

# Section 1. Introduction

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Engineering/Remediation Resources Group, Inc. (ERRG) has prepared this Removal Action Completion Report to document the non-time-critical removal action (NTCRA) that was completed during two work seasons beginning June 28, 2010, and ending November 11, 2011, at the Blue Ledge Mine Site, in the Rogue River-Siskiyou National Forest, Siskiyou County, California (Figure 1). ERRG conducted the NTCRA under U.S. Department of Agriculture Forest Service (Forest Service) Contract No. GS-10F-0294R, Delivery Order No. AG-0489-D-10-0126.

## 1.1. SITE LOCATION AND DESCRIPTION

The Blue Ledge Mine Site is an inactive underground copper mine, dating back to initial discovery in 1898. The site is located on patented and National Forest System lands in northern California, within the Rogue River-Siskiyou National Forest, approximately 3 miles south of the Oregon border (Figure 1). The mine site includes four waste rock piles (WRPs) that cover an area approximately 7.2 acres in size. The WRPs lie on steep hillsides at the upper headwaters of the Joe Creek watershed (Figure 2). Joe Creek flows north into Elliott Creek, which in turn is a tributary to the Middle Fork of the Applegate River. The Applegate River feeds the Applegate Reservoir. The small community of Joe Bar is located downstream of the Site, just downstream of the confluence of Joe Creek with Elliott Creek.

## 1.2. SITE BACKGROUND

The Blue Ledge Mine was discovered in 1898 and underwent limited development until production began in 1905. The national expansion of electrical infrastructure and World War I stimulated the demand for copper. Based on available information, the mine produced almost 9,000 tons of high-grade ore from 1917 through 1920. Following a period of inactivity, the mine produced nearly 2,600 tons of additional ore in 1930. 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 mine production years, over 2 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 hillsides and narrow drainages. The waste rock was in four discrete piles (WRP-1 through WRP-4) beneath the production adits. 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.

Mines that exploit mineralized sulfide deposits are common sources of acid mine drainage. Sulfide-rich waste rock, which was discarded from the mine adits, lies on the hillsides and in drainages below the adits. The waste rock was located in four primary areas downslope of historically productive adits. Over time, the waste rock has eroded and leached acidity and metals into Joe Creek and Elliott Creek. Both the acidity and the dissolved metals in acid mine drainage are harmful to aquatic and terrestrial natural resources and potentially harmful to humans.

Since 1981, various environmental investigations have been performed at the Blue Ledge Mine Site. Results of those investigations showed that acid mine drainage from the site had impacted surface water, stream sediments, and groundwater near the site. Results of those investigations also showed that cadmium, copper, iron, lead, and zinc were present in soil, groundwater, surface water, and sediments that could pose a risk to humans and wildlife.

In 2006, the U.S. Environmental Protection Agency (EPA) conducted a time-critical removal action (TCRA) at the site pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The purpose of the 2006 TCRA was to (1) relocate waste rock from a major drainage channel, (2) create an open limestone channel and sediment detention structures, and (3) stabilize a log dam that retained significant quantities of waste rock. Those efforts were not intended to address the long-term needs associated with the waste rock and acid mine drainage ([URS Corporation, 2010b](#)).

In 2008, the Forest Service performed an additional site assessment to fill data gaps from previous investigations, assess risk associated with mine-affected media, and evaluate three potential disposal sites (i.e., repositories) for potential disposal of excavated waste rock. The results of the site assessment were used to provide the basis for an additional removal action at the site and develop and evaluate removal action alternatives for contaminated media. Based on the comparative analysis of removal action alternatives developed for the Blue Ledge Mine Site, the following removal action was recommended to address contamination at the site: Alternative 1, Waste Rock Removal and Placement in On-Site Repository ([URS, Corporation 2010b](#)).

### **1.3. PROJECT PURPOSE**

The purpose of the NTCRA is to prevent direct contact with mine waste rock materials and reduce exposure of humans and wildlife to arsenic, cadmium, copper, lead, and zinc associated with the Blue Ledge Mine Site. The objective of the NTCRA is to allow unrestricted use of the property outside of the boundaries of the repository, in accordance with the Removal Design provided by the Forest Service. To meet the project objective, the NTCRA includes (1) constructing or reconditioning haul roads as needed, (2) constructing one permanent waste repository, (3) consolidating waste rock from four WRPs (1 through 4) into the repository, (4) performing site reclamation, and (5) capping the repository.

The repository will isolate the waste rock from the environment and inhibit leaching of acidity and metals. Sedimentation and pH treatment basins will control transport of contaminants from runoff, seeps, and erosion. Reclamation fill soil and plantings on the former waste rock areas will stabilize and minimize erosion and drainage from any residual waste rock, minimize runoff volumes and velocities, improve habitat value, and improve aesthetics. Bar gates installed on the mine adits will allow access by wildlife, prevent human access, and minimize physical hazards from the mine workings.

A minimum of 3 years of on-site and off-site operations, maintenance, and monitoring will be performed following the NTCRA. To assess the effectiveness of the NTCRA, sediment and surface water samples will be collected from Joe and Elliott Creeks. Drinking water supply samples will also be collected from the water supplies for the Joe Bar community.

#### 1.4. REPORT ORGANIZATION

The remainder of this report is organized as follows:

- [Section 2](#) describes the removal action objectives (RAOs) for the project
- [Section 3](#) describes the organizational structure of the project.
- [Section 4](#) summarizes the removal action activities performed in 2010 and 2011.
- [Section 5](#) summarizes the site controls, best management practices, and construction quality control activities performed in 2010 and 2011.
- [Section 6](#) describes the Removal Action monitoring activities.
- [Section 7](#) describes how the work completed during the NTCRA met the RAOs and complied with the performance objectives.
- [Section 8](#) lists the documents and guidance used to prepare this report.

Figures and tables are presented following [Section 8](#). This report also contains the following supplemental information:

- [Appendix A](#), Photographic Logs of Construction Progress in 2010 and 2011
- [Appendix B](#), Repository As-Built Drawings
- [Appendix C](#), Daily Quality Control (QC) Reports and Daily Superintendent Reports from the 2010 and 2011 Construction Seasons
- [Appendix D](#), Repository Geosynthetics QC and Quality Assurance (QA) Documentation
- [Appendix E](#), Field X-Ray Fluorescence (XRF) Sample Data
- [Appendix F](#), WRP Confirmation Samples
- [Appendix G](#), Adaptive Management Plan Reclamation Planting Documentation

- [Appendix H](#), Red-Line Record Drawings
- [Appendix I](#), Compaction Testing Results
- [Appendix J](#), Sediment and Water Sample Results from After Water Release from Unknown Adit A1N2
- [Appendix K](#), Submittal Log
- [Appendix L](#), Drinking Water, Stream Water, and Sediment Samples
- [Appendix M](#), Fish and Macroinvertebrate Sampling
- [Appendix N](#), pH Treatment Basin Data
- [Appendix O](#), Stormwater Pollution Prevention Plan (SWPPP) Inspection Form
- [Appendix P](#), Operation and Maintenance (O&M) Inspection Form