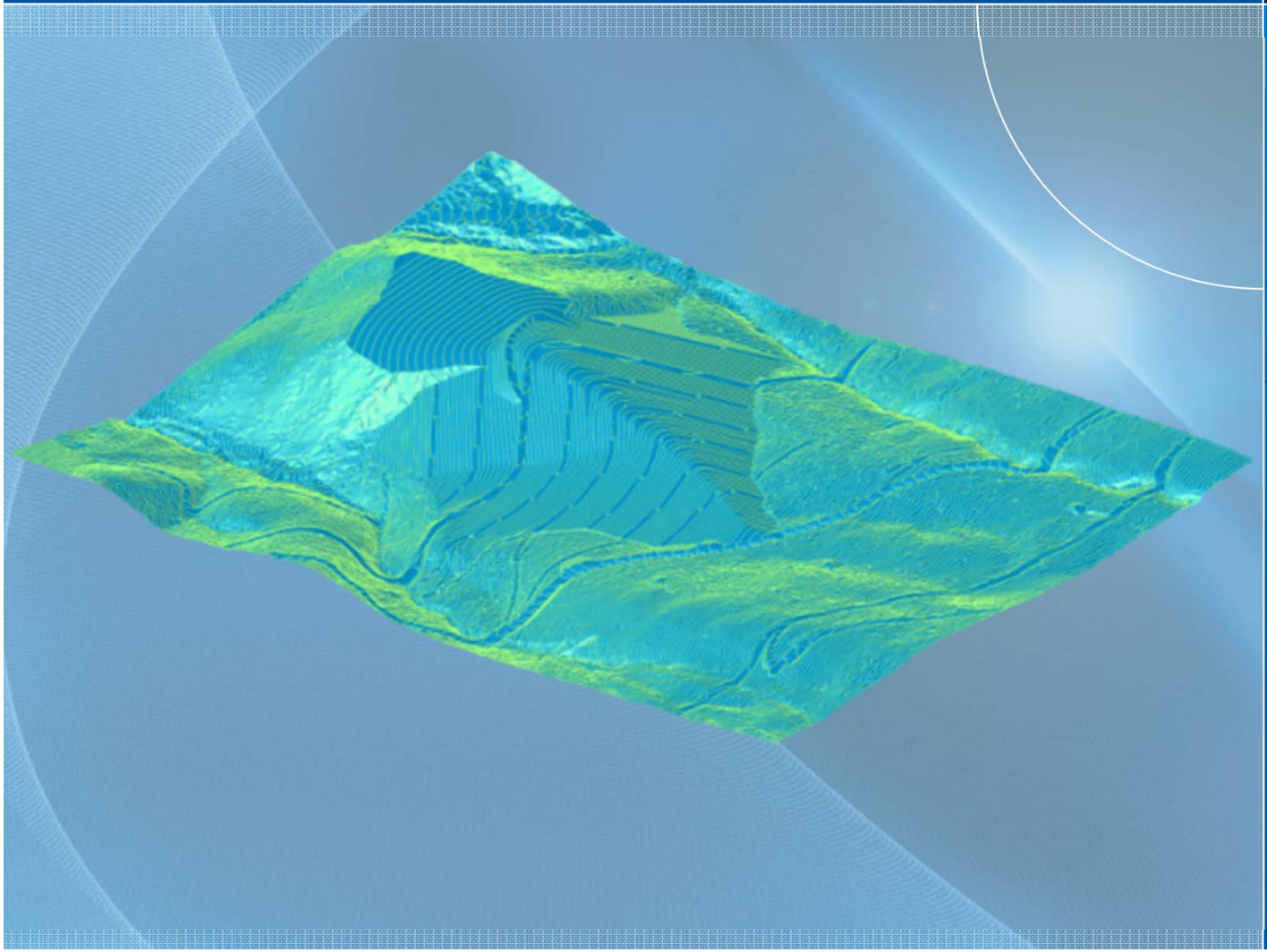
Location Evaluation and Maximizing Flexibility of a Waste Consolidation Area



Cody J. Lechleitner, P.E.

