



United States
Department of
Agriculture

Forest
Service

Pacific
Northwest
Region

333 SW First Avenue (97204)
PO Box 3623
Portland, OR 97208-3623
503-808-2468

File Code: 2100
Route To:

Date: May 13, 2010

Subject: Non-Time-Critical Removal Action Memorandum, Blue Ledge Mine Site

To: Forest Supervisor, Rogue River-Siskiyou National Forest

NON-TIME-CRITICAL REMOVAL ACTION MEMORANDUM

I. PURPOSE

The purpose of this Action Memorandum is to document approval to spend up to \$9,825,000 to conduct a non-time-critical removal action to mitigate threats to the environment and human health posed by the ongoing release of hazardous substances at the Blue Ledge Mine Site (the Site) in Siskiyou County, California.

The Site is a mixed ownership site located on patented and National Forest System (NFS) lands in northern California, within the Rogue River-Siskiyou National Forest, approximately three miles south of the Oregon border (Figure 1).

A Memorandum of Understanding between the United States Environmental Protection Agency (EPA) and the United States Department of Agriculture Forest Service (FS), effective December 8, 2008, documents the agencies' respective Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) authorities and intent to work collaboratively to implement necessary response actions (Attachment 1).

The proposed removal of hazardous substances would be undertaken pursuant to Section 104(a)(1) of CERCLA, 42 U.S.C. 9604(a)(1), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300, and pursuant to the authority found at Executive Order 12580 and 7 CFR 2.60(a)(39).

The action is taken to mitigate the migration of surface runoff containing sulfuric acid, dissolved copper, zinc, iron, cadmium, and other heavy metals, along with the erosion of metal-laden mine waste rock onto public and private. These substances have been demonstrated to be harmful to the environment and potentially harmful to humans. Site investigations show that the mine has contaminated surface waters, stream sediments, riparian soil, and groundwater.

Previous studies (EI, 2002; Weston, 2004; Weston, 2005; URS, 2009) document that acid mine drainage (AMD) and sediment released at the Site have historically, and unless abated, will continue to release hazardous substances into surface waters managed by the Forest Service. The investigations show that the ongoing release of these substances is toxic to aquatic life in Joe Creek below the mine, and is suspected to adversely impact the waters, stream sediments and riparian soils of Elliott Creek, Middle Fork of the Applegate River, and the Applegate Reservoir. The mine waste rock is potentially harmful to humans.

Forest Supervisor, Rogue River-Siskiyou National Forest

The actions proposed in this memorandum are based on the assessments presented in the documents contained in the Administrative Record. The proposed actions are expected to mitigate the threats posed by hazardous mine-related waste rock at the Site. The actions include the construction of necessary roads to access waste rock piles, along with excavation and haul of waste rock to a constructed on-Site repository for permanent disposal of these hazardous substances. Additionally, the removal action will involve placement of reclamation soil cover over where waste rock will be removed, construction of sediment detention basins and other erosion control measures, re-vegetation of all disturbed areas, construction of bat gates at adit portals, and a minimum of three years of post-removal operations-maintenance-monitoring of both on-Site and off-Site conditions.

The removal action will not address contaminated groundwater emerging from adits, potential groundwater contamination or contaminated sediment and riparian soils in the creeks-rivers-reservoir downstream of the Site. These contaminant sources are outside the scope of the proposed removal action and are the subject of future investigations and studies.

II. SITE CONDITIONS AND BACKGROUND

Site Status: Non-National Priorities List
Category of Removal: Non-Time-Critical
CERCLIS ID: CAN000906063

A. Site Description

1. Removal Site Evaluation

Mine waste rock discarded onto the hill slopes and drainages at this abandoned copper mine is a major contributor to the release of hazardous substances at the Site. Low-grade sulfide ore and massive iron sulfide not considered of economic value were dumped, along with non-mineralize rock, in four discrete piles at the Site. Waste rock dumps such as these have released sulfuric acid and dissolved metals by a process known as acid mine drainage. Since the mine's inception, AMD at the Site has continually formed by the weathering process that oxidizes the sulfide-bearing minerals, creates sulfuric acid, and leaches toxic metals from the waste rock as rain and snow-melt water percolates through the piles.

As demonstrated by the sampling data and aquatic surveys, water percolating through the waste rock piles carries sulfuric acid and dissolved cadmium, copper, zinc and other metals downslope into Joe Creek and downstream, creating an environment toxic to aquatic life (Photo 1). In addition, periodic high-intensity summer thunderstorms generate debris torrents that scour the mine waste piles and deposit tons of metal-rich sediment into Joe Creek, and subsequently to its downstream reaches (Photo 2).

In 1992, a water sample was obtained during the early spring when an estimated 600,000 gallons per day of runoff from the Site was entering Joe Creek. The laboratory analysis revealed AMD was entering the creek at low pH and high metals contents (Photo 3). This information, along with other Site observations, was incorporated into a 1995 watershed analysis of the nearby Squaw and Elliott Creeks, and Applegate Lake, prepared by the Forest Service. Given that all other similar creeks in the watershed support healthy fish populations, this document identified the Blue Ledge Mine as the most likely cause for the absence of fish in Joe Creek.

Forest Supervisor, Rogue River-Siskiyou National Forest

In 1998, the FS requested that EPA Region 9 and the California North Coast Regional Water Quality Control Board investigate the Site. At that same time, EPA Region 10 and the Oregon Department of Environmental Quality were notified of the FS concerns about the Site. The Water Board visited the Site in August of 1998, evaluated laboratory data, and concurred with the FS that AMD from the Site is toxic to aquatic life.

In 2000 and 2001, a sampling program was initiated by the FS to gather data to determine if the natural resources that it manages have been impacted by AMD from the Site. The surveys included surface water sampling and laboratory analysis, fish and amphibian surveys, and macroinvertebrate surveys. In addition, a detailed stream survey was conducted from the mouth to the headwaters of Joe Creek. The data from these surveys were analyzed and discussed in a pre-assessment screen document that verified that AMD from the Site has severely impacted aquatic life in Joe Creek (EI, 2002).

