EFNM Waste Consolidation Area Site Selection, Design and Initial Construction

American Society of Mining and Reclamation

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CDM Smith®

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
- Settlement funds were placed in a Successor Coeur d'Alene Custodial and Work Trust (Trust)

Getting Started

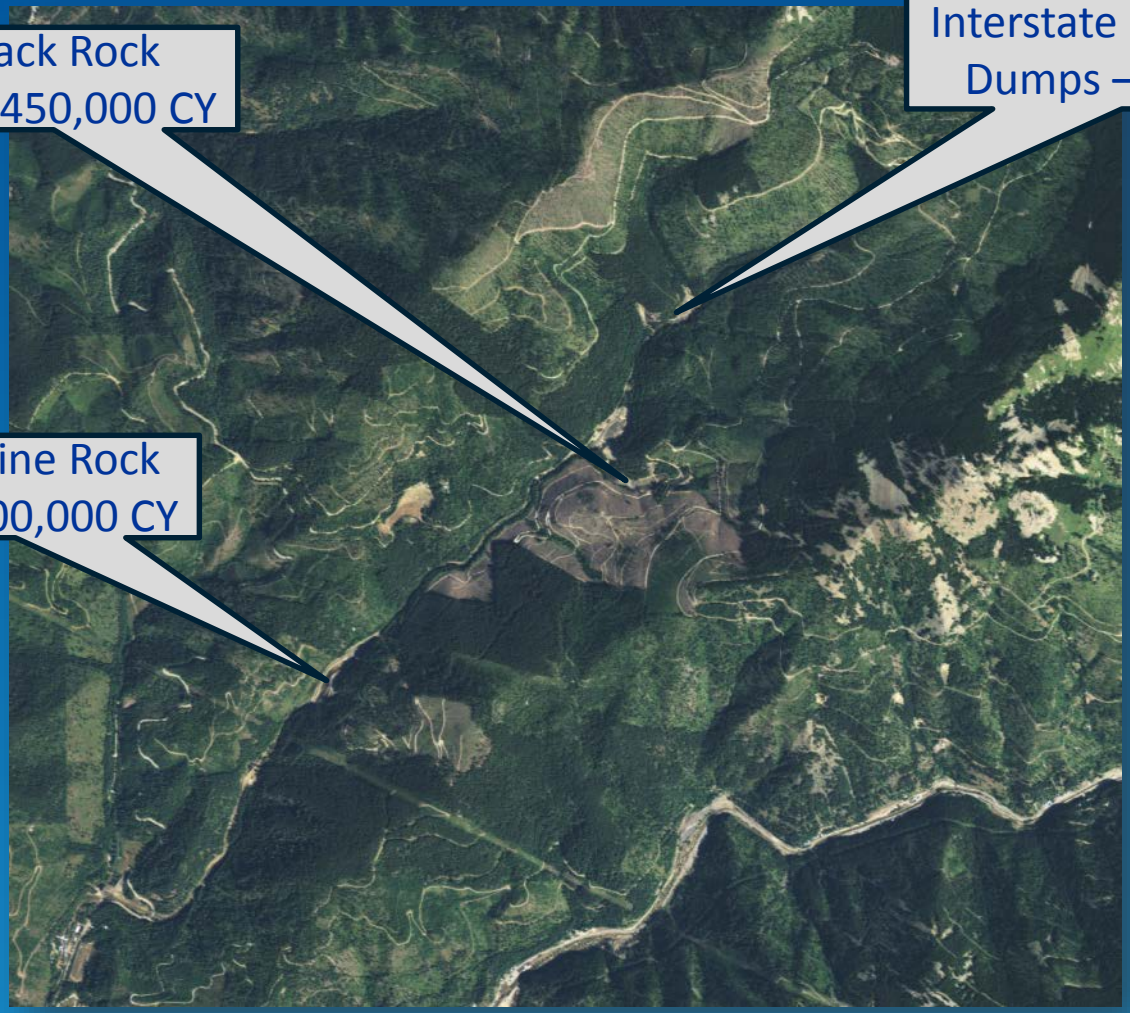
What is the problem?

- Waste rock and tailings deposited high in the Coeur d'Alene Basin are the source of heavy metals (i.e., lead and zinc) contamination

Solution

- Remove the mine waste from its present location and place "high and dry"
- Start at the top of the basins and work down

