

Water Quality Improvement Projects at Legacy Hardrock Mine Sites

NWCOG Water Committee
October 21, 2015



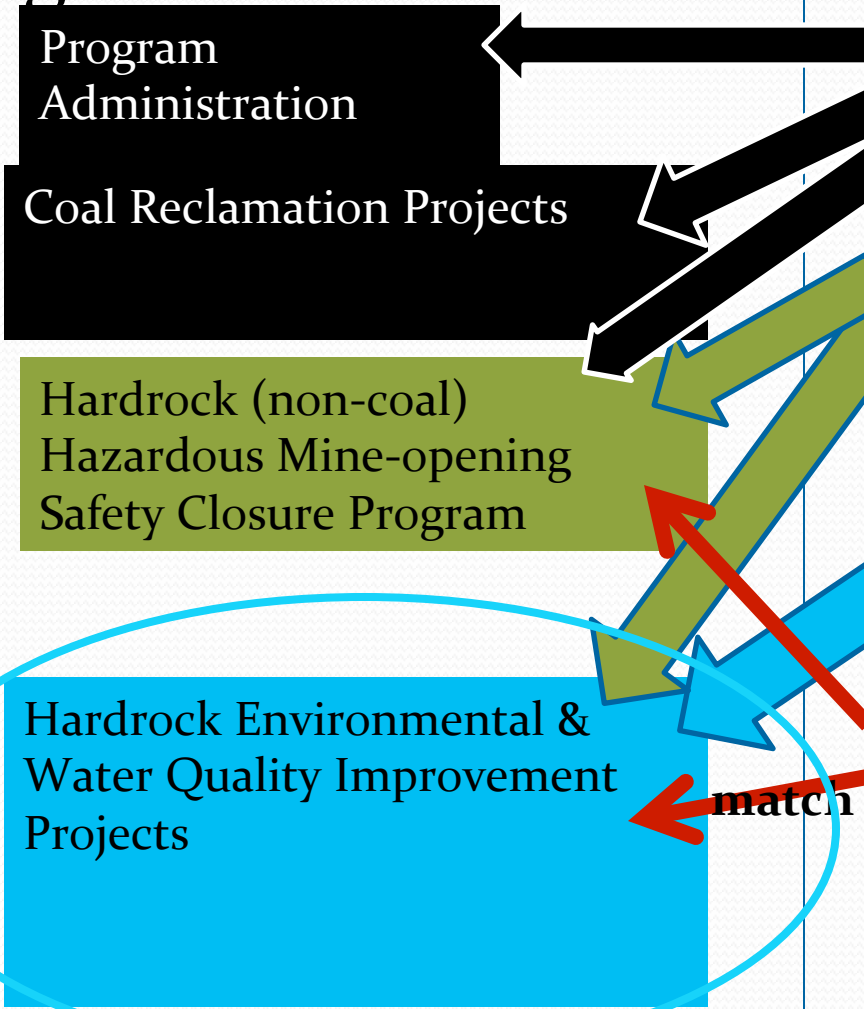
COLORADO

Division of Reclamation,
Mining and Safety

Department of Natural Resources

DRMS Legacy* Mine Program Activities

\$\$\$ Funding Sources \$\$\$



*(Legacy Mine– sites where mining was conducted prior to 1977, AKA “abandoned mines”)

** (NPS= CWA section 319 “NonPoint Source” Program Funding)

Water Resources and Power Development Authority Grants

- **2013 (\$914,000)**: Inspection, Engineering and Implementation of Best Management Practices at High Priority sites.
- **2013 (\$166,000)**: Long Term Maintenance of Previously Completed Nonpoint Source Projects.
- **2014 (\$1,000,000)**: Implementation of Best Management Practices at High Priority sites.
- **2015 (\$800,000)**: Implementation of Best Management Practices at High Priority sites.