April, 2014

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

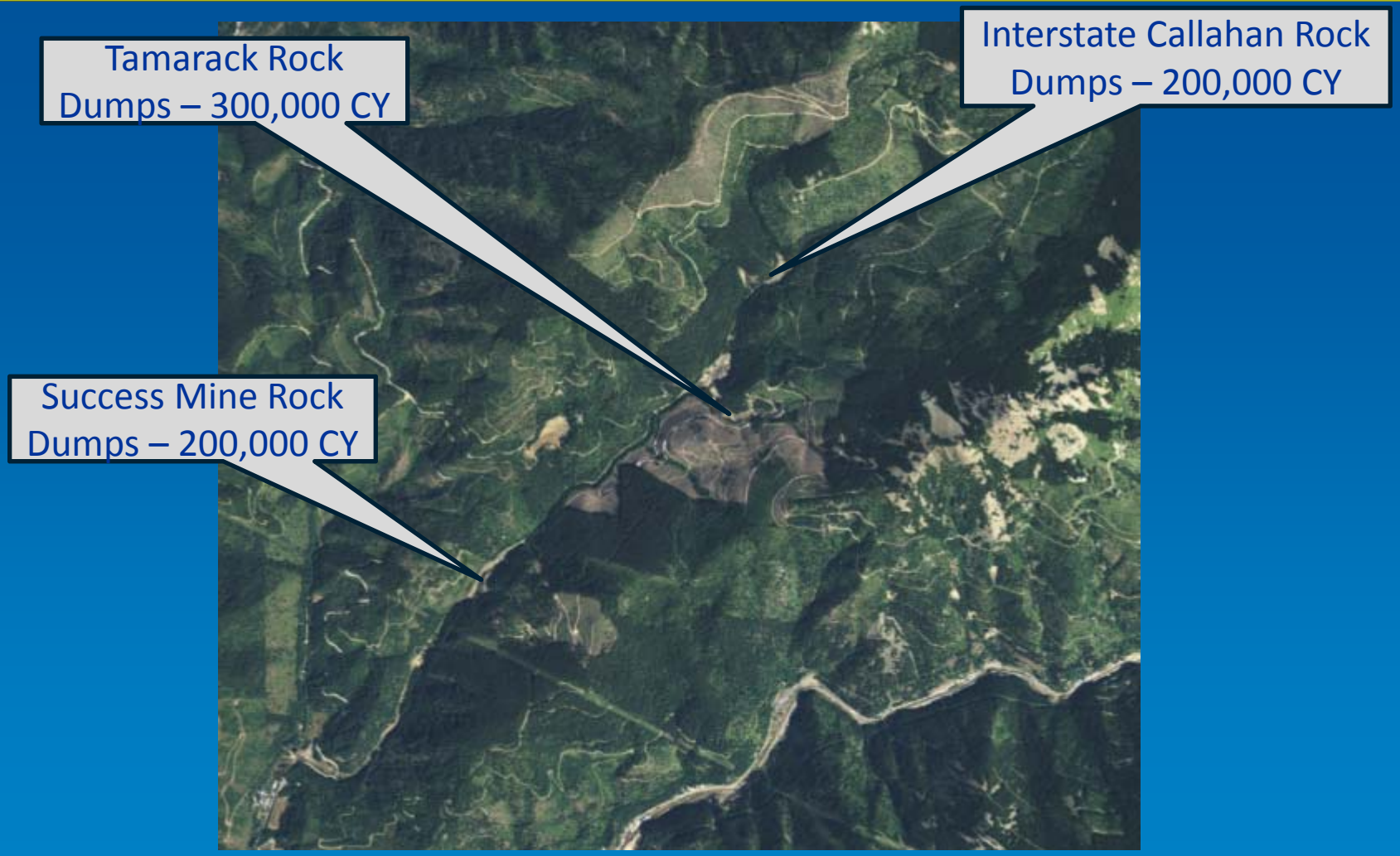
What is the problem?

- 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

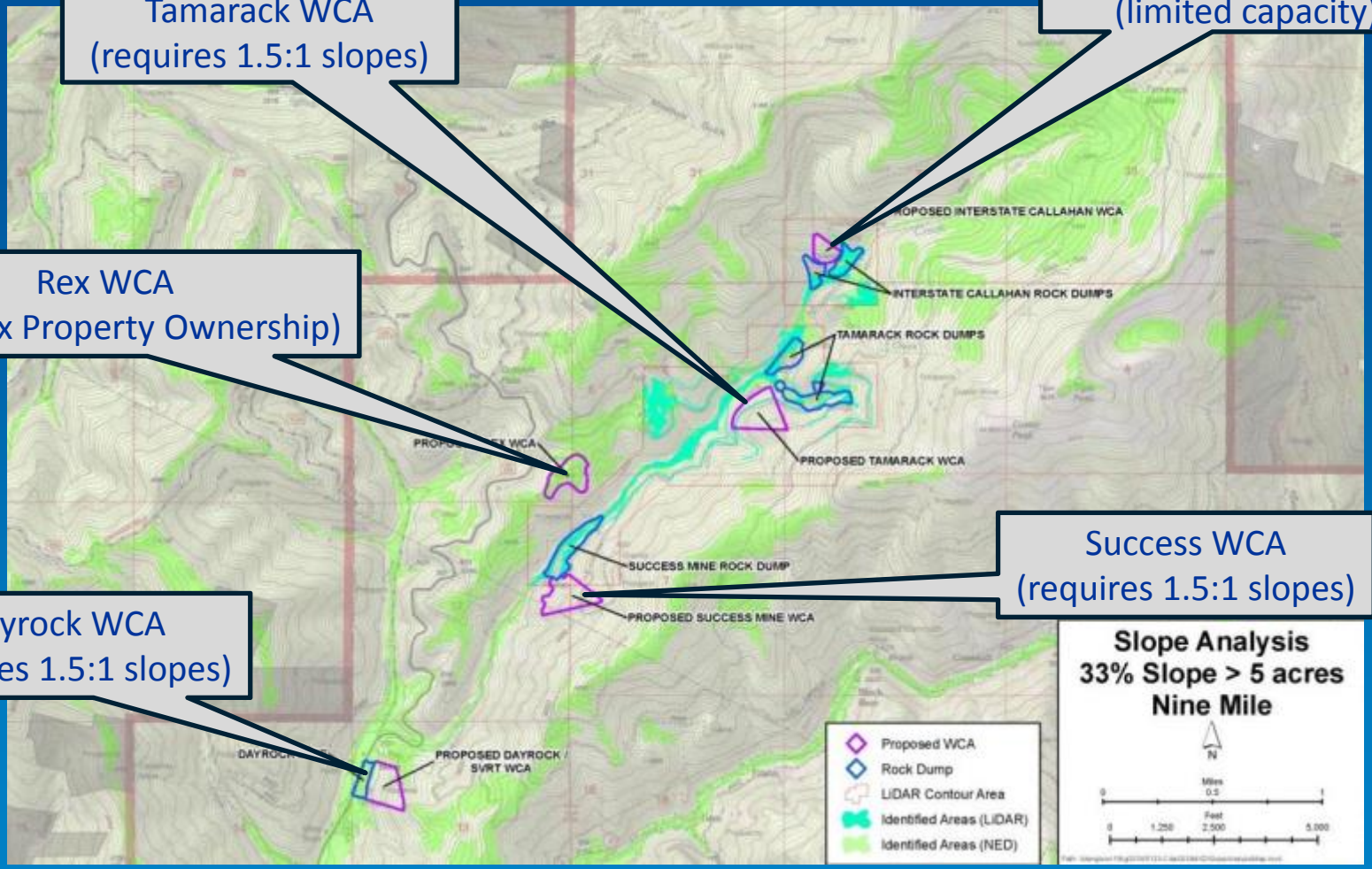


Where Does It Go?