East Fork Ninemile Creek Mine Waste



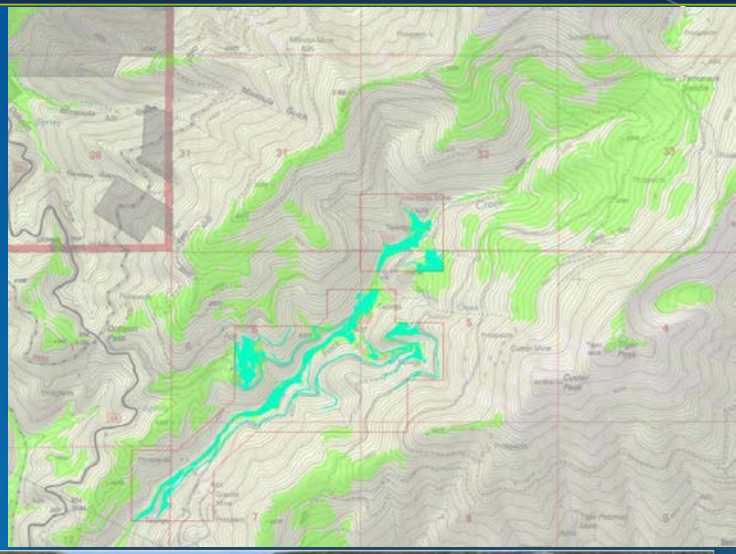
Where Does It Go?

Waste consolidation area location selection criteria:

- Close to remediation sites
- Large enough area to contain 1M to 3M CY mine waste
- Existing access roads present
- Potential clean soil and/or rock borrow source
- Free of complex land ownership issues
- Relatively flat
  - Waste will be stacked at 3:1 or flatter

Site Selection Tools

- ESRI ArcGIS Slope Analysis
- Google Earth
- Site Visit!



View From Tamarack

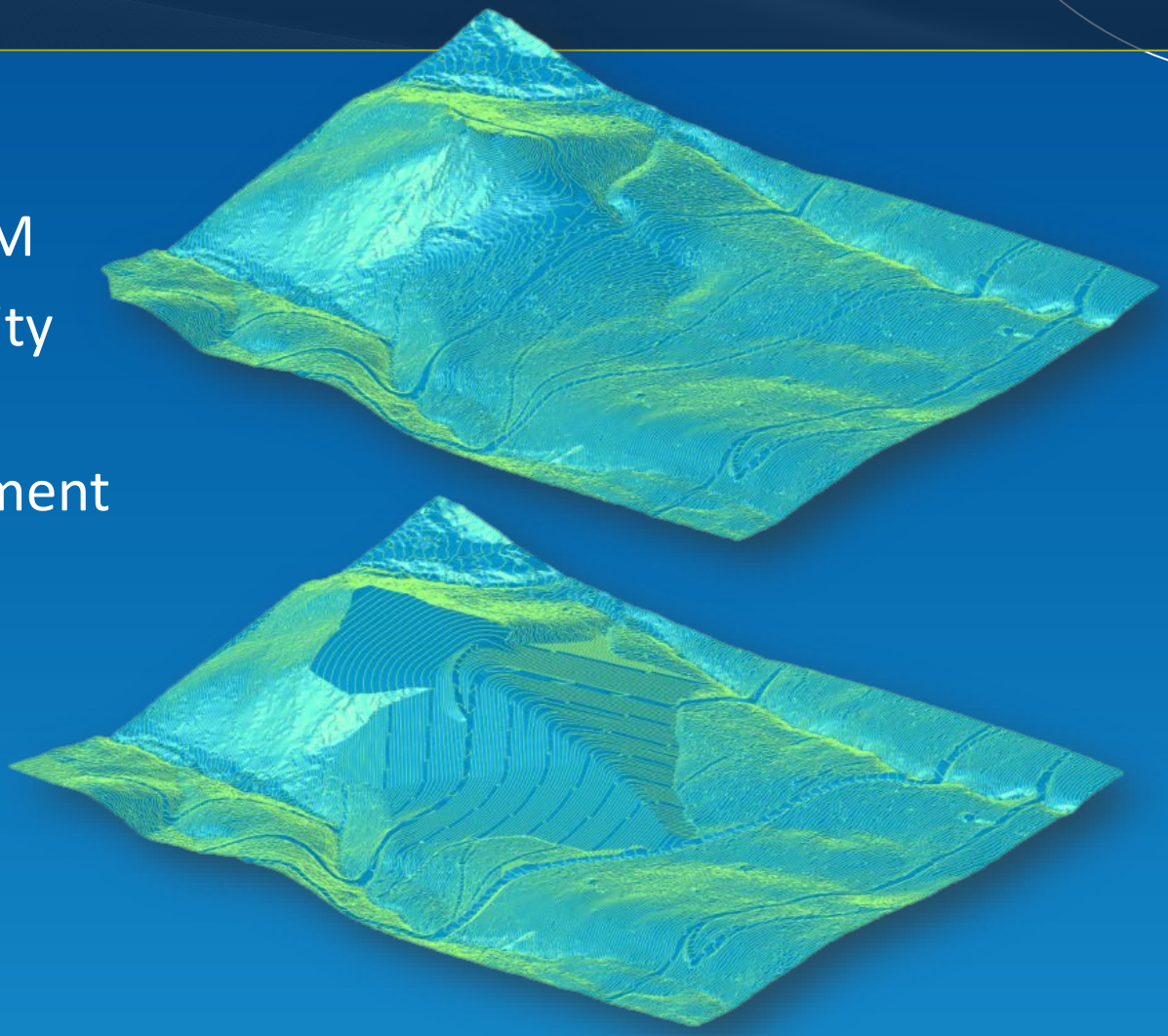
Review Site Selection Criteria

- Waste consolidation area location selection criteria:
  - ✓ Close to remediation sites
  - ✓ Free of complex land ownership issues
  - ✓ Existing access roads present
  - ✓ Relatively flat
    - Waste will be stacked at 3:1 or flatter
  - ✓ Potential clean soil and/or rock borrow source
  - – **Large enough area to contain 1M to 3M CY mine waste**

