

CASE STUDY

Alpine County-2, California Enhanced, Semi-Passive, Sulfate-Reducing Bioreactor

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**Prepared by
The Interstate Technology & Regulatory Council
Mining Waste Team**

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**ALPINE COUNTY-2, CALIFORNIA
ENHANCED, SEMI-PASSIVE, SULFATE-REDUCING BIOREACTOR**

1. SITE INFORMATION

1.1 Contacts

Ionic Waters Technologies
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<https://wvmdtaskforce.files.wordpress.com/2016/01/06-tsukamoto.pdf>

1.2 Name, Location, and Description

The site is located in the Sierra Nevada mountains on an inactive, open-pit sulfur mine. Acid mine discharge (AMD) leaches from a waste rock dump at a flow of 5–40 gallons per minute and directly affects the immediate drainage and subsequent waterways from the site. The site is remote and inaccessible through ordinary means of travel two to six months of the year. There is no power available on site, and snow depths can approach 6 feet.

The cleanup goals are based on mitigation of human health risk and ecological risk. The contaminants of concern are acid discharge, aluminum, copper, iron, manganese, nickel, sulfate, zinc, arsenic, cadmium, cobalt, copper, mercury, lead, selenium, and sulfate.

2. REMEDIAL ACTION AND TECHNOLOGIES

The ethanol-enhanced, semi-passive, sulfate-reducing bioreactor can be operated on less than 1 kw of electricity. Metals are removed outside of the bioreactor matrix, and carbon source is continually supplied at stoichiometric concentrations. The system requires operation and maintenance checks every two weeks. It has been operating for 13 total years and 6 years on the current system.

3. PERFORMANCE

This bioreactor system has been upgraded and improved throughout the last 13 years to incorporate a design which is sustainable and energy-efficient and can be operated throughout the year with minimal maintenance requirements. Sludge and precipitated metals are removed previous to entry into the bioreactor cells, limiting system short-circuiting and metals loading.

The ethanol-delivery system provides a carbon source that is not depleted over time, eliminating the need to remove and replace the substrate.

4. COSTS

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

- Capital: \$ 800,000
- Operation and maintenance: \$ 75,000 annually

5. REGULATORY CHALLENGES

No regulatory challenges were encountered.

6. STAKEHOLDER CHALLENGES

No information available from survey.

7. OTHER CHALLENGES AND LESSONS LEARNED

See information under “Performance.”

8. REFERENCES

No information available.