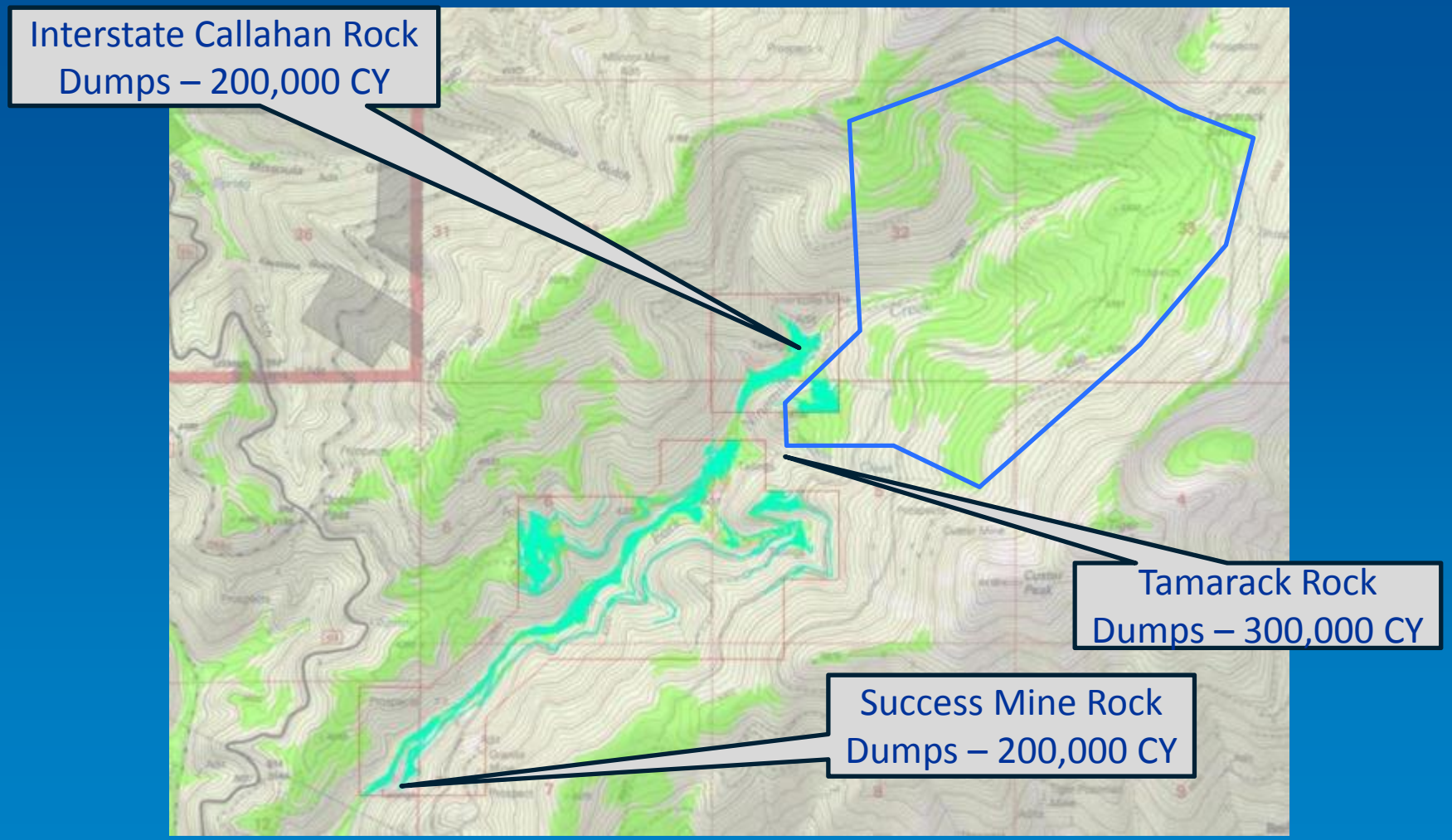
Waste consolidation area location selection criteria:

- 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

Initially Proposed Waste Consolidation Sites



ESRI ArcGIS Slope Analysis

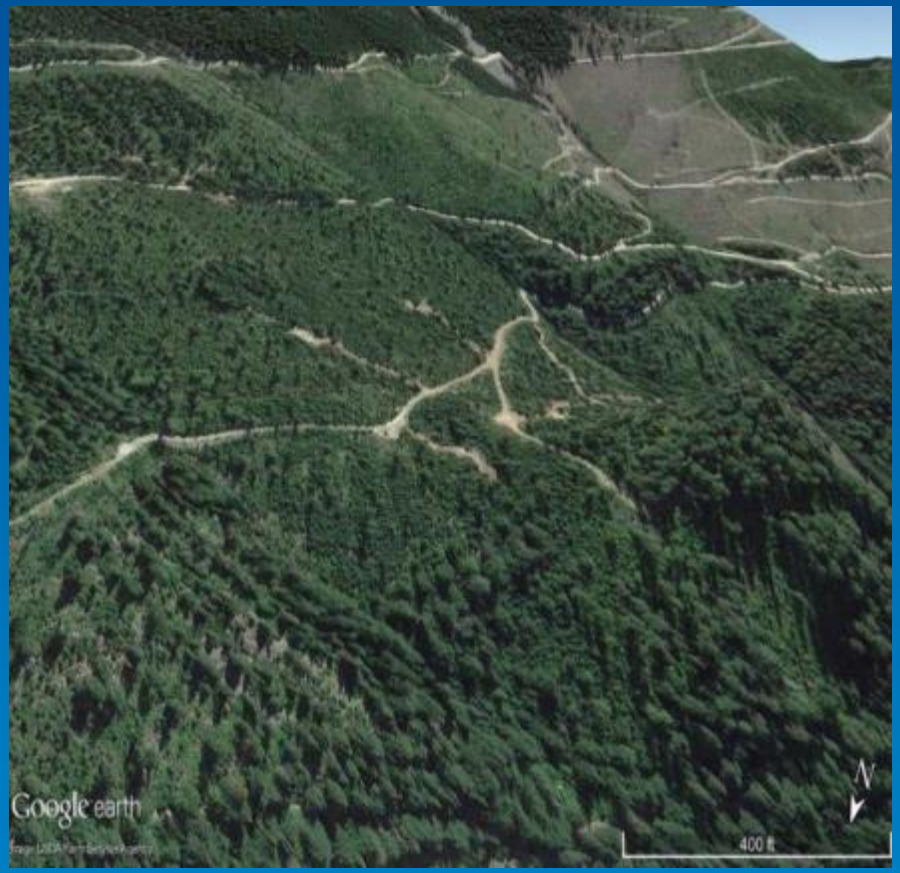


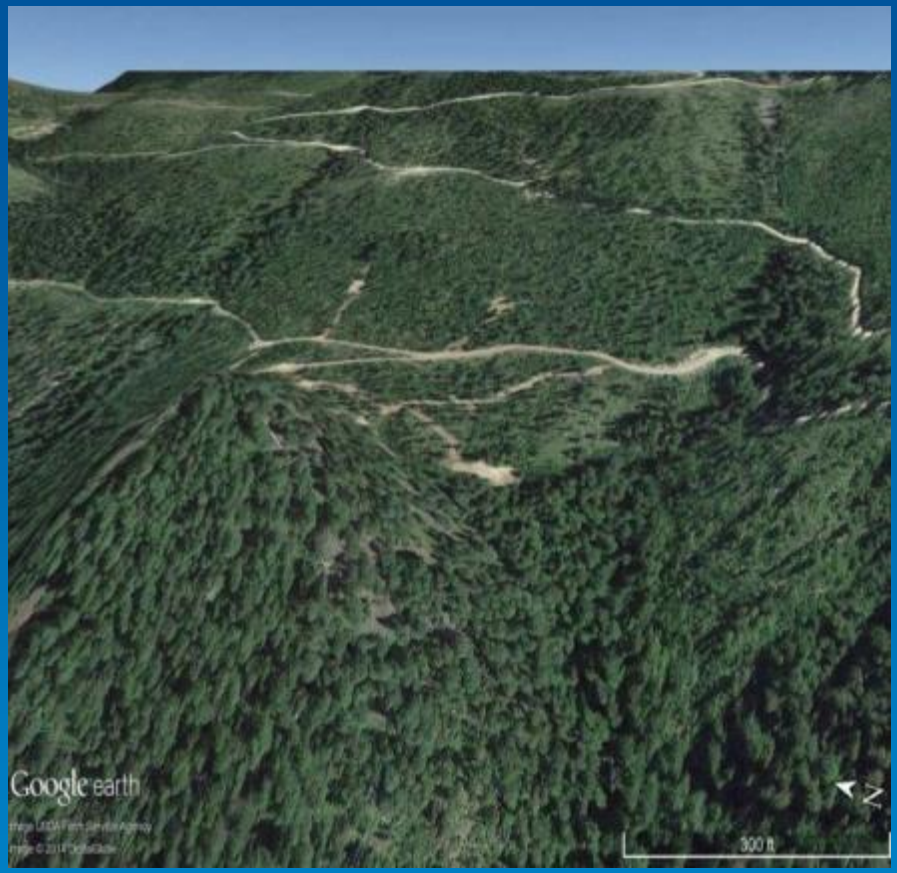
Google Earth

Nothing Beats a Site Visit!