EFNM Waste Consolidation Area

Design Criteria:

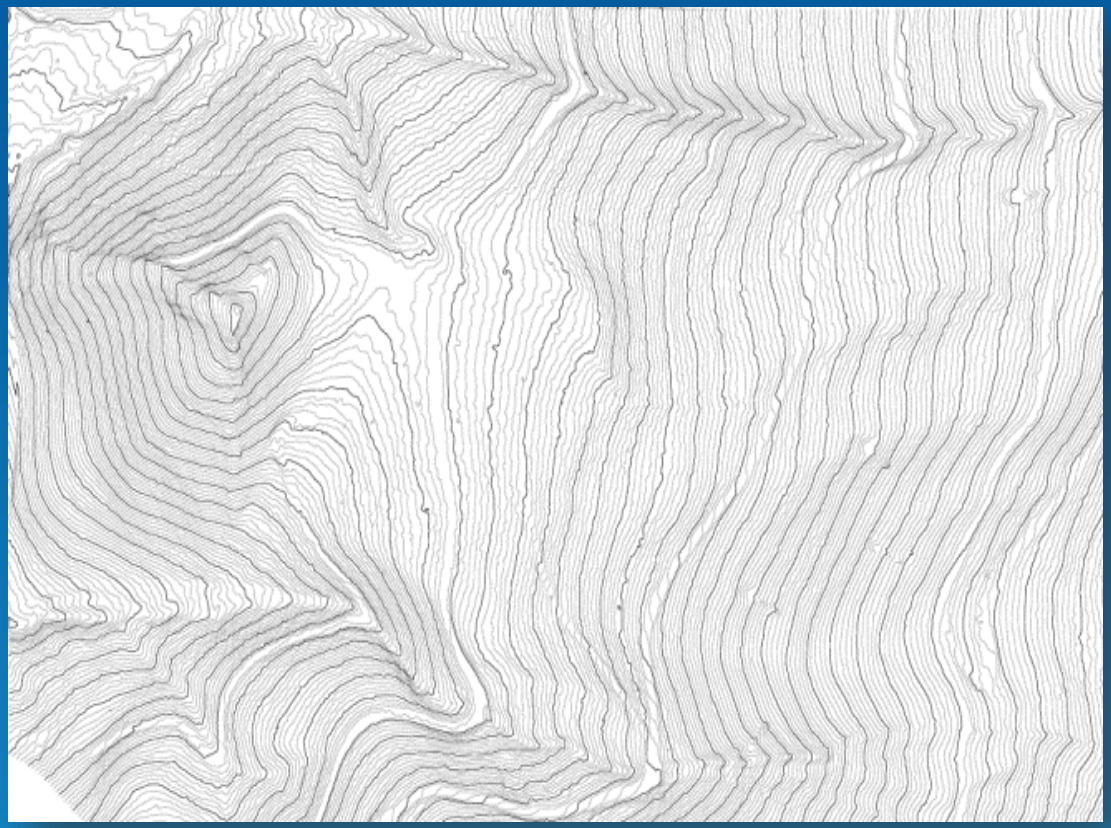
- Capacity – 1.5M to 3M
- Maximize site flexibility
- Minimize impacts to surrounding environment
- Integrate rock and soil borrow needs
- Utilize existing roads
- Manage storm-water run-on



