 19 public hearing, Commissioner Nicholson asked a series of clarifying questions, including:

1. Would this proposed new facility be something like the Argo Tunnel Water Treatment Plant?
2. Where would the heavy metals extracted from the water go after treatment? Where exactly is the on-site repository?

RESPONSE:

1. Yes, the plant would be similar, but the project is still in the pre-design phase. Decisions about specific chemical reagents and processes at the proposed plant have not yet been made.
2. Water treatment solids would be transported either to a municipal landfill or to the on-site repository located at the Church Placer site in Gilpin County.

QUESTION: Miles Wynn, a representative of Hunter-Bates and Standard Gold – Mr. Wynn asked a series of clarifying questions about the Proposed Plan:

1. What is the current status of a proposed purchase or lease agreement between the agencies and the owners of the Bates Hunter Mine water treatment plant?
2. What is the timeframe for construction of the proposed water treatment plant?
3. What is the project cost, and how much of the budget would the Bates Hunter Mine water treatment plant owners receive?
4. Would the construction of a new water treatment plant have any effect on mining at the Bates Hunter Mine operation?

RESPONSE:

1. Negotiations with Mr. George Otten for the purchase or lease of the existing Bates Hunter Mine water treatment plant were discontinued when Mr. Otten indicated a preference for maintaining ownership of the facility. Furthermore, EPA had expressed discomfort with the concept of spending government funds on a facility that the government would not own.
2. Construction of the proposed water treatment plant could begin in 2012.
3. The construction of a new water treatment plant is estimated to cost approximately $13,310,000, including construction of collection and conveyance systems. The estimated capital cost for the construction of the previously selected remedy (active treatment at the Bates Hunter Mine water treatment plant and passive treatment of the National Tunnel discharge) is $12,360,000. The difference in capital costs would be offset by reduced operation and maintenance costs, estimated at $1,000,000 for the new active water treatment plant versus $1,300,000 for the combined Bates Hunter Mine water treatment plant and the passive National Tunnel discharge system. Because there is no purchase or lease agreement for the Bates Hunter Mine water treatment plant, the company will receive no payment for the project. No lease or purchase price, for the Bates Hunter Mine water treatment plant was ever discussed.
4. Construction of a new water treatment plant will have no effect on mining at the Bates Hunter Mine operation.

QUESTION: Mr. Andrew Akin, a representative of Hazen Research – Mr. Akin asked what active treatment technologies would be used and what discharge limits would be attained.

RESPONSE: The project is in the pre-design phase. A lime-based process is an attractive option due to influent water chemistry and potential cost savings from purchasing bulk materials for use at both the Argo Tunnel Water Treatment Plant and the proposed OU 4 plant. Specific discharge targets have not yet been established. As governmental agencies under Superfund, CDPHE and EPA are not required to obtain National Pollution Discharge Elimination System (NPDES) permits, but we are required to meet the substantive requirements of the Clean Water Act, including discharge limits.

COMMENTS FROM GOVERNMENTAL AGENCIES, SPECIAL DISTRICTS OR WATERSHED ORGANIZATIONS

COMMENT: City of Black Hawk – The City of Black Hawk supports the Proposed Plan for the active treatment of the National Tunnel, Gregory Incline and Gregory Gulch. The comment further states that: "It was our belief that a new active treatment facility would be a better option for treating the mine drainage than attempting to use the existing privately owned Bates Hunter treatment plant."

The comment cites three major reasons for the City's support:

- The Bates Hunter is an older facility and may not be as effective as a newer facility using newer technology;
- The new active treatment facility would be publicly owned, and therefore not dependent on a private owner and its mining operation; and
- Active treatment would be more effective than passive treatment, and better able to react to changes in water quality.

RESPONSE: CDPHE and the EPA thank the City of Black Hawk for its support, and agree with the observations cited in the comment letter.

