Managing Mine Slimes and Other Lessons Learned
Jack Waite Mine Removal Action

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Introduction

• Project Team
  – Parametrix / CDM Smith; Engineering Design
  – U.S. EPA Region 10; Lead Regulatory Agency
  – U.S. Forest Service; Property Owner, Joint Lead Regulatory Agency
  – U.S. Army Corps of Engineers – Seattle District; Construction Procurement and Administration
  – Conti; Removal Action Contractor

• Site Features and 2011-2012 Removal Actions
  – Removal of two tailings piles (TP1 and TP2) and Mill area in alluvial valley
  – Consolidation to two repositories: TP3 and Borrow Area 2 (BA2)
  – Rehabilitation of Tributary Creek
Jack Waite Mine Layout

Tailings Pile TP4
Tailings Pile TP3
Borrow Area 2
Tailings Pile TP2
Tailings Pile TP1
1500-Level Adit and Waste Rock Pile
Borrow Area 1
Tailings Pile 1, Mill Area, & Tributary Creek

TP-1 (110,000 cy); Mill Area (14,000 cy); Alluvium (2,900 cy)
Tailings Pile 2

TP-2 (15,000 cy Tailings)
Materials Management & Restoration (MMR) Issues

- 2011 MMR Issues Encountered at the Jack Waite Site
  - Difficult material types
  - Additional waste volumes
  - Insufficient borrow soil gradation characterization
  - TP3 alluvial repository configuration
  - Remote high elevation site; limited construction season

- Issue Discussion
  - Design approach
  - 2011 construction issue
  - Solutions / lessons learned
Difficult Material Types

• Design Approach
  – Borings and cone penetrometers completed through tailings piles

• 2011 Construction Issue
  – TP2 slimes encountered in July 2011
  – Difficult to excavate material
  – Difficult to haul material – transportation caused separation of solids / liquids & spills

• Solutions / Lessons Learned
  – Temporary stockpile material to dewater, addition of Portland Cement (5%); transportable; achieved good compaction
  – For tailings piles, focus on potential volume of this material
Additional Waste Volumes

Design Approach
- Aerial survey / LiDAR data (2-ft. topographic contouring)
- Test pit and boring extent / depth of mine wastes
- Mine waste volumetrics developed using CAD 3D
- Contingency volumes included (~30 Percent)

2011 Construction Issue
- Additional waste rock volume at Mill Site (34,000 vs. 14,000 cy)
- Additional tailings volume at TP2 (23,000 vs. 15,000 cy)
- 2012 concerns with waste volume in Tributary Creek alluvium

Solutions / Lessons Learned
- Flexibility in repository design to allow additional capacity
- Steep slopes and alluvial interface difficult to estimate
Insufficient Borrow Soil Gradation Characterization

• Design Approach
  – Repository cover / rehabilitation area growth media and fill primarily developed from Borrow Area 2
  – Test pits used to estimate depth of borrow soils
  – Field observations / geotechnical data used to evaluate gradation (oversize vs. granular material)
  – Borrow soil volumetrics developed using CAD 3D and gradation

• 2011 Construction Issue
  – Significantly more oversize material - 19,000 cy vs. 11,000 cy
  – Limited stockpiling areas / double handling in steep terrain

• Solutions / Lessons Learned
  – Design approach should use grizzly / screening for oversize rock
TP3 Alluvial Repository Configuration

- **Design Approach**
  - EE/CA and Action Memorandum included TP2 repository located in Tributary Creek alluvial valley
  - Volume and cost constraints
  - Maximize mine waste in BA2 repository
  - Utilize low permeability cover to reduce infiltration
  - Utilize riprap toe armoring (100-yr event) ; HEC-RAS model

- **2011 Construction Issue**
  - Tailings piping observed

- **Solutions / Lessons Learned**
  - Revised design to include toe drain system
Remote High Elevation Site

• Design Approach
  – Completed design / contracting process in 2010 (utilized $1.2M ARAR funding)
  – Allowed for snow removal in bid for early mobilization
  – Allowed for flexibility in bid for one or two-season construction

• 2011 Construction Issue
  – Snow plowed in May; heavy precipitation in June; limited site construction until July

• Solutions / Lessons Learned
  – Field conditions can significantly impact schedule
  – Consider summer traffic on hauling
Questions