View From Proposed Tamarack WCA

Potential Site Selected





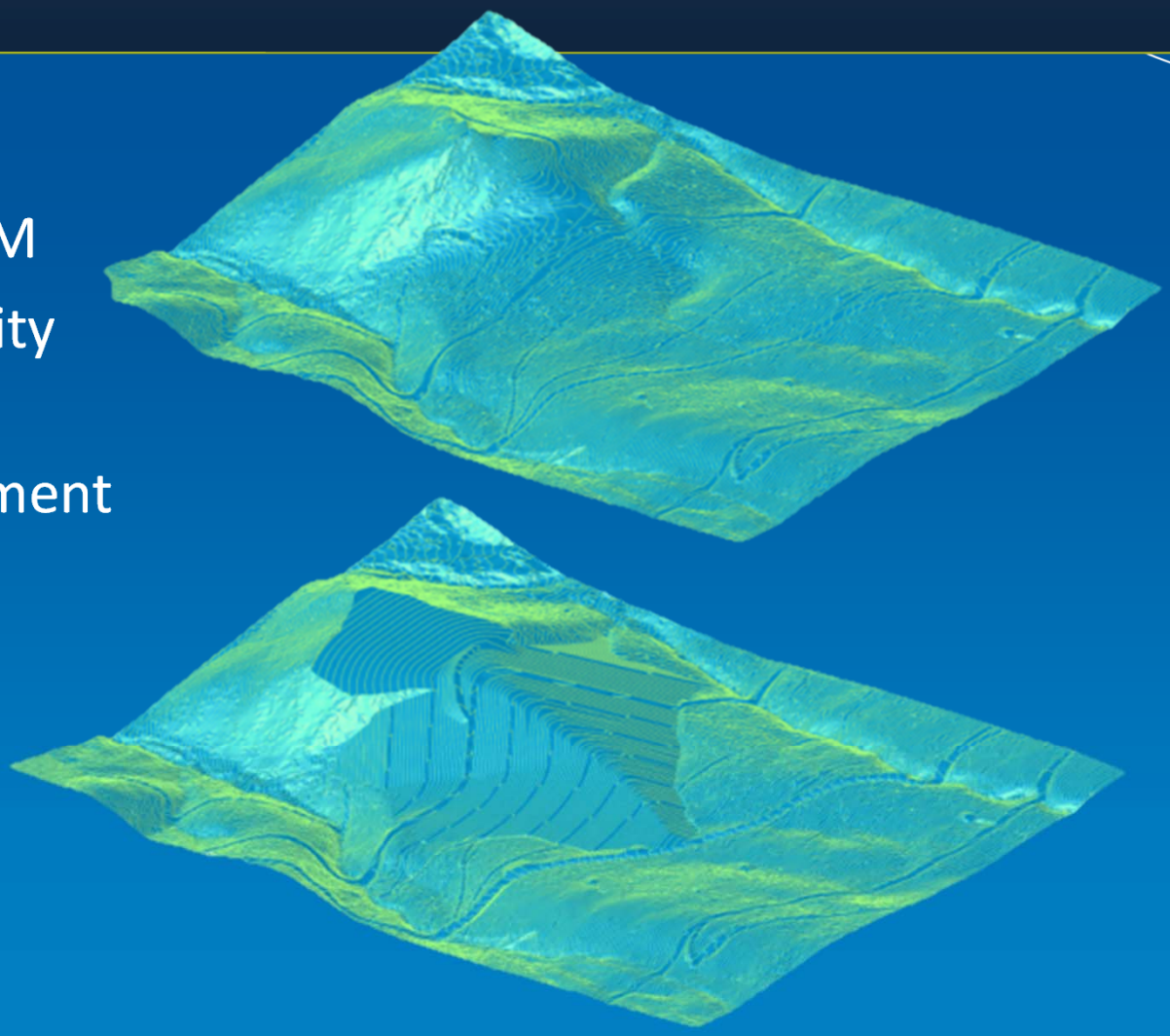
Review Site Selection Criteria

- 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:

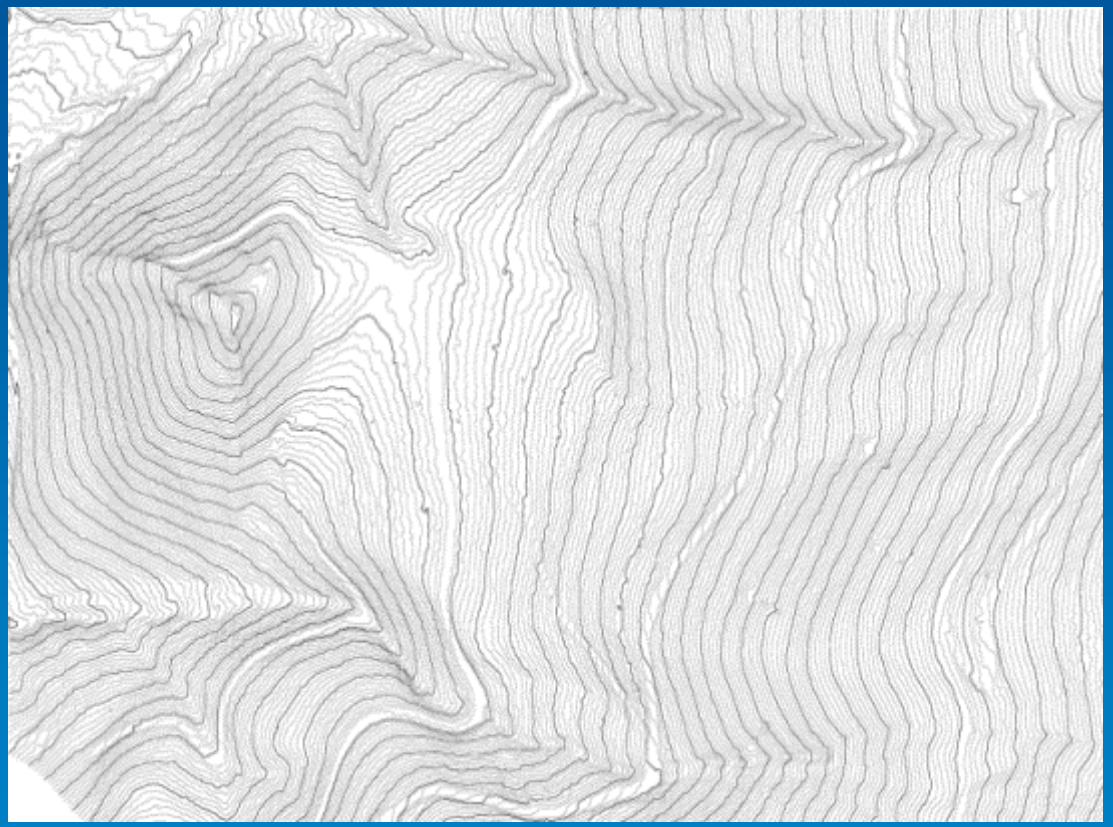
- Capacity – 1.5M to 3M
- Maximize site flexibility
- Minimize impacts to surrounding environment
- Integrate rock and soil borrow needs
- Utilize existing roads
- Manage storm-water run-on