In 2003, this report was provided to: EPA Region 9, US Fish and Wildlife Service, California North Coast Regional Water Quality Control Board, California Department of Fish and Game, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife, the Grand Ronde Tribe, the Quartz Valley Tribe, and the Confederated Tribes of the Siletz Indians. The regulatory agencies and the Confederated Tribes of the Siletz Indians responded with letters in support of pursuing further action at the Site.

In 2004, at the request of the FS, EPA prepared a Preliminary Assessment/Site Inspection report (PA/SI) (Weston, 2004). This investigation reviewed the previously collected data, evaluated contaminant pathways, and discussed factors relevant to the Hazard Ranking System. This report was followed by the Superfund Technical Assessment and Response Team (START) Removal Assessment Final Report in 2005 (Weston, 2005). These investigations found that elevated levels of lead and arsenic in waste rock piles are well above their respective action levels. The studies also found that cadmium, copper, iron and zinc are significantly above background concentrations in surface waters below the mine.

In 2006, EPA conducted a time-critical removal action at the Site pursuant to CERCLA to relocate waste rock from a major drainage channel, create an open limestone channel and sediment detention structures, and stabilize a log dam that retained significant quantities of waste rock. The efforts were not intended to address the long-term needs associated with the waste rock and AMD.

In 2009, the FS had a detailed Site Inspection (SI) report prepared, including human health and environmental risks assessments (URS, 2009). A draft Engineering Evaluation and Cost Analysis (EE/CA) was prepared in 2009. The EE/CA was finalized in April 2010 (URS, 2010).

2. Physical Location

The Blue Ledge Mine is an abandoned underground copper mine located in Siskiyou County, California; approximately forty miles southwest of Medford, Oregon. The approximate geographic coordinates of the mine are N 41° 57' 36" latitude, W 123° 05' 60" longitude. The mine is located on private land within the Rogue River-Siskiyou National Forest. The fee patent lands encompass approximately 580 acres. Of this, the waste rock contributing hazardous substances are distributed over approximately 50 acres. The nearest population is a small community of about ten residents known as Joe Bar located about three miles downstream of the Site just beyond the confluence of Joe Creek with Elliott Creek.

Forest Supervisor, Rogue River-Siskiyou National Forest

A map showing the Blue Ledge Mine in relation to regional surface water bodies is presented in Figure 1. The Site lies in the upper headwaters of the Joe Creek watershed, on a steep, generally north-facing hillslope that drains towards Joe Creek. Joe Creek joins Elliott Creek about three miles below the Site. Elliott Creek then flows west for another two miles before joining the northerly flowing Middle Fork of the Applegate River. From this point, the Middle Fork crosses from California into Oregon and enters the Applegate Reservoir. Waters from the Applegate River are a tributary to the Rogue River, which terminates at the Pacific Ocean in Gold Beach, Oregon.

The Blue Ledge Mine ranges in elevation from about 4,000 to 5,000 feet above sea level. The terrain is remote, steep (40-90% slopes) and rugged, with abundant rock outcrops, talus slopes, and cliffs (Figure 2). Average annual rainfall exceeds 40 inches the majority of which occurs during the fall and spring months. An average of 140 inches of snow falls annually on the Site. Periodic high-intensity, short-duration summer thunderstorms pass over the Site. These storm events cause severe erosion of the waste rock piles which lack protective vegetation cover (Photo 2).

Vegetation in the mine vicinity is a conifer-dominated forest consisting of Douglas fir, white fir, ponderosa pine, mountain hemlock, incense cedar, Oregon white oak, and alder. Understory species include chinquapin, manzanita and canyon live oak. The adits provide nesting and roosting habitat for many bat species. Other species with habitat near the mine include amphibians, reptiles, birds and mammals.

A northern goshawk, a FS sensitive species, has a nest in the vicinity of the Site. A number of northern spotted owls, a federally listed threatened species, reside in the area. The Siskiyou Mountain salamander is listed as a FS sensitive species and a California endangered species. There is abundant habitat for the salamander in the talus slopes surrounding the Site.

The watershed between the mine and Applegate Reservoir hosts resident rainbow and cutthroat trout and reticulate sculpin populations; Pacific lamprey may also inhabit the watershed. Historically, fish such as fall Chinook, Coho salmon, Pacific lamprey, and steelhead migrated to the watershed. Since the Applegate Dam was constructed in 1980 these migrations have ceased. However, last December the Federal Energy Regulatory Commission approved the development of hydroelectric facilities at the Applegate Dam. Associated with the approval are plans to reintroduce winter steelhead by 2013 into 35 miles of the drainages above the reservoir. Currently no fish reside in Joe Creek, as a result of the toxic substances being released from the Site.

Historic resource surveys have been conducted by the FS at and nearby the mine site. The abandoned mining community of Eileen is located approximately one mile downstream of the mine (Figure 1). This site is listed in the National Historic Register. There are two other known historic resource locations recently identified at the Site.

The Confederated Tribes of the Siletz Indians has responded to correspondence from the Forest Service. They discussed historical ties to the land and expressed concerns about demonstrated impacts from the mine on natural resources in the area. The tribes stated support for cleanup of the Site.

3. Site Characteristics

The Blue Ledge Mine was discovered in 1898, with limited development until production began in 1905. The lode claims were patented in 1911. The national expansion of electrical infrastructure and World War I stimulated the demand for copper, and, based on available information, the mine produced almost 9,000 tons of high-grade ore from 1917-1920. Following a period of inactivity, the mine produced nearly 2,600 tons of additional ore in 1930. The mine has essentially been inactive since the late 1940s.

Forest Supervisor, Rogue River-Siskiyou National Forest

Extensive exploration drilling was carried out by two firms in the early 1980s. The private land has been logged at various times, most recently by helicopters in the early 1990s.

