Corona Mercury Mine:
Subsurface Chemical Amendment Pilot Project to Treat Mine Drainage

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• Acknowledgements
• Abandoned Mines Overview
• Corona Project Description
• Mine Impacted Water treatment
• Results
• Lessons learned
Acknowledgments:

This project was funded by the State of California’s Ecosystem Restoration Program through Proposition 84 with the Department of Fish and Wildlife (CDFW) as its implementing agency.

Tuleyome (a non-profit land trust) implemented this project to treat water draining from underground mercury mine workings at the Corona Mine in the Inner Coast Range. This is a unique collaboration among a private landowner, public open space district, and non-profit organization. Tuleyome acknowledges the CDFW, for their financial support.

Project Team Members included Dr. Vic Claassen, Ms. Beth Kelly JD, Mr. Michael Lozeau JD, Dr. Stephen McCord, Dr. Darrel Slotton, Mr. Greg Reller, Mr. Justin Smith, and Dr. Tim Tsukamoto.
Abandoned Mines Overview

- Estimated 47,000 in California
- Treating mine impacted water (MIW) presents several challenges including:
  - Minimal infrastructure
  - Limited space
  - Inability to meet discharge requirements
- Addressing MIW is very costly and can result in unintended consequences
  - Increased development
  - Liability

Frequency of Abandoned Mines with Greater than $100,000 of Production by Watershed (Cal DOC 2000)
MIW Issues

- MIW is most often actively treated at significant cost.
- Optimizing MIW treatment will reduce costs and liability for responsible parties.
Project Description

- The Corona Mine project is considered to be a good Samaritan project under the California Water Code Chapter 5.7.

- Tuleyome also entered into an order on consent with US EPA, Region 9 as a Good Samaritan at Corona Mine.

- The project included consolidation of mine waste, revegetation, and improvements to existing mine drainage capture systems.
Corona Mercury Mine Location

One Mile
Corona Mercury Mine Overview

North 2000 Feet
Corona Mine Geology

Geologic Types
- Jsp - Great Valley Complex serpentinite
- KJfs - Franciscan Complex sedimentary rocks
- Qsl - Hillslope Deposits
- Tpmv - Sonoma Volcanic rocks

North

1000 Feet
Corona Mercury Mine Drain Tunnel MIW Treatment

- Initial Plans included above ground semi-passive biological treatment

- Active Treatment was considered

- Tunnel plugging was also evaluated
Corona Mercury Mine Drain Tunnel MIW Treatment

- Divert surface water
- Attempt subsurface chemical amendment
  - Biological treatment
  - Chemical neutralization
- Monitor Drain Tunnel discharge
- Design additional treatment based on monitoring results
Corona Mine Schematic Section
Pit surface water diversion

- Runoff
- Pit and Collapsed Workings at Surface
- Boilerhouse Portal Infiltration Trench
- Waste Rock
- Calcine Tailings
- Sandstone and Shale
- Kidd Creek
- Drain Tunnel
Corona Mercury Mine Drain Tunnel MIW Treatment: Pit Surface Water Diversion

Why?
- Linear-fracture controlled swale identified uphill from the pit
- Observed significant infiltration during runoff events

How?
- Diverted flow to pipeline through pit and into nearby drainage.
Corona Mercury Mine Drain Tunnel MIW Treatment: Surface Water Diversion

What Happened?

- After the diversion flow from the Boilerhouse dried up during the summer months for the first time.
- Sodium concentrations returned to pre-injection levels
- Decreased metal loading from Boilerhouse
- Decreased metal sludge handling efforts
- Reduced MIW flow between Pit and Boilerhouse.
Corona Mercury Mine Drain Tunnel MIW Treatment: Subsurface Chemical Amendment

Why?
❖ Needed to reduce nickel and iron loading to protect water quality
❖ Needed to reduce area and effort required to treat water flowing from the Drain Tunnel

How?
Injected bacteria, nutrients, and caustic.
Corona Mercury Mine Drain Tunnel MIW Treatment: Subsurface Chemical Amendment

Hypothesis: Adding caustic to the underground mine workings would neutralize acid and reduce the amount of metals in MIW at the Drain Tunnel.

➤ Solids/sludge stays underground reducing residual management effort during future above ground activities
Corona Mercury Mine Drain Tunnel MIW Treatment: Subsurface Chemical Amendment

What Happened?

- Metal concentrations and loading reduced
- Acidity Reduced
Drain Tunnel Ni Concentration and Mass

- Ni Concentration (ug/L)
- Ni Mass (g/min)
- Flow (L/min)
Initial n = 7
Transition n = 4
Post Amendment n = 15

Note differing vertical scales
(all concentrations ug/L)
Lessons Learned

- Surface water management can reduce the quantity of metals (and sludge) requiring treatment.
- Subsurface chemical amendment is able to significantly reduce metal loading from MIW.
- It is likely that monitoring will be affected by seasonal weather patterns.
QUESTIONS?

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