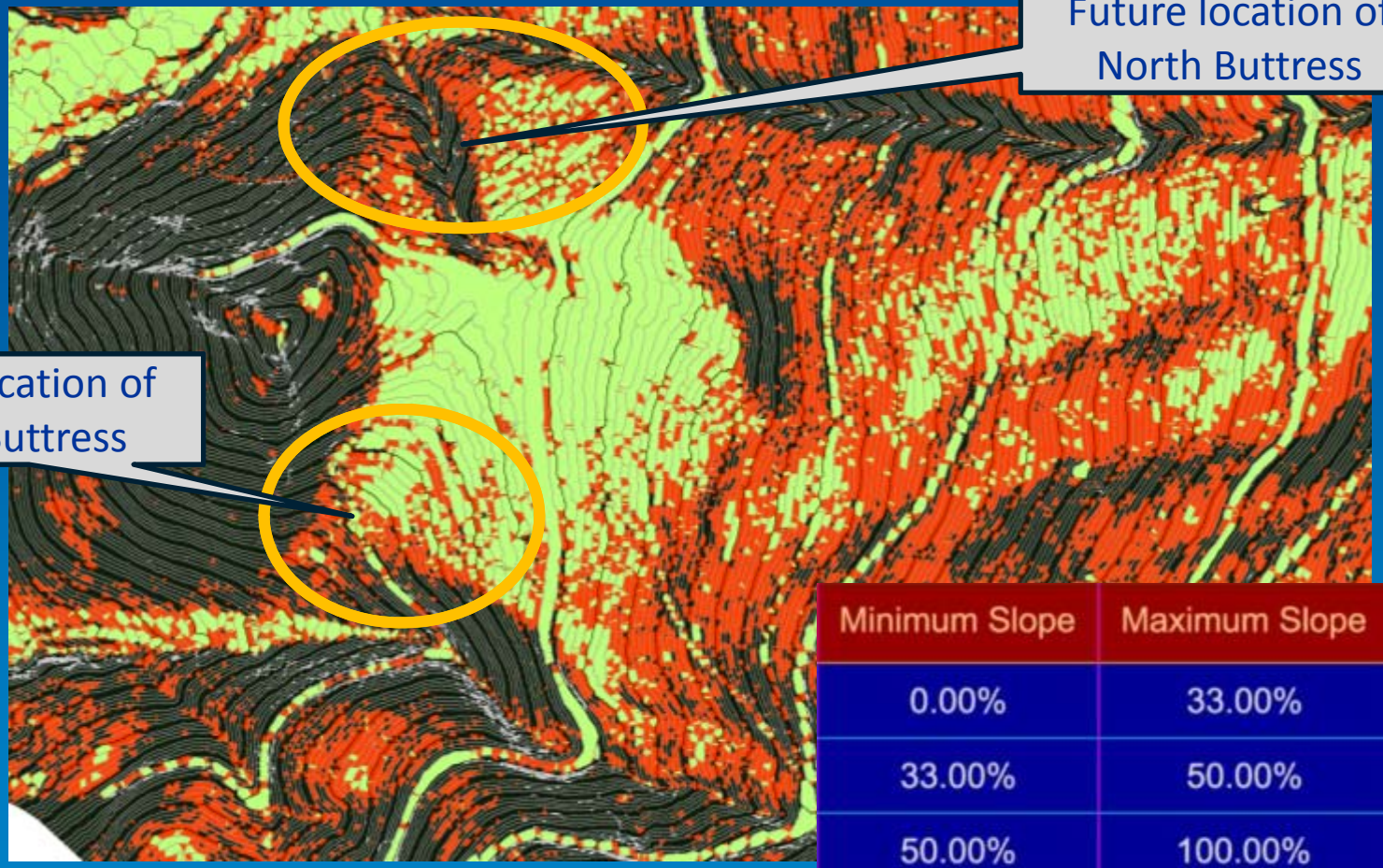
EFNM Waste Consolidation Area

Existing Conditions Evaluation:

- Access / property
  - One owner
- Rock source
  - 800K CY need over 10 years
- Soil borrow
  - 175K CY needed over 10 years
- Flat area large enough for WCA base
  - Slope analysis