During the production years over two miles of underground workings were created. With a 6:1 waste to ore ratio, it was estimated that more than 70,000 tons of waste rock was dumped over the steep hill sides and narrow drainages (EI, 2002). The waste rock is found in four discrete piles beneath production adits (Figure 2). Waste rock in the upper slopes is situated among precipitous rock outcrops and cliffs (Photo 4). Waste rock on the lower slopes is underlain by colluvial soil and talus (Photo 5). A large timber dike remains that was placed by the miners across the lower slope of the largest pile. There is no evidence of a mill site or associated tailings at the Site. The high-grade massive sulfide ore was hand-sorted from the waste rock and trammed down the mountain. The ore was taken by wagon to be shipped from the Rogue Valley to Tacoma, Washington for smelting.

All of the mine underground workings and waste rock piles are currently accessible to the public. No additional waste rock stabilization efforts or maintenance of sediment detention structures has occurred since EPA's time-critical removal action in 2006.

4. Release or Threatened Release into the Environment of a Hazardous Substance or Pollutant or Contaminant

The final EE/CA indicates that an estimated 46,700 cubic yards (70,000 tons) of waste rock remains in four discrete piles at the Site (URS, 2010). Waste rock piles at the Site are documented to contain high levels of arsenic, cadmium, copper, lead, and zinc. The AMD generated and released from the Site contains sulfuric acid. These released materials are hazardous substances, as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

A continual release or threat of release from the Site to the surrounding environment exists from mine waste, AMD, contaminated sediments in the creeks, contaminated riparian soil, groundwater and surface waters contaminated with metals and acid. Locations specifically known or suspected to be impacted include: the mine site, Joe Creek, Elliott Creek, Middle Fork of the Applegate River, and the Applegate Reservoir.

The SI built upon and supplemented previous studies conducted at the Site. Data collected in 2005 (Weston, 2005) and 2008 (URS, 2009) includes, but is not limited to:

1. Waste rock samples from 18 location in 2005, four locations in 2008,
2. Water samples from 32 locations,
3. Sediment samples from 24 locations,
4. Riparian soil from 10 locations, and
5. Drinking water samples from three of the Joe Bar residents.
6. Laboratory analysis results were compared to human health and ecological screening criteria established by the EPA and California. Results of the 2009 SI and 2005 Removal Assessment Report are summarized below:

Mine Waste Rock at the Site:

1. Lead concentrations at the Site ranged from 616 mg/kg to 2,710 mg/kg, with an average of 1,656 mg/kg. The mean lead concentration is 1.75 times EPA's preliminary remediation goal action level of 800 mg/kg for non-residential sites.

Forest Supervisor, Rogue River-Siskiyou National Forest

2. Mean arsenic concentration in waste rock is 135 mg/kg. The level is six times the EPA preliminary remediation goal of 22.41 mg/kg (three times the average background concentration of 7.47 mg/kg in soils at the Site). The California modified industrial preliminary remediation goal for arsenic is 1.6 mg/kg (Weston, 2005).

Waters in Creeks, Rivers, and Reservoir:

1. Dissolved arsenic was detected in nine samples collected from the Applegate Reservoir, Middle Fork Applegate River, and Elliott Creek. Dissolved arsenic was not detected in any of the Joe Creek surface water samples. Concentrations in Elliott Creek ranged from 0.22 ug/L to 0.50 ug/L. All dissolved arsenic detections exceeded the 0.14 ug/L screening criteria protective of humans ingesting fish/aquatic organisms.
2. Dissolved cadmium was detected in all river and creek surface water samples except one in Elliott Creek. Dissolved cadmium concentrations ranged from 0.012 ug/L to 0.564 ug/L. Detections at six of the sample stations in Joe Creek exceeded the ecological screening criteria for cadmium.
3. Dissolved copper was detected in all river and creek surface water samples with the exception of the Middle Fork Applegate River. Detected concentrations ranged from 0.46 ug/L in Elliott Creek to 62.8 ug/L in Joe Creek (Figure 3). Detections from six of the Joe Creek sample locations and two samples from Elliott Creek exceeded the ecological screening criteria for copper.
4. Dissolved iron was detected at only five of the sample locations. Detected concentrations ranged from 5.1 ug/L to 7.9 ug/L. All detected dissolved iron concentrations were below the associated screening criteria.
5. Dissolved lead was detected in six surface water sample locations. Concentrations ranged from 0.008 ug/L to 0.066 ug/L. All dissolved lead concentrations were below the associated screening criteria.
6. Dissolved zinc was detected at all surface water sample locations except Middle Fork Applegate River (Figure 3). Concentrations ranged from 0.61 ug/L in Elliott Creek above the Joe Creek confluence to 88.5 ug/L at Joe Creek. Zinc detected at Joe Creek slightly exceeded the ecological screening criteria.

Sediment in Creeks, Rivers, and Reservoir

1. Arsenic concentrations ranged from 1.14 mg/kg to 7.59 mg/kg. All sample concentrations, except one in Joe Creek, exceeded one or more of the screening criteria.
2. Cadmium concentrations ranged from 0.211 mg/kg to 2.93 mg/kg. Cadmium exceeded the screening criteria only in Joe Creek below the mine.
3. Copper concentrations ranged from 28.0 mg/kg in Elliott Creek to 978 mg/kg in Joe Creek below the mine. Copper exceeded the screening criteria at all locations except for three locations in Elliott Creek.
4. Iron concentrations ranged from 11,300 mg/kg in Joe Creek to 37,200 mg/kg in Elliott Creek. No screening criteria are available for iron in sediment.
5. Lead concentrations ranged from 3.54 mg/kg in Elliott Creek to 13.8 mg/kg in Joe Creek below the mine, and were below the screening criteria at all locations.
6. Zinc concentrations ranged from 59.0 mg/kg in Elliott Creek to 533 mg/kg in Joe Creek above the confluence with Elliott Creek. Zinc exceeded the screening criteria at all Joe Creek sample locations, and one Applegate Reservoir sample location.

