CASE STUDY

Golinsky Mine
Shasta County, California

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Prepared by
The Interstate Technology & Regulatory Council
Mining Waste Team

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1. SITE INFORMATION

1.1 Contacts

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1.2 Name, Location, and Description

The Golinsky Copper Mine operated between 1890s and 1930s. The mine is in Sections 28 and 33, T34N, R5W, MDB&M (Figure 1-1). Three portals discharge acid mine drainage (AMD) to Little Backbone Creek, which is tributary to Shasta Lake. Sulfide ore was mined and smelted on site. The area is at edge of the Klamath Mountains U.S. Forest Service property and is approximately 20 acres. Access is limited to boat and ATV. Two portals seals have been installed with limited success.

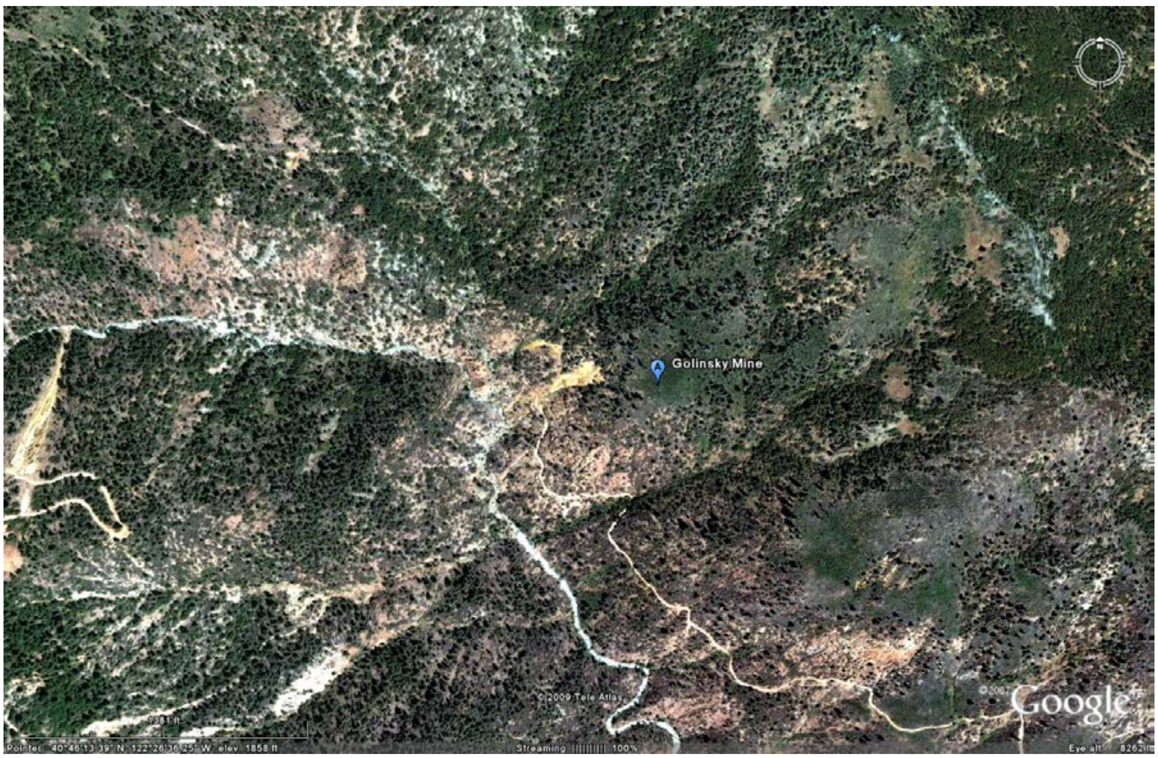

Figure 1-1. Site location map.
(www.lat-long.com/Latitude-Longitude-266760-California-Golinsky_Mine.html)

Inspections by staff from 1978 to 1991 revealed pH ranging 2.8–3.5, copper ranging 8.6–17.6 mg/L, zinc ranging 16.8–78 mg/L, and cadmium 0.18–1.5 mg/L in discharges from the portals. Federal effluent limits for copper, zinc and cadmium at that time were 0.3, 1.5, and

0.1 mg/L, respectively (California Regional Water Quality Control Board, Central Valley Region, 98-701).

