Design Considerations for Waste Rock Cleanup Sites

Ely Copper Mine 1873

Nobis Engineering, Inc. - Brett Kay
Site Setting

♦ Vershire, VT
♦ General Site area - 350 acres
♦ Dwight Hill, Ely & Schoolhouse Brooks
♦ ~20 acres of exposed wastes
♦ Abandoned underground workings & historic features
♦ Primary Shareholders
  ❖ USEPA R1 – Federal Site Lead
  ❖ VTDEC – State Site Lead
  ❖ Nobis – Remedial Design Contractor
Site History

♦ Ore discovered in 1813, mined 1853 through 1905
♦ Site added to National Priorities List in 2002
♦ Mining era town population ~1,900, current population ~630
Contamination Impacts

✦ Acid rock drainage (ARD) and acid mine drainage (AMD)
  ❖ Low pH & High Metals in surface water and sediments
  ❖ Acid impacted barren areas throughout Site
  ❖ Groundwater water impacts
Waste Areas - Waste Rock & Tailing

Upper Waste Area

- Waste Rock: 102,700 CY (8.9 acres)

Lower Waste Area

- Ore Roast: 12,600 CY (2.2 acres)
- Waste Rock: 48,400 CY (5.6 acres)
- Tailings: 7,200 CY (0.7 acres)
Waste Areas – Contaminated Sediment

Ely Brook Middle Reach

Contaminated Sediment
1,200 CY
(0.7-acres)

Ely Brook Lower Reach

Contaminated Sediment
4,600 CY
(2.0-acres)
Initial Design Considerations

♦ AMD 101 – Remove waste & keep it high and dry
  ❖ Consolidate waste in a capped containment cell

♦ Minimize potential for residual risk - “No waste left behind”
  ❖ When in doubt, take it out (once cap is done, hard to add volume)
  ❖ Copper SW standard is 9 ug/l and Ely Brook contains 6,600 ug/l – 99.9% reduction for cleanup success.

♦ A Greener Cleanup
  ❖ Minimize the environmental footprint
  ❖ Use on-site materials
  ❖ Achieve natural restoration

♦ NHPA
  ❖ Avoidance, documentation, mitigation
Historic Foundations/Features
Historic Foundations/Features

“Lost” Ore Wash House Foundation

Historic Retaining Wall in the Ore Roast Bed Area
Recent Design Considerations

♦ Endangered Species Act - Northern Long-Eared Bat (NLEB)

♦ Potentially flooded underground workings with potential for release of AMD
Northern Long-Eared Bat

- Initially listed in April 2015
- Preliminary study in 2015
- Final Rule in January 2016
- Detailed study in 2016 to learn more about how bats are using the Site
- Main Shaft and Main Adit are critical habitat
- No impacts to bats allowed within ¼ mile of an identified hibernacula
- Seasonal work restrictions

Main Shaft Area
Reduced Clearing/Disturbance Limits
Flooded Adit and Shallow Workings

♦ Deep Adit: collapsed/buried portal
♦ Potential for areas where bedrock is thin above workings

Photo from 1899

Photo from 2014
Potentially Flooded Adit

Leaking collapsed adit portal
Historic Foundations & Features, Bats, and UGWs
Revised Cleanup Approach

♦ “The Balancing Act”
♦ Achieve cleanup objectives
  ❖ Meet ROD requirements
  ❖ A Greener Cleanup
♦ Minimize clearing/disturbance around critical bat habitat & historic features
  ❖ In-situ treatment of waste remaining in-place
♦ Avoid release from adit or collapse of mine workings
♦ Optimize the design to incorporate all factors
  ❖ Requires an iterative process
♦ Maintain awareness of cost impact of changes
Lessons Learned

♦ Identify issues as early as possible in RD
  ❖ Bring in expertise, if necessary, to fully understand non-engineering ROD requirements
  ❖ Involve key stakeholders early and often

♦ Be aware of on-going developments that can impact the RD
  ❖ New Endangered Species listing
  ❖ New guidance for mine sites
  ❖ Design costs will likely increase but remedial costs should be more defined if uncertainty is minimized
  ❖ Goal is to address issues that would make final acceptance of design and remediation difficult
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