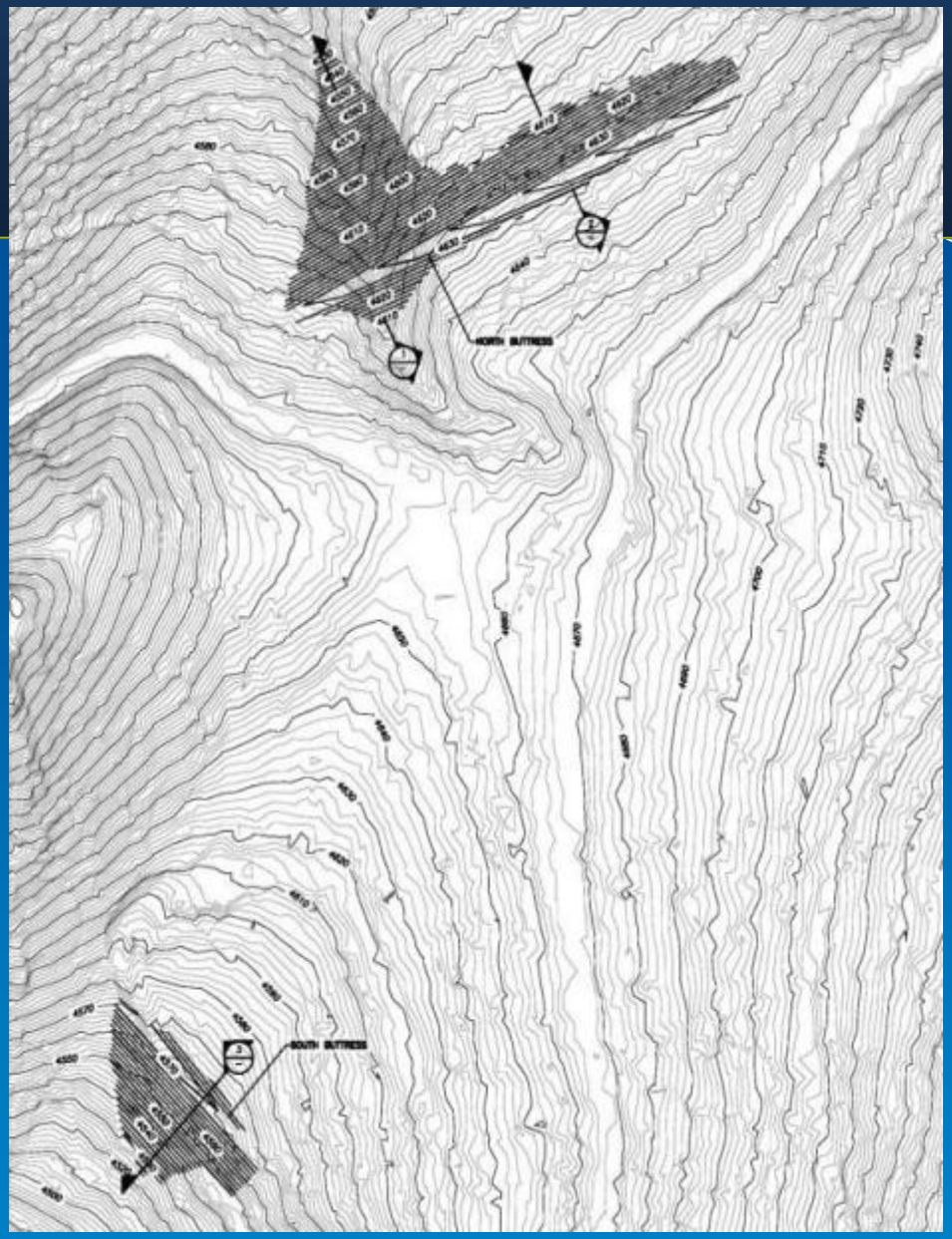
Existing Conditions Slope Analysis – CIVIL 3D



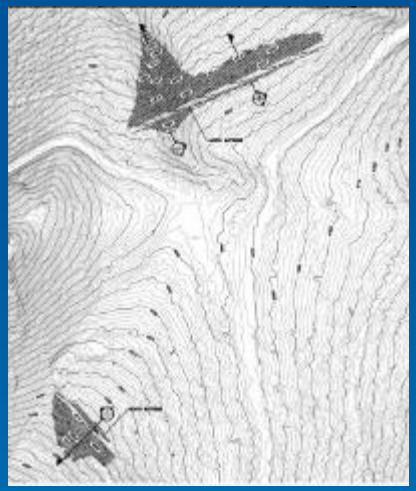
Minimum Slope	Maximum Slope	Color
0.00%	33.00%	
33.00%	50.00%	
50.00%	100.00%	

Maximizing Buttress Efficiency

- Trial and evaluate
- Start small and work up
- North buttress
  - Size mostly restricted by existing conditions
- South buttress
  - Many different size variations
  - What is the best size?
- Geotechnical considerations
  - Buttress slopes 2H:1V → flexible buttress rock fill