Riparian Soils at Creeks, Rivers, and Reservoir

1. Arsenic concentrations ranged from 3.29 mg/kg Elliott Creek to 17.8 mg/kg in Joe Creek below the mine. Arsenic in soils exceeded the screening criteria at all locations.

Forest Supervisor, Rogue River-Siskiyou National Forest

2. Cadmium concentrations ranged from 0.202 mg/kg to 1.09 mg/kg in Joe Creek. Concentrations at two locations in Joe Creek and the Applegate River, exceeded the screening criteria.
3. Copper concentrations ranged from 51.9 mg/kg in Elliott Creek to 378 mg/kg in Joe Creek, just above the confluence with Elliott Creek. Only two locations did not exceed the screening criteria; one upstream and one downstream of the confluence with Joe Creek.
4. Iron concentrations ranged from 23,000 mg/kg in Joe Creek to 52,400 mg/kg in Joe Creek below the mine. Iron exceeded the screening criteria at all locations.
5. Lead concentrations ranged from 5.75 mg/kg in Elliott Creek to 31.2 mg/kg in Joe Creek above the confluence with Elliott Creek. Lead exceeded the screening criteria only at the Joe Creek sample locations below the mine.
6. Zinc concentrations ranged from 64.9 mg/kg in Elliott Creek to 185 mg/kg in the Middle Fork of the Applegate River. Zinc exceeded the screening criteria at all locations.

Drinking Water Sources at the Community of Joe Bar:

1. Samples of two ground water wells and one spring source used as drinking water supplies for Joe Bar detected arsenic, cadmium, copper, iron, lead and zinc.
2. Arsenic concentrations are 0.22 ug/L, 2.04 ug/L, 6.24 ug/L. EPA's regional screening level for tap water is 0.045 ug/L. The EPA maximum contaminant level is 10 ug/L.
3. Cadmium concentrations are 0.019 ug/L, 0.062 ug/L, 0.554 ug/L. EPA's regional screening level for tap water is 1.8 ug/L. The EPA maximum contaminant level is 5 ug/L.
4. Copper concentrations are 1.16 ug/L, 4 ug/L, 9.67 ug/L. EPA's regional screening level for tap water is 1,500 ug/L. The EPA maximum contaminant level is 1,300 ug/L.
5. Iron concentrations are 4 ug/L, 20 ug/L, 20 ug/L. EPA's regional screening level for tap water is 26,000 ug/L. The EPA maximum contaminant level is 300 ug/L.
6. Lead concentrations are 0.092 ug/L, 0.166 ug/L, 2.82 ug/L. EPA's maximum contaminant level is 15 ug/L.
7. Zinc concentrations are 7 ug/L, 43 ug/L, 540 ug/L. EPA's regional screening level for tap water is 11,000 ug/L. The EPA maximum contaminant level for zinc is not established.

5. National Priorities List Status

The Site is not currently on or proposed for inclusion on EPA's National Priorities List (NPL). The Site did receive a Hazard Ranking System score in 2005. In August 2009, the FS Regional Forester requested that the EPA Region 9 Superfund Director consider ways to make the Site a higher priority in the Region's Superfund program – including possible listing of the Site on the NPL. Funding for 2010 has been secured by EPA Region 9 to assist in further evaluating the merits of the request from the Regional Forester. Additional investigations may be conducted by EPA and/or the FS following the removal action and monitoring proposed in this memorandum. The proposed removal action will not address all contaminated media and migration pathways.

B. Other Actions to Date

In 1998, the FS requested that the California North Coast Regional Water Quality Control Board (RWQCB) investigate the Site. An environmental engineer from the RWQCB reviewed the background Site information provided by the FS and visited the Site in August 1998. The RWQCB concluded that several EPA water quality and aquatic life criteria were exceeded due to releases from the Site. The RWQCB suggested that additional aquatic life surveys be conducted by the FS and offered to review the results of the studies.

In 2004 and 2005, EPA conducted preliminary and final site assessments. The results of these

Forest Supervisor, Rogue River-Siskiyou National Forest

investigations caused EPA Region 9 to conduct a time-critical removal action in the fall of 2006. This work consisted of grading waste rock in the lowermost portion of the largest waste pile to relocate the material out of an active drainage channel. After the waste rock was graded, the work also included lining the drainage channel with limestone riprap and creating sediment detention basins. A historic log dam that held waste rock was deemed to be unstable. A rock buttress was installed below the log dam. EPA also fashioned diversions to redirect stormwater and snowmelt to reduce the rate of gully erosion at the main waste pile.

The 2006 efforts were successful in removing waste rock from the channel and reducing gully erosion at the waste pile. Post-removal action monitoring by the FS revealed that the sediment detention basis and the voids in the limestone riprap had been filled by eroded, fine-grained waste rock. Shortly after construction, limestone in contact with surface water runoff had begun to form an iron oxide coating on the riprap. This coating greatly reduces the opportunity to neutralize acid generated at the Site. In the winter of 2006 and during 2007, Southern Oregon University geology students collected and analyzed surface water samples. They found no decrease in dissolved metals being released to Joe Creek.

There are no other actions that have taken place at the Site by other government agencies or private parties.

C. State and Local Authorities' Roles

1. State and Local Actions to Date

There has been no State or local government actions to date.

2. Potential for Continued State/Local Response

In 2003, the Preliminary Assessment Screen report (EI, 2002) was shared with: California North Coast Regional Water Quality Control Board, California Department of Fish and Game, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife, the Grand Ronde Tribe, the Quartz Valley Tribe, and the Confederated Tribes of the Siletz Indians. These regulatory agencies and the Confederated Tribes of the Siletz Indians responded with letters in support of pursuing further action at the Site.