COMMENT: The Upper Clear Creek Watershed Association (UCCWA) – At its Jan. 14, 2010 meeting, the Upper Clear Creek Watershed Association voted unanimously to support the Proposed Plan. The comment stated: "Project[s] such as this one, along with the many other CDPHE/EPA efforts to improve the water quality in Clear Creek and its tributaries are welcomed, encouraged and wholeheartedly supported by the members of UCCWA."

RESPONSE: CDPHE and the EPA thank UCCWA for its support, and will continue working to protect and improve water quality in Clear Creek and its tributaries.

COMMENT: Mr. Medill Barnes, executive director of the Silver Dollar Metropolitan District – In supporting the project, Mr. Barnes cited the opportunity for multiple government agencies to combine efforts on a project of mutual benefit to the town of Black Hawk, the motoring public and water users. "There are tremendous cost savings involved in the way we approach this project," he said.

RESPONSE: CDPHE and EPA thank you for your comments, and agree that this project is a prime example of the power of interagency cooperation.

SPECIFIC COMMENTS FROM COMMUNITY MEMBERS

COMMENT: Ms. Katie Fendel, a member of the public who has lived in the Clear Creek watershed for 15-plus years, and who has been active in water-quality protection for 20-plus years – Ms. Fendel expressed her hearty support for active treatment at a new water treatment plant instead of the previous combination of passive and active treatment at the existing Bates Hunter Mine water treatment plant. Her comment stated: "I support the additional water quality improvements that will result and applaud CDPHE and EPA for taking this critical step to protect the beneficial uses of the North Fork."

RESPONSE: CDPHE and EPA appreciate your support, as well as all your efforts to protect and improve water quality.

COMMENT: Ms. Lynn Venters, a resident of Gilpin County – Ms. Venters expressed her wholehearted support for active treatment proposed for the National Tunnel, Gregory Incline and Gregory Gulch drainage. Her comment stated: "This project will clean up one of North Clear Creek's most damaging contributors. This proposal for the new water treatment plant will be a much better solution over the problems that would most likely occur [with] passive treatment or teaming up with the private Bates Hunter plant. I'm very excited for this project to begin and even more excited for North Clear Creek…"

RESPONSE: CDPHE and EPA thank you for your support and welcome your continued involvement as a member of the community.

COMMENT: Mr. Jim Forbes, environmental engineer – Mr. Forbes, an employee of the Black Hawk Public Works Department speaking on his own behalf, thanked the agencies for their decision to pursue an active treatment plant and offered his support for the Proposed Plan.

RESPONSE: Thank you for all of your input throughout this process.

COMMENT: Mr. Randall Palmer, Gilpin County resident – Mr. Palmer spoke against the active treatment option and urged the agencies to consider passive treatment for all of the mine discharges in the North Fork of Clear Creek. He described his concept for a passive bioreactor utilizing crushed white rock and peat moss, noting that passive treatment is self-sustaining and less costly than active treatment.

RESPONSE: The selected remedy in the original ROD called for a passive bioreactor to treat water from the National Tunnel. The agencies conducted extensive research on passive bioreactor technology from 2006-2008, with participation from the Colorado School of Mines, Colorado State University, the EPA Engineering Technology Support Center, the EPA Mine Waste Technology Program, Golder Associates, JRW Bioremediation, MSE Technology Applications and Penn State University. Although bioreactors can be effective, treating all of the North Fork mining-impacted waters with a passive system would require a much larger footprint than is available. Active treatment of the Gregory Incline, Gregory Gulch alluvial ground water and National Tunnel flows provides greater long-term effectiveness and permanence than the combined active and passive treatment remedy in the original ROD, due to the increased reliability of a water treatment plant to effectively treat water year-round in perpetuity. Passive treatment systems generally show seasonal variation in effectiveness, tend to lose effectiveness over time, are less adaptable to variations in flow and have not yet been demonstrated for a period of performance greater than several years.