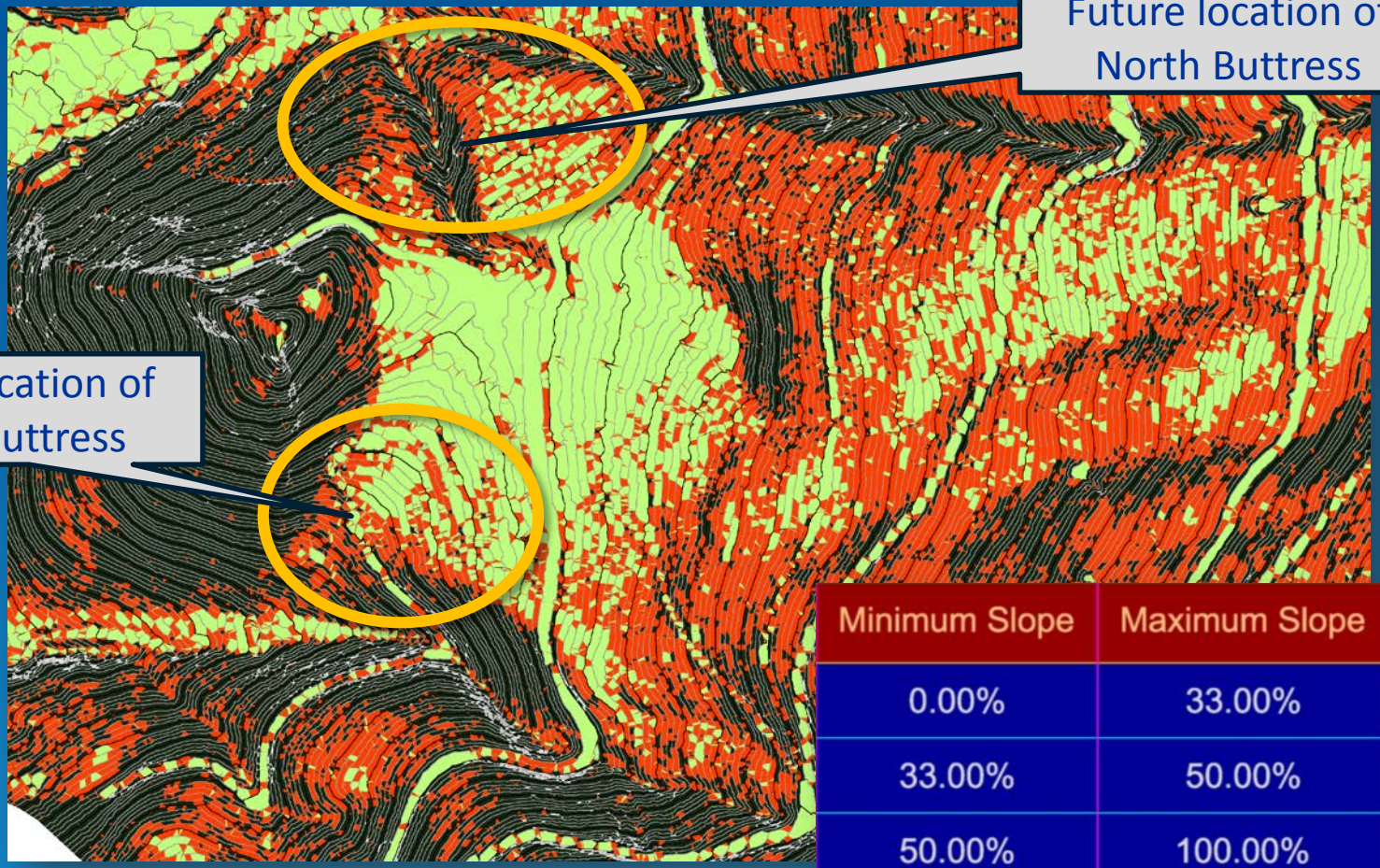
EFNM Waste Consolidation Area

Existing Conditions Evaluation:

- Access / property
  - One owner
- Rock
  - Need Up To 400K CY
- Soil Borrow
  - Need Up To 175K CY
- Flat area large enough for WCA base