In August 2009, the FS invited Federal and State regulatory agencies, and the Tribal nations to review and respond to the public notice of the availability of the EE/CA and the administrative record. With the exception of technical notes regarding repository design elements submitted by the RWQCB and the California Department of Toxic Substances Control, there have been no written comments received or commitments to assist with the proposed removal action. There are no indications of proposed financial involvement from state agencies for the response activities described in this action memorandum.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT AND STATUTORY AND REGULATORY AUTHORITIES

Conditions at the Site represent a release, and potential threat of release, of CERCLA hazardous substances threatening the public health or welfare, or the environment, based on the factors set forth in the NCP at 40 CFR 300.415(b)(2). These factors include:

Forest Supervisor, Rogue River-Siskiyou National Forest

1. Actual or potential exposure to human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.

AMD originating at the Site has been demonstrated to have toxic effects on aquatic life in Joe Creek downstream of the waste rock piles. Macroinvertebrate surveys show robust and diverse populations above the mine, but macroinvertebrates are essentially non-existent downstream during the wet season when AMD flows (Figure 4). Populations recover somewhat during the dry season when AMD runoff ceases, but are severely impacted each year with the return of the wet season and AMD releases.

Abundant populations of amphibians are found upstream of the mine. However, none to very few amphibians are found along Joe Creek from the mine downstream to the confluence with Elliott Creek.

Joe Creek is the only stream in the Elliott Creek and Middle Fork of the Applegate River drainages where fish are absent in the watershed, except for small reaches of certain streams where there are likely physical barriers to fish. Data from the fish surveys taken on Joe Creek, examined in combination with water quality data, demonstrate that hazardous substances from the mine have caused injury to fish resources.

2. Actual or potential contamination of drinking water supplies or sensitive ecosystems.

The small community of Joe Bar receives drinking water from four wells and one surface spring. Arsenic, cadmium, copper, iron, lead, and zinc were detected in each of three sources tested. Elevated arsenic (6.24, 2.04, 0.22 ug/L) was found in each of the water sources, which exceeds the EPA regional screening level for tap water of 0.045 ug/L. The EPA maximum contaminant level for arsenic is 10 ug/L. The source of elevated dissolved arsenic is unknown at this time.

Studies have confirmed the absence of aquatic life in Joe Creek below the mine is attributable to hazardous substances released from the Site. Surface water analysis of Joe Creek shows copper concentrations up to 62.8 ug/L, which exceeds California ecological water quality standards by sevenfold. The average dissolved cadmium in Joe Creek of 0.52 ug/L is more than twice the EPA recommended ecological water quality criteria.

Sensitive, threatened and endangered species have been identified in the vicinity of the Site. The northern spotted owl is a federally listed threatened species that resides in the area. A northern goshawk, a US Fish and Wildlife Service candidate species, has a nest in the area. The Siskiyou Mountain salamander is found at the Site, and is listed as a FS sensitive species, and is a California endangered species.

3. High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate.

There are high concentrations of arsenic, cadmium, copper, lead and zinc in several distinct areas of the Site. These source areas include AMD, waste rock piles, stream sediment, and riparian soils. AMD is generated at the Site and is mobilized during the wet season and during spring snowmelt. The steep waste rock piles are exposed to surface runoff which erodes the material and causes them to enter into Joe Creek. Waste rock sediment in Joe Creek is part of the bedload that migrates downstream during high stream flow periods. Large storm events cause sediment and waste rock to be deposited in the riparian soils adjacent to the streambed. Groundwater contamination has not been fully evaluated but is suspected to move off the Site and come in contact with the waters of Joe Creek.

Forest Supervisor, Rogue River-Siskiyou National Forest

4. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

Rain, snowmelt and high winds increase the erosion of uncontained waste rock and mobilize dissolved and solid contaminants from the Site into Joe Creek and downstream reaches. Periodic high intensity summer thunderstorms have been observed to generate high runoff events that cause debris torrents that scour gullies on the waste piles. These events flush AMD and erode tons of waste rock into Joe Creek.

5. Availability of other appropriate federal or state response mechanisms to respond to the release.

In December 2008, EPA and the FS entered into a memorandum of understanding that generally describes the coordination efforts and roles of the agencies (Enclosure 1). No EPA funds have been allocated to the proposed removal action. No local or state public funding source has been identified.

6. Other situations or factors that may pose threats to public health or the environment.

Continued discharge of contaminants from the Site combined with downstream transport of contaminants in surface water and sediment could potentially result in future elevated levels of contamination in aquatic environments and risk to human and ecological receptors as far downstream as the Applegate Reservoir. The reservoir was completed in 1980 and now acts as a trap and accumulation point for contaminated sediments.

On December 17, 2009, the Federal Energy Regulatory Agency issued a license to retrofit the Applegate Dam to generate 10 megawatts of electricity. A part of the license provides for the reintroduction of anadromous fish upstream of the dam, including salmonid species, and the threatened Southern Oregon/Northern California coast Coho salmon. Elevated arsenic, lead, and cadmium exceeding human health and ecological screening criteria have been documented in fish tissue in Elliott Creek, Middle Fork Applegate River, and the Applegate Reservoir. Reintroduced anadromous fish above the dam would be subject to contaminated sediments and surface waters associated with releases from the Site.

IV. ENDANGERMENT DETERMINATION

The FS and EPA have observed and documented Site conditions, including high concentrations of metal-rich waste rock on Site, the migration of contaminants into surface water bodies, and toxic impacts to the aquatic ecosystem. Actual or threatened releases of hazardous substances from this Site may present an imminent and substantial endangerment to public health or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

The objective of this removal action is to mitigate threats to human health and the environment posed by waste rock containing hazardous substances and the associated AMD generated by the waste remaining on the surface at the Blue Ledge Mine. The goal is to remove hazardous substances associated with the waste rock piles. Given that the waste piles generate AMD and hazardous sediment that erodes from the Site, removal of the waste is intended to minimize and isolate a major source of pollutants from exposures to humans and the environment.