Projects Funded by the Water Resources and Power Development Authority (PA), 2011 - 2013

- Characterization Projects
 - Water and tailings samples collected from impaired streams
- Engineering Projects
 - Planning and design of site-specific best management practices (BMPs) for mine waste rock, tailings, and water-source controls
- **Reclamation Construction Projects**
 - **Implementation of Non water-treatment BMPs**
- Maintenance of previously completed Projects

Recent Nonpoint Source and Water Quality Improvement Projects

- Mary Murphy Mine/Golf Tunnel bulkhead (Chaffee)
- London Mine tailings reclamation (Park)
- London Butte Mine waste rock and tailings reclamation (Park)
- Hough Mine waste rock and tailings reclamation (Hinsdale)
- Red & Bonita Mine bulkhead (San Juan)
- Pennsylvania Mine bulkhead (Summit)
- Bullion King Mine waste rock (San Juan)

Projects underway to investigate, characterize and develop final reclamation designs include:

- Waldorf/Santiago Mine on Leavenworth Creek (Clear Creek)
- Rico-Argentine Mine underground rehabilitation and investigation (Dolores)
- Uncompahgre Mine Reclamation Project (Ouray)
- Carbonero Bulkhead investigation* (San Miguel)
- Gertrude-Venture Mine waste-rock project (Lake)
- Perigo Mine drainage investigation* (Gilpin)

*(may be delayed-technical review period)

Hardrock Mine Water-Quality Improvement Projects-Saints John





Saints John Creek, Tributary to Snake River



















Saints John Project

- Approximately 18,000 cubic yards of tailings excavated and consolidated in upland repository, ~ \$200k
- Wetland Re-vegetation completed in 2013; approximately 20,000 wetland plantings, ~\$70,000.
- **LEVERAGED FUNDING** - project funded by CWRPDA, Freeport McMoRan contributions, and NPS program funds.

