Design and Construction of Mine Waste Cap at the Jamestown Mine for the Jamestown Trust

J.C. Isham PG, CEG, CHG - Aptim
Relevance of Project for a Trust

- Jamestown Mine a California fund lead project
- Cost of remedial actions the financial responsibility of Jamestown Trust
- Funds of Trust contained in two trusts:
  - Trust 1 funded design and construction of cap [approximately $10 million]
  - Trust 2 funds long term O & M [approximately $12 million].
- To meet funding requirements of Trust 1, APTIM had to start and complete construction of cap within one dry weather season
- Cost to remobilize to finish construction over 2-year period not an option
- Trust 2 for long term O&M invested in financial instruments to last into perpetuity
California Attorney General sued Mining Company, Tuolumne County, and land owners for trust funds

Trust 1 - Public money from County invested in low risk bonds:
• Payments to APTIM had to coincide with payout schedule of laddered bond portfolio
• Trustee requested APTIM schedule remediation activates to meet bond due dates to help with cash flow on purchase of new bonds

Trust 2 - Private money invested in bonds, stocks, and cash instruments:
• APTIM had to be conscious of selection of remediation technologies
• Example, Trust 2 had enough funds to purchase reverse osmosis plant, but not enough to run it long term
14 Million Cubic Yards Mine Waste in 140-Acre TMF Impacting Aquifer and Endangering Woods Creek

Legend
- Tailing Dam Monitoring Wells
- Rock Storage Monitoring Wells

0 1000 2000
SCALE (feet)

2019 Design and Construction Issues at Hazardous Waste Sites
Remediate mine waste and restore water quality:

- Dewater and reduce leachate leakage from TMF
- Dewater 300 million gal. impacted water from TMF by siphoning through ¼-mile pipeline to Harvard Pit
- Crush 420,000 cy rock to meet RCRA low perm cap standards
- Stabilize tailings to compact low perm clay cap
- Delist 200-ft high dam from State regulations
- Spillway through rock to sustain 1000-year storm
- Place cap on waste to reduce water quality impacts
- Prevent Harvard Pit from impacting Woods Creek
Groundwater Plume Captured by Pit
2019 Design and Construction Issues at Hazardous Waste Sites

TMF & Spillway Design
Placing Low Perm. & Veg. Layers
Turning Shale into Clay
RCRA Cap Almost Done
Harvard Pit Filling Up

• Modeling Predicted to discharge in 2015, Delayed to 2018
• Flow through bedrock fractures into Woods Creek impacting water quality of Lake Don Pedro
• Predicted to spillover south rim in 2029
• Installed 10 floating spray evaporators (25 Hp each) in 2015
• Enhanced evaporation up to 450 gpm
• Possible solar farm for electrical sustainability
• Possible spray irrigation of 250 gpm over TMF to stabilize pit rise
10 Spray Evaporators
Summary of Challenges and Lessons Learned:

• Cap design to conform to RCRA standards, 4-foot minimum thickness with 1-foot layer of low permeability soil \(1 \times 10^{-6} \text{ cm/sec}\) and vegetative layer

• Before capping; 300,000 million gallons of mine impacted water from top of waste, siphoned off through pipeline to Harvard Pit

• To stabilize soft saturated tailings for compacting low permeability clay layer, large quantities of rock hauled from top of tailings dam

• Low permeability soil made by crushing 420,000 cy of rock back into clay

• To accelerate delisting 200-foot high tailing dam from State regulations, to allow for construction within one dry season, spillway redesigned by cutting deep slot through rock abutment to sustain 1000-year storm event

High risk design/build project. To limit financial risk, APTIM bought environmental insurance, costing over $1 million. APTIM did not make any claims. Lesson learned, if you trust yourself, do not buy insurance.