Forest Supervisor, Rogue River-Siskiyou National Forest

The removal action is structured to address the waste rock piles commensurate with the availability of funds in relation to the bid proposals received. The “base” items are centered on removal and internment of the two main waste piles. These piles represent approximately 85% of the estimated volume of waste rock at the Site, and are directly influenced by surface drainages. To the greatest extent that allocated funds will allow, the “option” items will be ordered to provide for removal and internment of waste from each of the remaining two piles.

The removal action will not address adit water discharge, potential impacts to groundwater, contaminated stream sediments or riparian soils identified downstream of the Site.

1. Proposed action description

The FS proposes to remove and contain surface mine wastes in an on-Site repository to be constructed on nearby private land under the same ownership as the mine. Temporary roads necessary to gain access to the waste rock piles will be constructed. The combination of rock outcrops, cliffs and very steep slopes present challenging obstacles for site access, efficient waste rock removal, and reclamation. A combination of heavy equipment and laborers will be used to removal the waste rock. Off-road dump trucks will be used to haul waste rock to the repository.

Stark color and texture contrasts between the waste rock and underlying and adjacent non-contaminated soil provide visual evidence of the extent of hazardous substances. Test pit excavations and laboratory analysis have determined that the vertical extent of the waste rock is approximately one foot beneath the boundary between the waste and underlying colluvial soils (Photo 5). The lateral extent of contamination in each of the mine waste rock piles will be determined by visual examination, coupled with field and laboratory analysis of confirmation sample.

Following waste rock removal, the surface and edges of the removal sites will be field- tested by x-ray florescence and pH tests to ensure metals and acid generating minerals have been removed to levels commensurate with background soil concentrations. Samples will be sent to the laboratory to confirm adequate waste removal has been completed. In addition to quality control performed by the contractor, an independent quality assurance team provided by the contractor will perform inspection to ensure compliance with specifications, including analysis of split samples for laboratory analysis. A Quality Assurance Project Plan has been developed that provides guidelines and requirements for field and laboratory operations. The FS On-Scene Coordinator and an inspector will oversee all contractor operations.

The EE/CA identified two viable alternatives for the repository. The repository location selected is on private land, under the same ownership as the Blue Ledge Mine. This repository site, previously referred to as the South Repository in the EE/CA (URS, 2010), is located less than one mile from the mine (Figure 1). The repository has been designed to be a fully enclosed system with a geosynthetic cover and liner. The design includes provisions to neutralize and collect any leachate that may be generated. The repository system is being designed to have minimal maintenance requirements after installation once wastes inside and restoration measures on the cover have stabilized.

While the repository is designed to require minimal long-term maintenance, adjacent mature conifers on FS land will introduce seeds to the repository soil cover. The cover soils are designed to be a minimum of eight feet thick to reduce the potential for tree roots penetrating the geosynthetic clay cover beneath the cover soil. However, some tree species are known to have deep tap roots, so periodic clearing of conifer saplings will be required.

Forest Supervisor, Rogue River-Siskiyou National Forest

To the extent, practical locations where non-contaminated soils remain following waste rock removal will be reclaimed with clean topsoil and mulch cover. Temporary erosion control cover, such as hydromulch or erosion control blankets, will be placed over the clean topsoil to minimize erosion. Locations too steep to receive soil cover will be revegetated to the extent practical. All disturbed sites will be revegetated with native grasses, forbs, shrubs and trees.

Temporary and permanent erosion control structures such as large woody material, gabions, boulders, wattles and silt fences will be installed. Sediment detention basins, pH treatment basins, and vegetated treatment basins will be constructed at the base of drainages beneath waste piles to capture sediment and treat runoff that may contain any remaining residual amounts of contaminated waste and non-contaminated soil.

The removal action is expected to take two field seasons to complete, followed by three years minimum of operations, maintenance, and monitoring. This will include: cleaning out sediment detention structures, replacement of limestone in treatment basins, adjustments and repairs to erosion control measures, collection and analysis of any leachate generated in the repository, and replanting of vegetation as needed.

Effectiveness monitoring will be performed in Joe and Elliott Creeks. Monitoring will include surface water, creek sediments, macroinvertebrates, and fish tissue sampling. Drinking water sources of Joe Bar residents will be monitored before, during, and for three years following the removal action. Annual monitoring reports will be prepared to summarize findings and provide recommendations for further actions, as needed. An Operations and Maintenance Plan has been developed and will be updated to provide for conditions present following the removal action.

During the initial years following the removal action, and until vegetation has become fully established, some erosion of reclamation soil cover is anticipated. While all reasonable efforts will be taken to remove waste rock over bedrock, some trace amounts of waste rock may not be removed and would be subject to erosion. Residual waste rock and soil eroded from the Site is designed to be caught in a series of detention structures. Cleanout of the soil and trace waste rock from the basins is provided for a minimum of three years following the removal action. Laboratory analysis performed on the waste rock indicates that the sediment and trace waste rock pass leaching criteria and will be accepted for disposal at the Dry Creek Landfill near Medford, Oregon. Following laboratory analysis, any leachate collected from the repository will be disposed of at a municipal water treatment facility.

Prior to ground disturbing activities, wildlife surveys will be performed by the FS to determine if any appropriate construction restrictions are necessary to protect threatened, endangered, and sensitive species.

All activities will be performed in conformance with standard health and safety practices that will be outlined in a Site-specific health and safety plan. Sampling and analysis activities will conform to approved methodologies and mandatory specifications for quality assurance and quality control activities.

2. Contribution to remedial performance

This removal action should mitigate the immediate threats posed by uncontrolled hazardous substances at the Site and is consistent with potential long-term remedial action.

Forest Supervisor, Rogue River-Siskiyou National Forest

The long-term cleanup plan for the Site:

The proposed removal action discussed in this memorandum will address waste rock piles that release hazardous AMD and metal-rich sediment from the Site. The removal action does not address impacts to groundwater, groundwater that is discharged from two adits at the mine, hazardous sediment and riparian soil found in Joe Creek and downstream reaches, and possible direct or indirect impacts to drinking water supplies for residents in the small community of Joe Bar.