2. REMEDIAL ACTION AND TECHNOLOGIES

The remedial action is to provide for the mitigation of ecological risk using sulfide and carbonate precipitation via sulfate-reducing bacteria.

Concrete bulkhead seals were originally placed in two portals in the hopes of preventing the discharge of AMD. The workings were too shallow and the host rock too fractured to adequately contain the AMD. A third portal was clean/neutral prior to the bulkheads and has returned to clean since the bulkhead valves were opened and remained so for one year. Discharge from the upper and lower portals is collected in pipes, diverted around the waste piles and mine ravine to a tank and flume, and discharged back into the ravine just before it enters Little Backbone Creek. Spring and fall monitoring and periodic inspections of equipment continue.

A final design is near completion for a long-term higher capacity treatment system consisting of three parallel cells with a design plan of 10 gpm per cell. Construction of the first cell will begin as soon as a source of funding is obtained. Bankruptcy negotiations with PRP ASARCO continue. Since there is no infrastructure (roads, electricity, etc.) near the site to support a conventional treatment system, a "passive" treatment system was the best alternative.

Three ponds will be filled with organic material to support anaerobic sulfate-reducing bacteria. The acid mine drainage will flow vertically through the pond, where the metals will precipitate out as sulfides in the media. A pilot-scale sulfate-reducing bioreactor treated 1 gpm, and the full-scale proposal is to treat 10 gpm.

The bench pilot test cell using a moderate amount of rice hulls as the test medium yielded the best results. A full-scale pipeline (6-inch high-density polyethylene) was built to the limestone quarry, then reduced to a temporary 1-inch line for the last 50 feet to feed the pilot cell bioreactor. In July 2004, the first samples were taken, and the analytical results indicate the system is functioning as expected.

3. PERFORMANCE

The goal is to reduce metals in the discharge sufficiently to support aquatic life overall in Little Backbone Creek, Shasta Lake, and the Sacramento River. The state is attempting to rely on application of best management practices to reduce the discharge of metals from abandoned mines in place of requiring numeric effluent limits (Table 3-1).

Table 3-1. Cleanup concentrations

Contaminant	Target cleanup level
Acid mine drainage	
Cadmium, copper, iron, and zinc	99% removal each

The treatment cell achieved 99% removal of all the target metals and raised the pH to acceptable levels.

4. COSTS

Cost of activities at this site are reported as a total:

- Capital: $1,700,000
- Operation and maintenance: $65,000/yr

5. REGULATORY CHALLENGES

It is unlikely the effluent will consistently meet the state or federal requirements for discharge to surface waters. However, the U.S. Forest Service claims it is not held to strict state standards as it can waive certain applicable, relevant, and appropriate requirements using its position under CERCLA. The state is attempting to rely on application of best management practices to reduce the discharge of metals from abandoned mines in place of requiring numeric effluent limits.

6. STAKEHOLDER CHALLENGES

None reported.

7. OTHER CHALLENGES AND LESSONS LEARNED

Concrete bulkhead seals were originally placed in the portals in the hopes of preventing the discharge of AMD. The workings were too shallow and the host rock too fractured to adequately contain the AMD. Since there is no infrastructure (roads, electricity, etc.) near the site to support a conventional treatment system, a "passive" treatment system was the best alternative.

8. REFERENCES

Note: 2008 Action Memo, design documents, and current monitoring reports are all maintained in the Administrative Record on the Shasta Trinity National Forest in Redding. Contact: Brad Shipley

California Regional Water Quality Control Board, Central Valley Region. 1998. "Cleanup and Abatement Order for U.S. Department of Agriculture Forest Service, Shasta-Trinity National Forest, Golinsky Mine, Shasta County." Order No. 98-701.

Department of Conservation California, Abandoned Mine Lands Forum. 2004. "August 11, 2004 Meeting Notes." www.consrv.ca.gov/OMR/abandoned_mine_lands/Forum/Minutes/AML%20Minutes%20-%20August%2011%2004%20notes%20final.pdf.