Hardrock Mine Water-Quality Improvement Projects-Penn Mine



Pennsylvania Mine Project



Collapsed Stopes

Level B

Level C

Level F

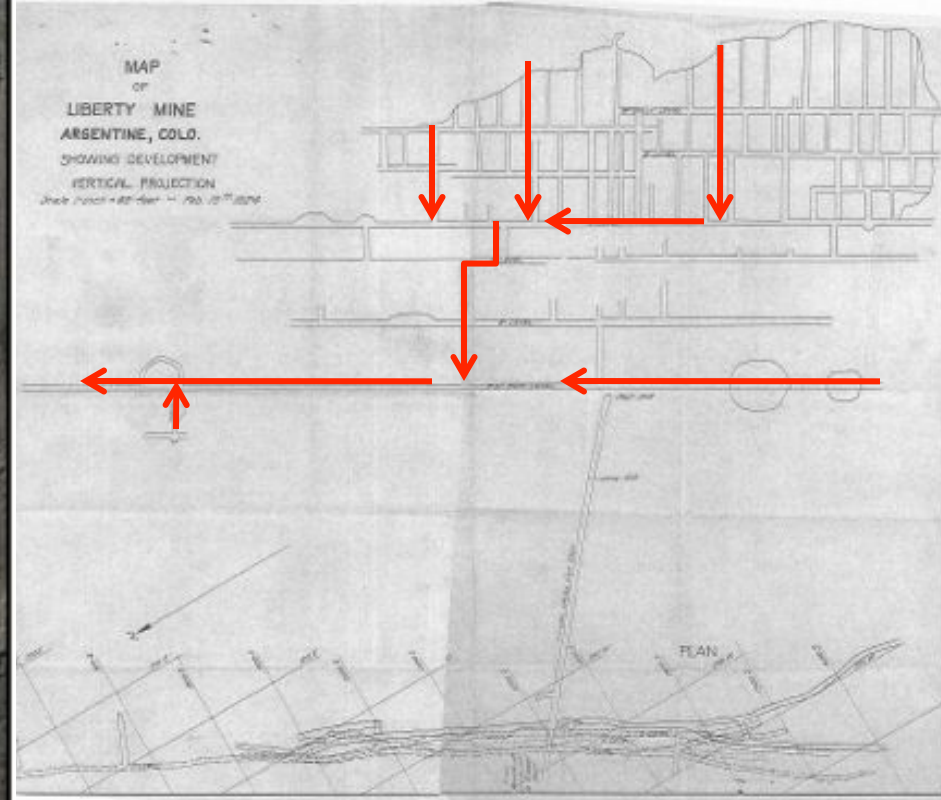
Vein Outcrop

PERU CREEK

Underground Mine Workings and Flows



0 75 150 300 450 600 Feet



Level F

Underground Rehab

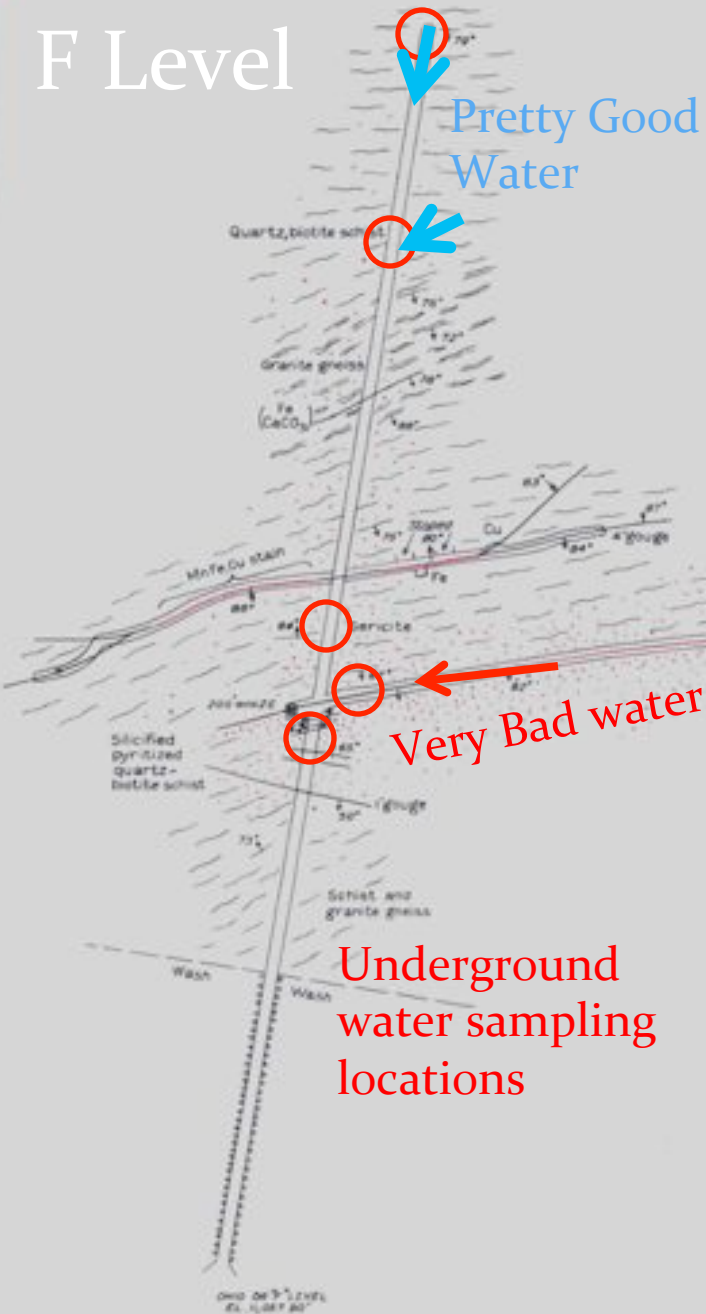
Goal: Provide safe underground access.

- Installed spiling rods, bolts, mesh, steel sets, and utilities.