The proposed removal activities described in this memorandum will act to contribute to the efficient performance of any potential long-term remedial actions.

Potential remedial actions may include: evaluation of post-removal action monitoring reports, investigation of hazardous substances sources and exposure pathways, assessment of treatment alternatives, disposal or treatment of contaminated sediment and riparian soils, treatment of adit water discharge, and treatment of contaminated groundwater and surface waters in and around the Site.

Threats that will require attention prior to the start of a long-term cleanup:

In order to determine whether a long-term cleanup is necessary or warranted, removal of the surface wastes are proposed in this action memorandum. From evaluation of the Site, high levels of hazardous metals present on the surface are a major factor in the migration of contaminants and AMD. Removal and containment of these wastes will mitigate, to the extent practical, the continuing migration of these contaminants.

The containment of surface mine wastes should produce an overall reduction of hazardous substances migrating from the Site. This will have a positive impact on downstream aquatic life. Post-removal monitoring will assist with further assessment of whether other sources of contamination are migrating from the Site and establish trends in the concentrations of hazardous substances in surface water, stream sediment, and riparian soils.

The extent to which the removal will ensure that threats are adequately abated:

The purpose of this removal action is to mitigate the threat of contaminant migration from surface wastes at the Blue Ledge Mine into Joe Creek and its downstream reaches. The removal will involve the construction of a fully-contained repository for mine wastes, which will ensure that threats from surface mine wastes are adequately abated. This removal will not address threats of contaminant migration from adit water discharge, groundwater, or stream sediments and riparian soil.

Consistency with the long-term remedy:

This remedy is consistent with any currently foreseen long-term remedy (including no further action). The stabilization and permanent containment of surface mine wastes mitigates the threat and continuing migration of hazardous substances from the Site. The removal addresses a major source of mobile contaminants and allows for the further evaluation of contaminant sources and pathways.

Post Removal Site Control:

The FS will further evaluate the need for post-removal Site control, consistent with the provisions of Section 300.415 of the NCP. The design of the repository and the containment of surface mine wastes is expected to minimize the need for post-removal Site control. The FS and EPA are currently pursuing means to try to ensure the investments in the removal and internment of waste rock, and Site reclamation measures are protected from disturbances in the future.

Forest Supervisor, Rogue River-Siskiyou National Forest

3. Engineering Evaluation/Cost Analysis (EE/CA)

Table 4-1 in the EE/CA identified and analyzed treatment alternatives to address the removal action objectives (URS, 2010). The screening process assessed effectiveness, implementability, and applicability of treatment alternatives and cost. The screening process identified and evaluated the following treatment alternatives: various methods of waste rock removal, off-Site and on-Site waste rock repositories, placement of waste rock in a municipal landfill, repository design criteria, in-situ stabilization and treatment of waste rock, leachate and runoff collection and treatment, waste rock area reclamation cover, and adit entrance safety closures. Treatment of on-Site and off-Site groundwater, along with hazardous substances in stream sediment and riparian soils is outside the scope of the EE/CA.

On August 26, 2009, a public notice was issued in the local newspapers to announce the availability of the draft EE/CA for review by agencies and the general public. Administrative record documents were made available at the Rogue River-Siskiyou National Forest Supervisor's Office, the Siskiyou Mountains Ranger District Office, and on the Forest's webpage. In addition, letters were written to regulatory agencies and Tribes that had expressed written interest in the project following their review of the Preassessment Screen (EI, 2002). Following a written request from the public, the 30-day comment period was extended to 48 days to allow for additional review of the administrative record. Written replies to comments and questions were posted on the administrative records website in March 2010.

No written comments were received from regulatory agencies or Tribes. Written comments were received from four private citizens. Public comments included: suggestion of a groundwater treatment barrier, suggestion of placing mine waste into the existing underground workings, suggestion of placing a clay cover over the waste rock piles, and a request to provide dust abatement on the road passing by the Joe Bar community.

The most extensive document review, comments, and questions came from collective responses from the Joe Bar community submitted in two letters. The majority of these comments and questions centered on their concerns for avoiding accelerating contaminant loading to Joe and Elliott Creeks and indirectly adversely impacting their drinking water supplies and aquatic life in Elliott Creek.

In addition to providing written comments to substantive public comments, three separate meetings were conducted at the Joe Bar community to listen to questions and respond with information to address their concerns. In addition to the FS On-Scene Coordinator, the FS District Ranger and Public Affairs Specialist attended and participated in the meetings. The Joe Bar residents were generally supportive of the removal action, and responded positively after hearing assurances that repeated monitoring of their water supplies would occur, and that multiple levels of erosion control are designed to minimize off-Site transport of hazardous materials.

4. Applicable or relevant and appropriate requirements (ARARs)

Section 300.415(j) of the NCP requires that removal actions attain ARARs under federal or state environmental laws or facility siting laws, to the extent practicable, considering the urgency of the situation and the scope of the removal. In addition to ARARs, the lead Agency may identify other federal or state advisories, criteria, or guidance to be considered for a particular release.

ARARs are either applicable or relevant and appropriate. Applicable requirements are those standards, requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant found at a site. Relevant and appropriate requirements are those standards, requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that are not

Forest Supervisor, Rogue River-Siskiyou National Forest

applicable to a particular situation but apply to similar problems or situations, and therefore may be well-suited requirements for a response action to address. ARARs are divided into chemical-specific, location-specific, and action-specific requirements.

Chemical-specific ARARs are listed according to specific media and govern the release to the environment of specific chemical compounds or materials possessing certain chemical or physical characteristics. Chemical-specific ARARs generally set health or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of cleanup activities because they are in specific locations. Location-specific ARARs generally relate to the geographic location or physical characteristics or setting of the site, rather than to the nature of the site contaminants.

Action-specific ARARs are usually technology or activity based requirements or limitations on actions taken with respect to hazardous substances.