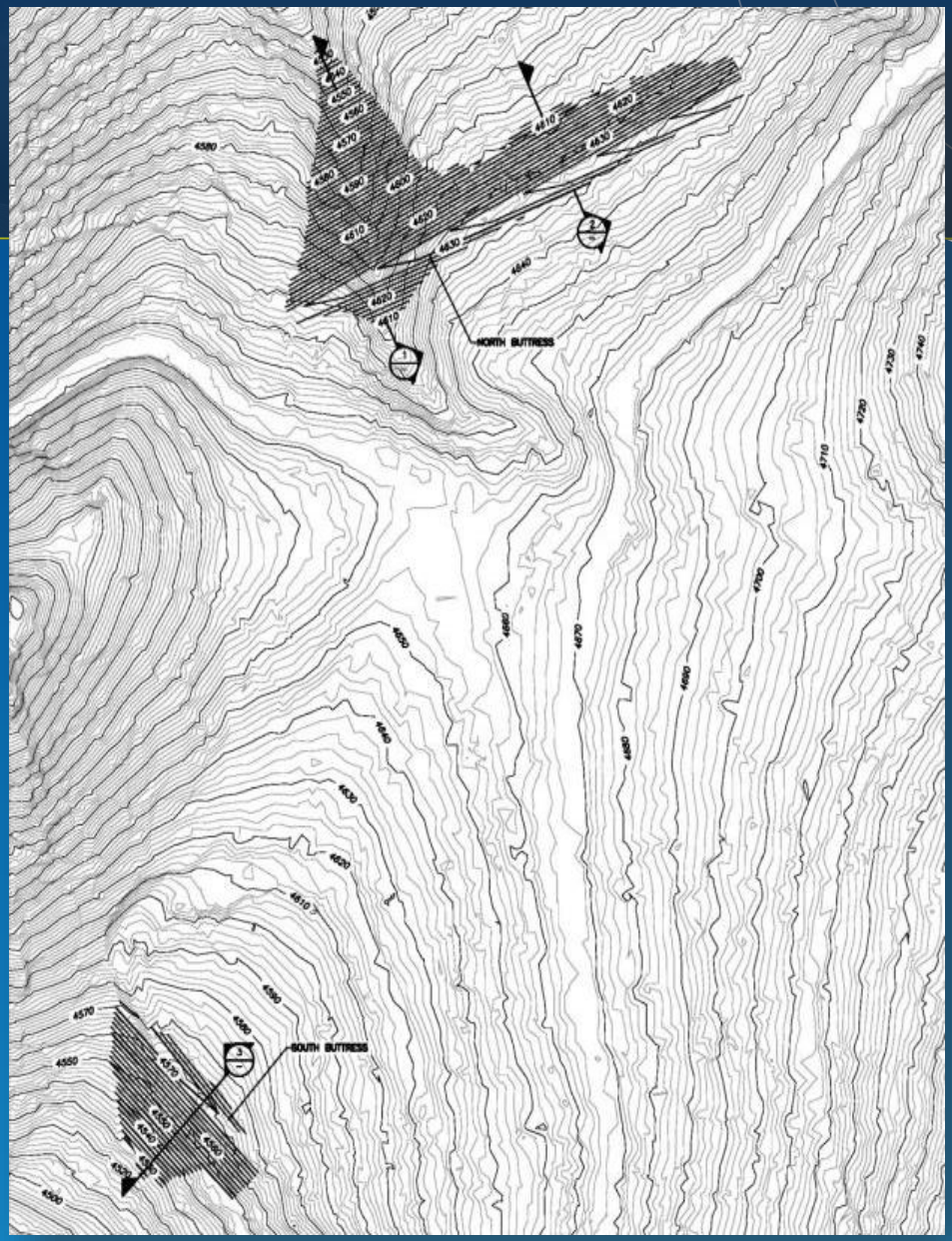
Existing Conditions Slope Analysis – CIVIL 3D



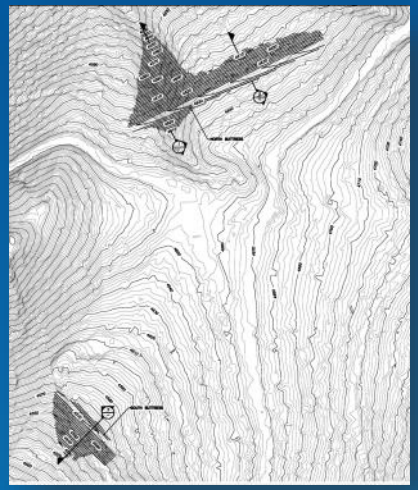
Minimum Slope	Maximum Slope	Color
0.00%	33.00%	
33.00%	50.00%	
50.00%	100.00%	

Maximizing Buttress Efficiency

- North Buttress
- South Buttress
  - Many different size variations
  - What is the best size?
- Geotechnical considerations
  - Buttress slopes 2H:1V → flexible buttress rock fill
- Trial and Evaluate

