Adaptive Management and Remedial Design of the Canyon Complex Repository

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Introduction

• History of Bunker Hill and Coeur d’Alene Trust
• Problem Statement
• History of the SVNRT Repository
  • Silver Valley Natural Resource Trustee Repository
• Adaptive Management
• Design Considerations
• Repository Design Features
History of the Bunker Hill Superfund Site

- Silver Valley
- Superfund Designation Established in ‘83
- Addressed the Upper Basin in ‘12 ROD Amendment

(EPA 2012)
Coeur D’Alene Trust

• In December 2009, U.S. EPA announced the largest Superfund settlement in U.S. EPA history. The U.S. EPA settled with ASARCO for $1.7 Billion for cleanups across the country.

• $494 Million toward the cleanup of the Bunker Hill Superfund Site

• The Successor Coeur d’Alene Custodial and Work Trust (Trust) Works in Conjunction with U.S. EPA Region 10
Repository Site Location

(EPA 2012)
Problem Statement

• Use Adaptive Management to Vary from the ROD
• Canyon Creek Mine Waste Estimated At 2M CY
• Existing Repository (LBCR) Capacity ~750,000 CY Remaining
• Limited Locations for Additional Repositories in Canyon Creek Near Mine Waste
• Existing SVNRT Repository is Loading Zinc and Lead to Canyon Creek
• SVNRT Area Identified As Potential Repository For Additional Waste
History of the SVNRT Repository

- Developed – 1995-1999
- Metals Source Control Project
  - Voluntary Removal of Contaminated Materials
  - Non-Time Critical CERCLA Action
  - Material Removed from the Canyon Creek Floodplain
- Capacity - ~600,000 cy.
- Metals Concentrations
  - Pb – 53,000 ppm
  - Zn - 30,500 ppm

(SVNRT 2000)
SVNRT Repository Issues

• The Dreaded “Red Toe”
• Draft Closure Report (SVNRT 2000) does not provide specific info regarding foundation preparation
• 2007 Canyon Creek Hydro Study (CH2M 2007)
  • Significant drainage from behind slope
  • 20-49 lbs/day zinc loading to Canyon Creek from hillside seepage and groundwater underflow
  • 1-3 lbs/day zinc loading to Canyon Creek via deep percolation of precipitation
• Discharge from SVNRT repository equals ~26% of total zinc loading in Woodland Park area (CH2M Hill 2007, Table 6)
SVNRT Repository Issues (Contd.)

- Inadequate Hydraulic Isolation
- Perched Water in the Waste
Selected Remedy (Interim ROD)

• Remedial Component Screening Woodland Park Area of Canyon Creek (CH2M Hill 2007)
  • Source Control Option 1 – Capping in Place
    • Advantages: Low O&M requirements
    • Disadvantages: Low effectiveness in reducing loading
  • Source Control Option 2 – Excavate and Place in Star Tailings Impoundment
    • Advantages: High effectiveness in eliminating loading
    • Disadvantages: High cost ($38M ⇒ $985,000 per lb/day of load reduction)
• Selected Option - Groundwater Control Option – Install French drain and piping to convey drainage to Central Treatment Plant ($220,000 per lb/day)
Adaptive Management

- Selected Remedy for SVNRT
- Construction of Repositories
  - Still Working Within the Framework of the Record of Decision
- Lessons Learned from Other Projects
  - Specifically the SVNRT Repository
New Repository Design Considerations

• SVNRT Area Satisfied the Repository Siting Criteria:
  • Close to Remediation Sites in CC
  • ~1.8M CY Capacity For Contaminated Materials
  • Existing Access Roads Present
  • Potential Clean Soil and/or Rock Borrow Source
  • Free of Complex Land Ownership Issues
  • Relatively Flat
New Repository Design Considerations (Cont.)

- Maximum Waste Volume Capacity – 1.8M CY
- Geologic Faulting in Area
- Borrow Soil Availability
- Identify Maximum High Groundwater Elevations
CCR – Pre-Design Investigation

- Why did SVNRT Fail
- Inadequate Hydraulic Isolation of Waste
- Determine High Groundwater Level
  - Numerous Wells
  - Data Loggers
- GW Elevation Variability
  - Large Swings Observed in 3 Wells
CCR - Pre-Design Investigation (Cont.)

- Hydraulic Separation of Waste
  - Peak 2016 – 2983’
  - Peak 2017 – 2996’
  - Peak 2018 – 2984’
- Data Loggers Vital To Design
- Used Peak Data and Additional Separation To Determine Design GW Elevation Surface
Repository Design Features

• Clean Fill In SVNRT Area To Raise Base Drainage System Elevation
  • Added Supplemental Base Drainage System Beneath Clean Fill

• Shallow and Deep GW Dewatering Trenches
  • Drain Rock, 12” Perforated Pipe
  • Drain to Perimeter of Repository
Repository Design Features (Cont.)

• Base Drainage Layer Beneath Waste
  • Placed 5 Feet Above Anticipated High GW Elevation
  • Prepared Foundation
  • 16 oz. Non-Woven Geotextile
  • Secondary Monitoring and Drainage Trench
  • 2 ft. Drainage Rock
  • 16 oz. Non-Woven Geotextile

• Seep Collection Trenches
  • All Identified Seeps Collected and Piped to Perimeter
Repository Design Features (Cont.)

• Lesson Learned from Other Repository Construction
  • Lined Channel Upgradient of Base Drainage System
Repository Design Features (Cont.)

• Construction Phasing
  • Borrow Soil – 340,000 CY
  • Repository Foundation Preparation
    • 60,000 CY Fill
  • Base Drainage System
  • SVNRT Removal & Placement -600,000 CY
    • $2.5M
Repository Design Features (Cont.)

• Phased Construction
  • Responsive to Waste Volume
  • Base Drainage System
  • Permanent Cover System
• Phased Design
Conclusion

• Apply Adaptive Management During Design and Construction
• Importance of Pre-Design Investigation
  • Cost of Relocation
• Groundwater Fluctuations in Mountains Can Be Very Responsive To Spring / Snow Melt
  • Belt, Suspenders and Some Duct Tape
• Utilize Lessons Learned From Previous Work
• Phased Construction
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