Only the substantive portions of the requirements are ARARs. Administrative requirements are not ARARs and do not apply to actions conducted entirely on-site. Provisions of statutes or regulations that contain general goals expressing legislative intent, but are non-binding, are not ARARs.

ARARs were requested from the State of California for the proposed action at the Site. Only those state standards that are identified by the State in a timely manner and are more stringent than federal requirements may be applicable or relevant and appropriate. Other Federal regulations that provide ARARs for this site were identified.

In August 2009, the FS requested the California North Coast Regional Water Quality Control Board review and comment on the contents of the draft EE/CA, and other submittals. Two additional requests for lists of ARARs were made in February and March of 2010. In a letter dated March 29, 2010, the California Regional Water Quality Control Board provided to the Forest Service ARARs relating to the proposed mine waste repository. The California Department of Toxic Substances Control was requested to review and provide comments to the draft EE/CA table of ARARs. Their response was received on April 13, 2010.

Responses from both state agencies were analyzed and incorporated into the final EE/CA. Enclosure 4 provides the complete table of federal and state regulations that were evaluated in the EE/CA, and provides rationale in the determination of which are considered ARARs. To the extent practicable, all ARARs are expected to be met with the proposed removal action.

5. Project schedule

Barring unanticipated delays, removal action activities are projected to commence in June of 2010 and be completed in the fall of 2011. Due to the Site's location at high elevation, two construction seasons will be needed to complete the removal action activities. Completion of the removal action at all four of the waste rock piles is contingent upon bid proposals being received that are commensurate with available funds. Following the removal action, three years of post-removal operations, maintenance, monitoring, and reporting will be performed.

Forest Supervisor, Rogue River-Siskiyou National Forest

B. Estimated Costs

Removal Cost Allocation

Cleanup/O&M Contractor	\$9,300,000
Contingency (4.3%)	\$ 400,000
Contract Administration	<u>\$ 125,000</u>
TOTAL	\$9,825,000

The majority of removal action funding is provided by the American Recovery and Reinvestment Act of 2009 (ARRA).

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Given the Site conditions, the nature of the hazardous substances documented on Site, and the exposure pathways to the environment and humans, described in the Sections above, actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response actions selected in this Action Memorandum, will continue to present an imminent and substantial endangerment to the environment, or public health.

VIII. OUTSTANDING POLICY ISSUES

No outstanding policy issues with the Site have been identified at this time.

IX. ENFORCEMENT

On February 16, 2006, the United States filed its initial Proof of Claim in the bankruptcy proceeding of ASARCO, LLC (ASARCO). ASARCO, which had operational control of the Blue Ledge Mine from approximately 1923 through 1956, filed for Chapter 11 bankruptcy protection on August 9, 2005, in the United States Bankruptcy Court for the Southern District of Texas, Corpus Christi Division, case number 05-21207. The Government's claim against ASARCO for past and future response costs and natural resource damages at Blue Ledge was subsequently added to this claim. The Government's claim against ASARCO has not yet been resolved, and the outcome is uncertain.

In addition, \$1,325,000 to fund the removal action in calendar year 2010 was secured from the ASARCO Environmental Trust. (This Trust is funded by ASARCO, Inc., a potentially responsible party at the Site, pursuant to a 2003 Consent Decree that settled the litigation captioned United States of America v. ASARCO, Inc., and Southern Peru Holdings Corp., No. CV 02-2079-PHX-RCB (D.Ariz.))

Enforcement action is also expected to be taken against the current Site owner, the Michelle B. Tracey Testamentary Trust. Based on available information, the Trust does not have the financial means to pay an allocative share of site costs. However, the Trust has been generally cooperative to date, and has provided the Government access to the Site for purposes of conducting the contemplated removal action.

Based on available information, there are no other viable PRPs at this Site.

X. RECOMMENDATION

Forest Supervisor, Rogue River-Siskiyou National Forest

This decision document represents the selected removal action for the Blue Ledge Mine Site, in Siskiyou County, California, developed in accordance with CERCLA as amended, and is not inconsistent with the NCP. This decision is based upon the Administrative Record for the Site. Conditions at the Site meet the NCP criteria for a removal action under 40 C.F.R. § 300.415.

KEN VAUGHAN (FOR)

SAM CARLSON
Director of Engineering
Forest Service, Regions 6 and 10

Enclosures:

1. MOU
2. Figures
3. Photos
4. ARARs Table

cc: Gary Fremerman, USDA Office of the General Counsel
Holly Fliniau, USDA Environmental Management Division
Julie Creed, USDA Forest Service
Peter Jones, USDA Forest Service
Donna Mickley, USDA Forest Service
Tim Chesley, USDA Forest Service

Forest Supervisor, Rogue River-Siskiyou National ForestDocuments Cited

Documents cited from the Administrative Record:

- Environment International, October 2002; Preassessment Screen for the Blue Ledge Mine Site
- EPA, 2004-2006; Link to EPA webpage listing reports, analysis and removal action
- URS, April 2009; Site Inspection Report
- URS, April 2010; Engineering Evaluation and Cost Analysis
- USFS, August, October 2009; Terrestrial-Botanical-Fisheries Biological Evaluations
- USFS, March 11, 2010; Responses to substantive public comments
- USFS, August 2009; Public Notices
- Various, 1998 to 2010; Interagency letters to and from USFS and various natural resource Trustees, Tribal representatives, and regulatory agencies
- Weston Solutions, April 2004; Preliminary Assessment/Site Inspection Report
- Weston Solutions, September 2005; Blue Ledge Mine Removal Assessment Final Report

Forest Supervisor, Rogue River-Siskiyou National ForestAttachment 1Memorandum of Understanding USEPA-USFS

Attachment 2Figures

Forest Supervisor, Rogue River-Siskiyou National ForestAttachment 3Photos

Forest Supervisor, Rogue River-Siskiyou National Forest

Attachment 4

ARARs Tables

/s/ Ken Vaughan (for)