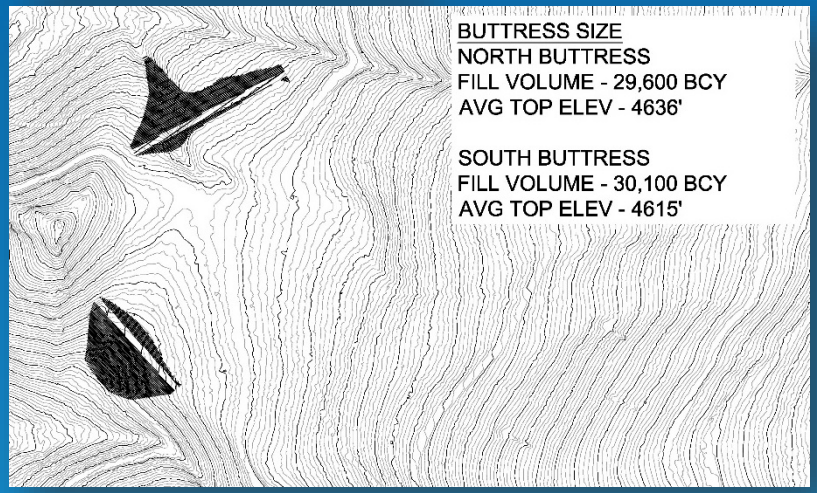


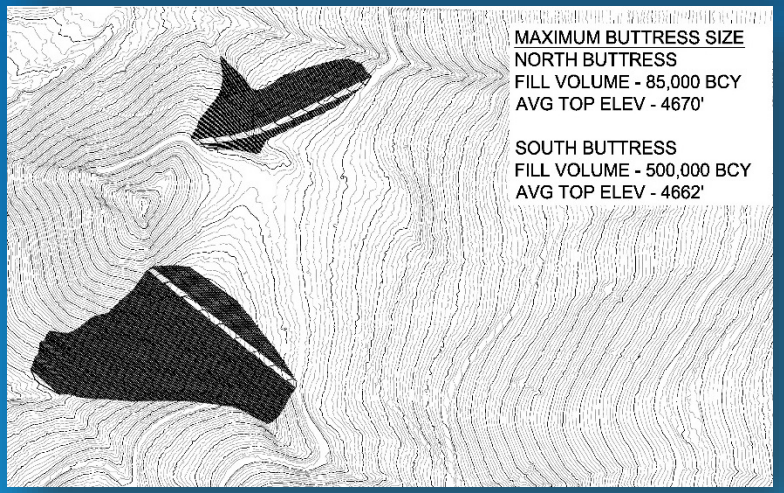
Buttress Sizing – Trial and Evaluate



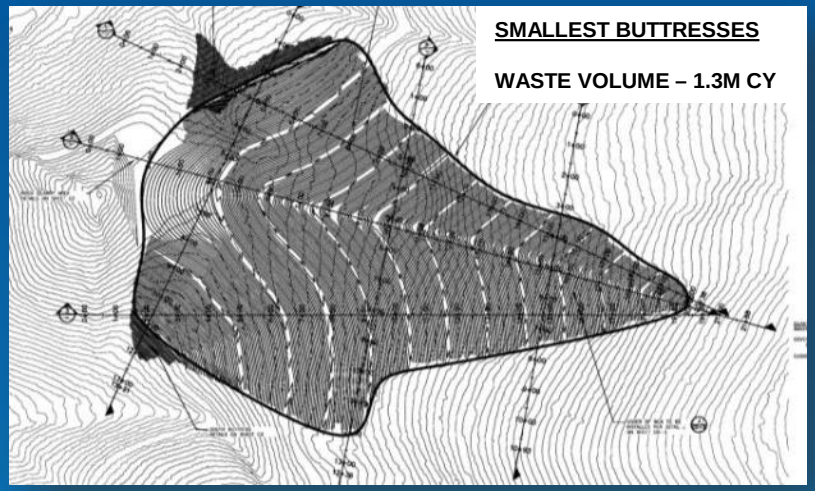
BUTTRESS SIZE
NORTH BUTTRESS
FILL VOLUME – 18,500 CY
AVG TOP ELEV – 4,628’

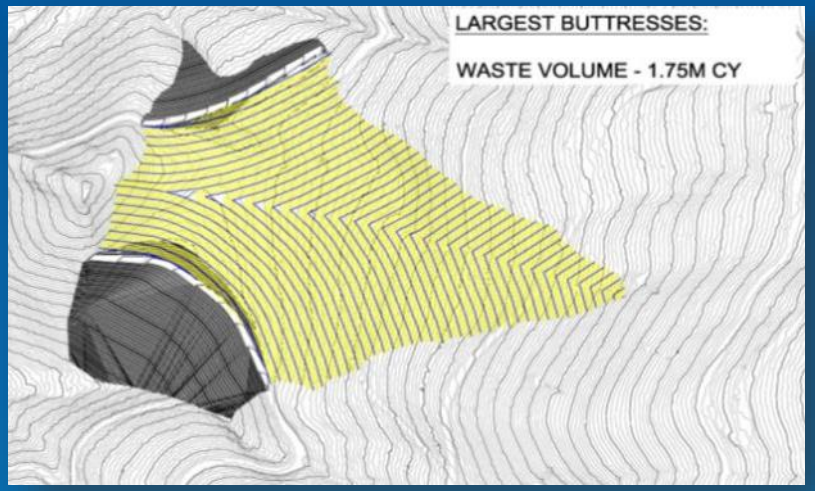
SOUTH BUTTRESS
FILL VOLUME – 2,500 CY
AVG TOP ELEV – 4,570’