F Level

Pretty Good Water



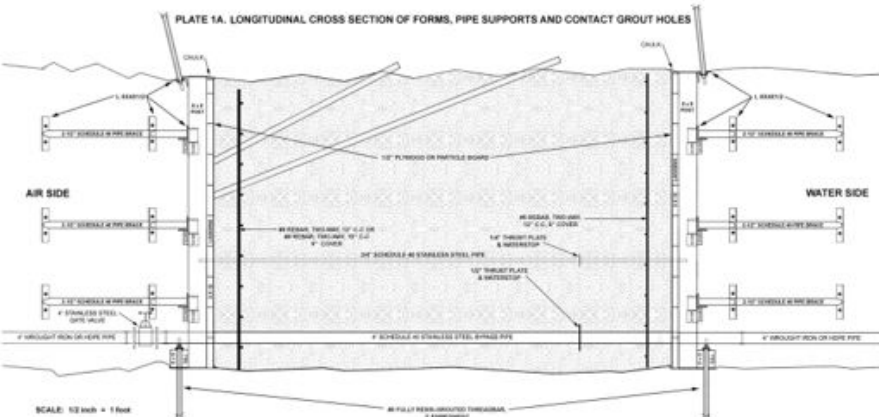
Underground water sampling locations



Data Evaluation

Goal: Determine remedial options.

- Investigations indicate:
 - Bulkheads are viable source control option.
 - Multiple bulkhead approach.
 - Possible opportunity for inflow reduction on Level C and in mine treatment.
- Implement as phased approach.



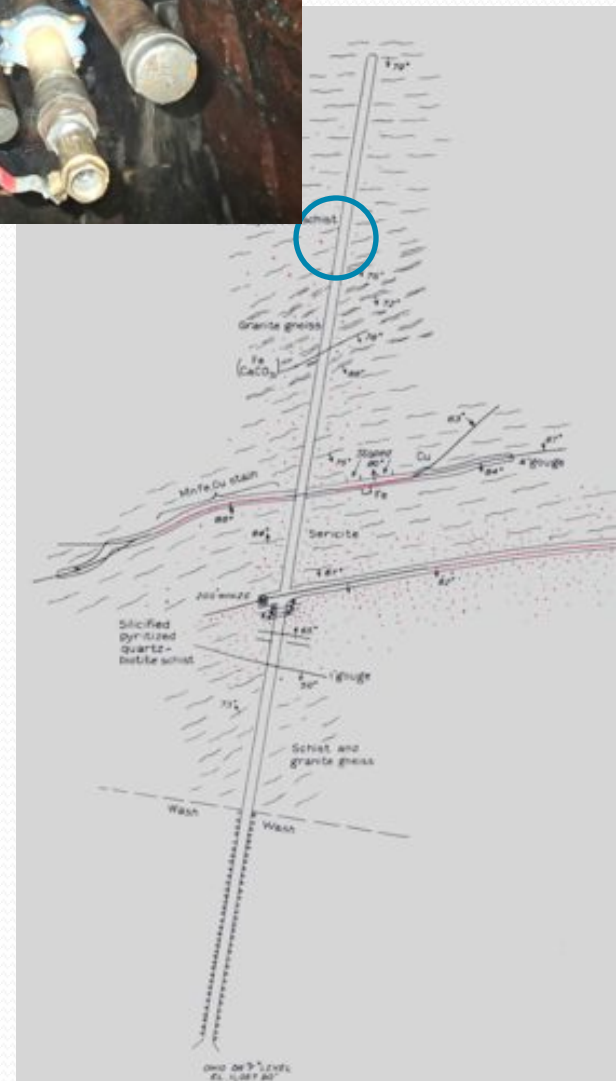
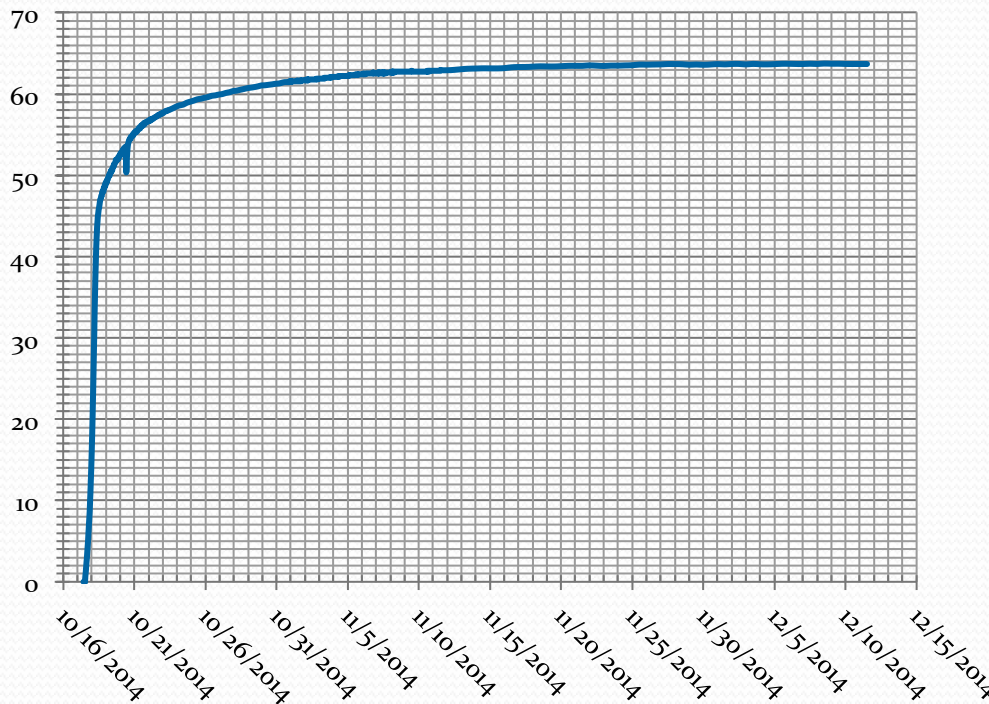
Bulkhead 1

