Formosa Mine Adit #1 Reopening and Acid Mine Drainage System

Paul Dries, Project Manager
Overview

- Project Location
- Project Scope and Purpose
- Project Details
  - Construction of Decant Facility
  - Construction of High-Strength Pressure Plug Construction
- Project Challenges
  - Practicality -vs- Efficiency
Formosa Mine is located in southwest Oregon in Douglas County, approximately 25 miles south of Roseburg, Oregon, and 7 miles south of Riddle, Oregon.

- Situated in the Coast Range Klamath Mountains
- Elevations between 3,200 and 3,700 feet above mean sea level (amsl) near Silver Butte Peak (3,973 feet amsl)

- 6.5 miles of unimproved gravel logging road
- Accessed by BLM Road 30-6-35.0
Project Scope and Purpose

Purpose

- Control, treat, reduce, or eliminate uncontrolled releases of hazardous substances (i.e., metals and acidity) from the Formosa Adit #1 discharge.

Scope

- Design an adit closure consisting of a high-strength, water-tight, concrete plug constructed in the adit, including water-bearing fracture or fault grouting, if necessary, to stem the flow of AMD.
- The flow-through hydraulic plug will be designed as a high-strength pressure plug.
- Placed in a segment of the mine workings exhibiting competent rock and low fracture-density, to prevent hydraulic jacking.
- The plug will be placed as far back into the adit as possible but no closer than 200 feet from the portal.

Environmental constituents of concern (COCs) in soils and acid mine drainage (AMD)

- Arsenic, Cadmium, Copper, Zinc, and pH (2.15)
Project Details

- The Formosa Mine was actively mined for copper, gold, and silver in the 1920s and 1930s and again from 1990 to 1993 and is now a U.S. Environmental Protection Agency (EPA) Superfund Site.

- Client: USACE
- Field Work: 05/08/2018 - 11/30/2018
- Award Amount: $5.4M
- Contract Type: Cost Plus Fixed Fee
- Mine Material removed: 1,272.5 CY
- WRSA Quantity: 1,643 CY
- Plug Concrete: 95 CY
Construction of Decant Facility
Plug Removal and Adit Rehabilitation

Wooden bulkhead at 162 feet into the adit
Debris removed to 400ft
High-Strength Pressure Plug Construction
Challenges – Access Road

Restoring Road prior to project start
Continued road maintenance required
Road used by Logger, Fire,
Challenges - Work Site

- Narrow work area
- Road had to remain open
- Equipment use restricted
Challenges – Steep Terrain

64k-lb drill rig was backed into place approximately 200 feet down 50% grade using 80k-lb D-8 dozer
Challenges – Material Transfer

- Due to steep terrain material had to be transferred from highway haul trucks to dump trucks with trailers to reach site
- Concrete trucks were loaded 8 CY max due to road grades
Challenges – Fire

✓ 1 or 3 hour fire watch required after all power driven machinery has been shut down. PLAN, PLAN, PLAN
Challenges – Crew Safety

#1 Priority
Challenges – Adaptability

- Adapting to changing conditions key
- Project Team communication
  - Decisiveness
  - Project understanding
Summary

Keys to Success

- Project Team Communication
  - Involvement from all concerned stakeholders
  - All stakeholders were involved in decision making

- Vendors available to haul materials and equipment
  - Local Vendors are familiar with road conditions and equipment requirements
  - Have vendors on standby to transfer materials

- Adaptability to changing situations
  - Must foresee any changes in conditions
  - Compliance with Fire conditions