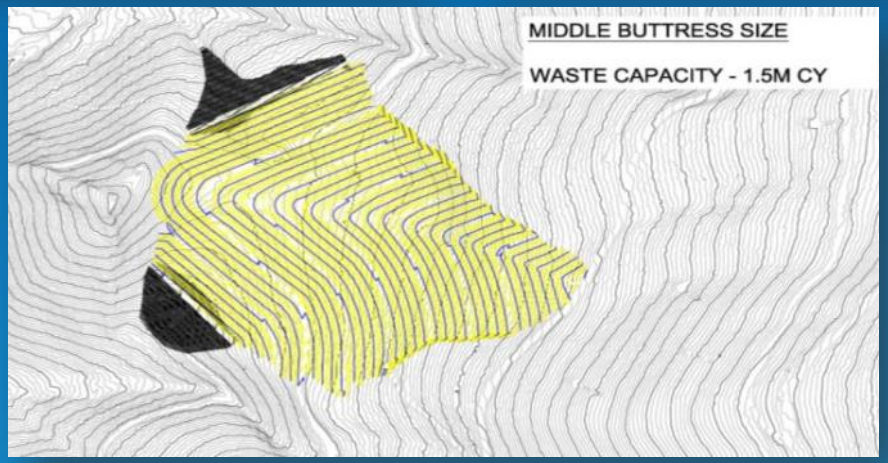




Buttress Size vs. Waste Capacity Trial



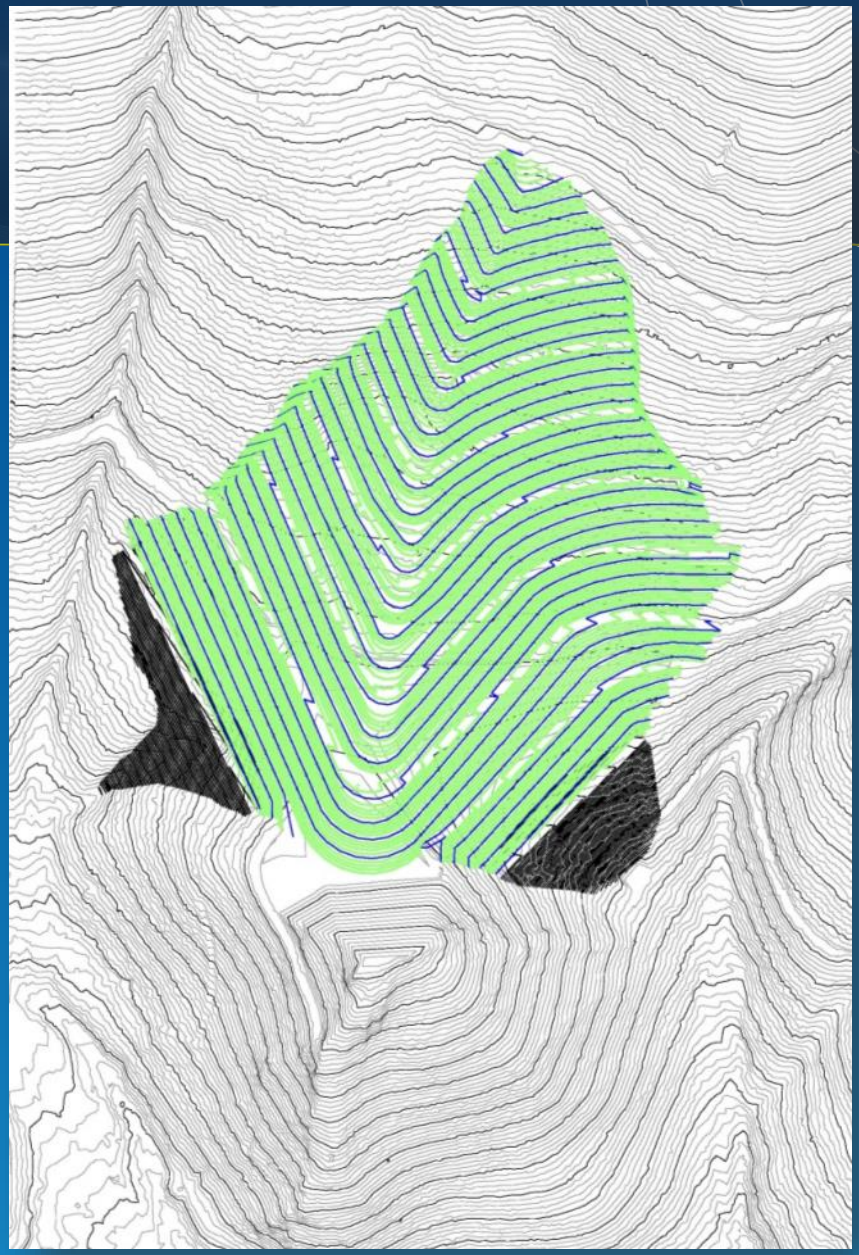




EFNM WCA Final Configuration

Design Information

- Buttress
  - Each Buttress ~35K CY after topsoil stripping
- Rock / soil borrow
  - 400K CY of rock or more
  - Expandable and almost entirely outside of the WCA footprint
  - Soil Borrow 250K CY or more
- Capacity
  - 1.5M CY
  - Expansion to ~2M possible



Why is this important?