Goal: Reduce portal discharge.

- Flow at portal was reduced 65%.
- Steady state reached quickly.
- No obvious leakage.



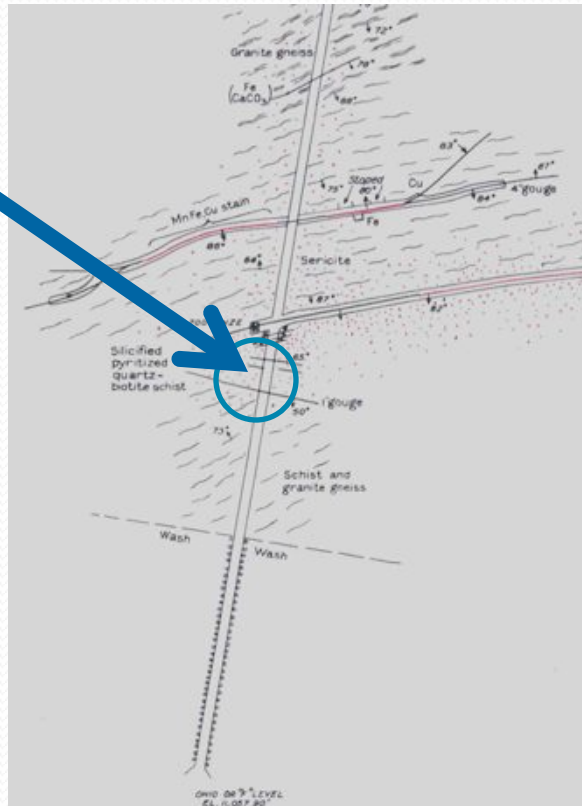
Bulkhead Pressure (psi)



Bulkhead 2

Goal: Reduce portal discharge and eliminate blowout potential.

- ▶ Installed August, 2015.
- ▶ Reduce remaining flow (flow control).
- ▶ Evaluate possibility of seepage from vein.



Penn Mine Remedial Goals

- Eliminate portal blowout events.
- Reduce/eliminate chronic loading to Snake River.
- Increase survivability of fish in the Snake River.
- Reduce long term O&M.
- Reduce long term cost:
 - Investigation, implementation and operation of bulkheads ~ \$2 million so far.
- Maintain existing land use and character of Peru Creek Watershed.



Thank You!



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