Other Potential WCAs

- Max Capacity
  - 300K - 1.05M CY
- Surface Area
  - 9 - 24 Acres
- Average Depth
  - 21 FT
- Design Slopes
  - 1.5(H):1(V)
- Est. Min. Cost
  - $28.40 / CY

EFNM WCA

- Capacity – 1.5M CY
  - Expandable to 2M CY
- Surface Area
  - 24 Acres
- Average Depth
  - 39 FT
- Design Slopes
  - 3(H):1(V)
- Estimate Cost
  - $17.12 / CY
- **WASTE PLACEMENT SAVINGS**
  - **$17 M**
- **ROCK / SOIL BORROW SAVINGS**
  - **$8 M**

EFNM WCA Construction

Initial Construction Activities

- Construction Season in Upper Basin
  - Very Short Season
  - Mid-May → Mid-November
- NWCS Began Mobilization July 8, 2013
  - Late Start
  - Nesting Birds
  - Final Approvals

Soil Salvage Plan

- Soil Salvage
  - Planned to stockpile 100K CY
  - Up to 5 feet of Topsoil
  - Usable subsoil from 5 to 15 feet
  - Mostly decomposed bedrock beyond 15 feet
  - Screen 6-inch plus
    - Use screened as rock product

Quarry Plan

- Rock Products Needed
  - ~70K CY Buttress Rock
  - ~25K CY 1” - 3” Drainage Rock
  - ~25K CY 1” Minus
  - ~5K CY Misc. Riprap
    - up to 36-inch diameter

North and South Buttress Plan

- Buttress Construction
  - Remove topsoil
  - Bench / Toe Drainage System
  - Buttress Rock Fill
    - 3” to 12” or 6” to 24” Rock
    - 2 or 3-Foot Lifts
    - 5-Passes w/ Vibratory Roller
  - North Buttress
    - ~35K CY
  - South Buttress
    - ~35K CY

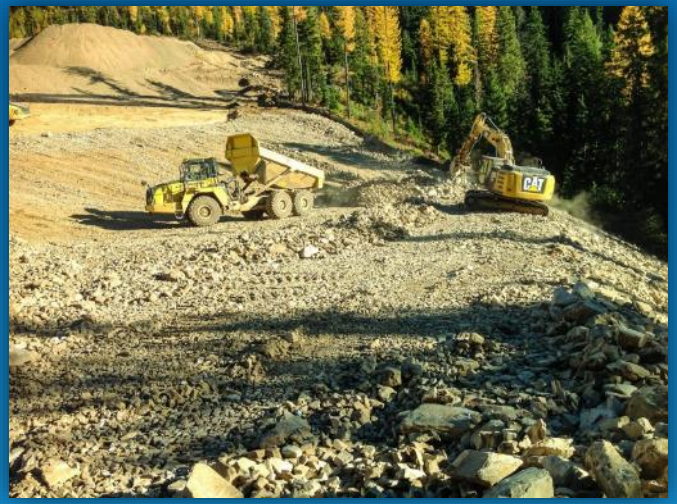
North Buttress (as constructed)

- Final Volume ~34K
- Toe Bench / Drain Installed
  - Dry
- Very Steep Terrain
  - Difficult To Get Rock To Toe
- Topsoil Salvage Very Difficult
  - Removed Majority
  - Very Rocky

Photo Provided By Alan Davis – Maul Foster and Alongi

South Buttress (as constructed)

- Final Volume ~44K
  - ~22K in 2013
  - Did Not Complete in 2013
- Toe Bench / Drain Installed
  - Very Wet / Natural Spring At Toe
  - Difficult To Prepare
  - Difficult To Define Toe



South Buttress (as constructed)

- South Buttress Toe Drain

Base Drainage System Plan

- Remove Topsoil / Subsoil
- Prepare Foundation
- Install Secondary Drainage Pipe Trench
- Place Geotextile
- 2 Feet of 1” to 3” Drainage Rock
- Place Geotextile

Initial Development Completed in 2014

- Remobilization Costs
- Perimeter Drainage Ditches
- South Buttress
- Soil Salvage
- Interstate Callahan Waste Consolidation Begins

Interstate Callahan Waste Placement Plan

- 220K BCY Waste At the Interstate Callahan
- 120K BCY Planned For 2014
- Utilized Waste Transfer Area Until Initial Development Complete

Interstate Callahan Waste Placement (End of 2014)

- Approximately 159K BCY Hauled to WCA
- Final Volume of Waste in WCA is ~119K BCY
  - Compaction / Shrinkage Calculated at 25.2%
- Top of Waste Graded To Drain 1% to 2% Grade
- Temporary Cover Placement
- Winterization

Interstate Callahan Waste Placement (End of 2015)

- Total Waste 216K BCY – 57K BCY in 2015
- Final Volume of Waste in WCA is ~164K BCY
  - Compaction / Shrinkage Calculated at ~24%
- Top of Waste Graded To Drain >5%
- Temporary Cover Placement and Winterization

Waste vs. Waste

Lessons Learned

- Don’t Trade June For November In The Upper Basin
  - Get Designs Approved Early
  - Can’t Do Much About Nesting Birds But Wait
- LiDAR
  - Expect Volume Variation May Be Significant
  - Truth Check LiDAR Or Survey After Clearing And Grubbing
- Waste Compaction
  - Compaction / Shrinkage Hard to Estimate
  - Lots of Variation (i.e., grain size, debris, moisture content)
  - Time and Materials for Waste Placement and Compaction
- Temporary Cover Design
  - >5% Final Grades Encourages Runoff

Questions?

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