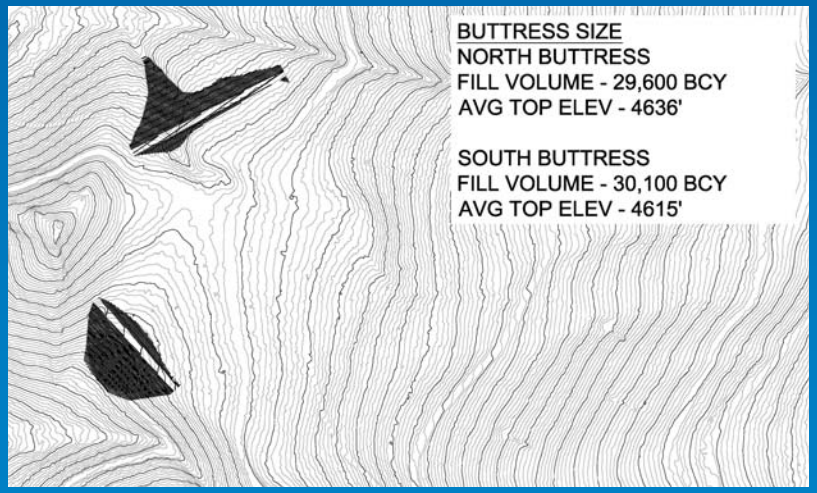


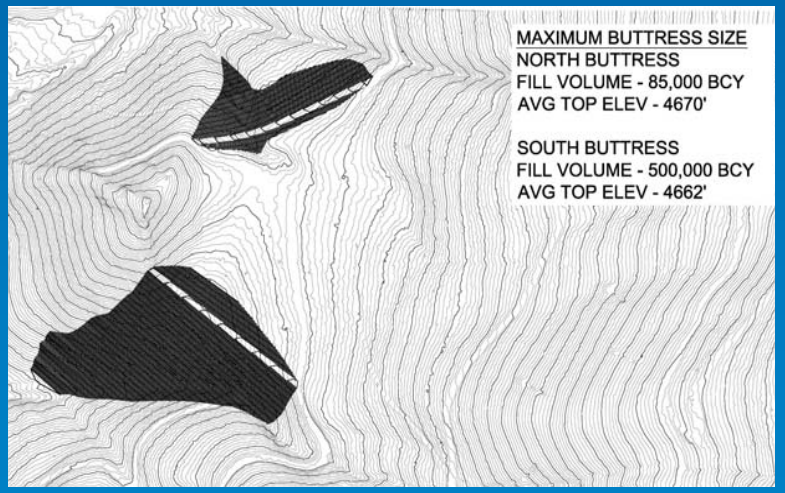
Buttress Sizing – Trial and Evaluate



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

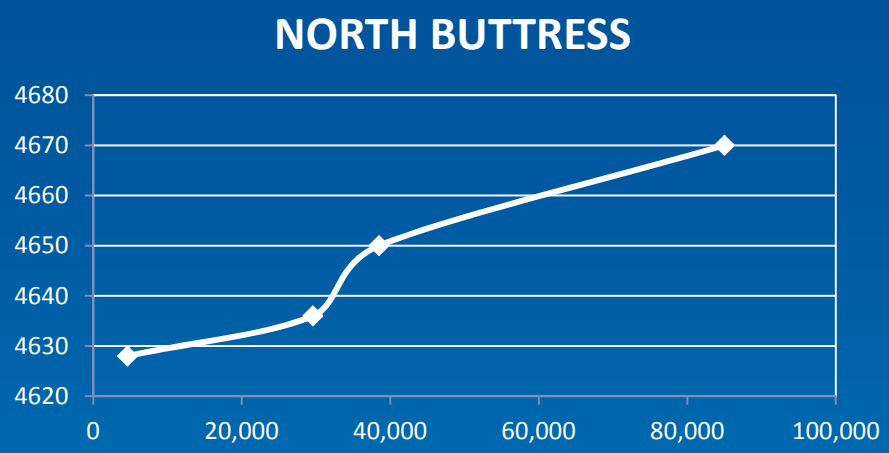
SOUTH BUTTRESS
FILL VOLUME – 2,500 CY
AVG TOP ELEV – 4,570’

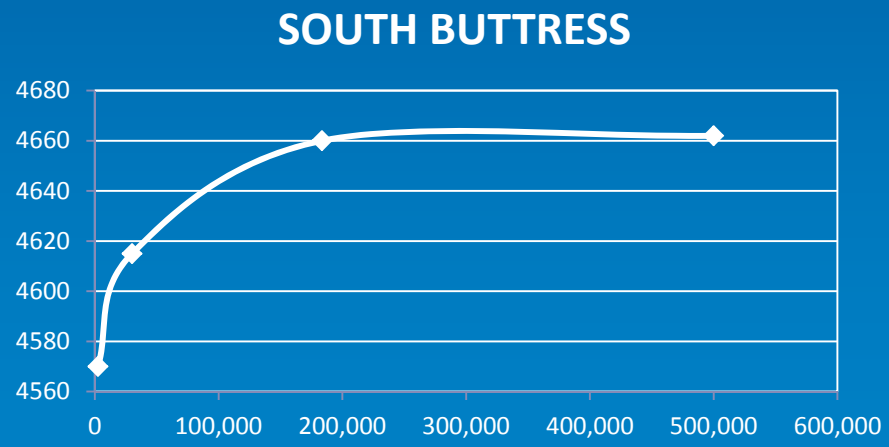




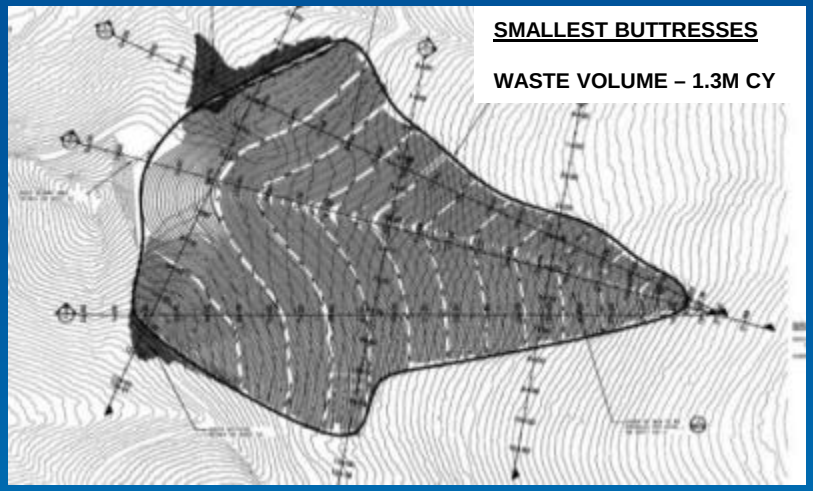
Buttress Sizing – Trial and Evaluate

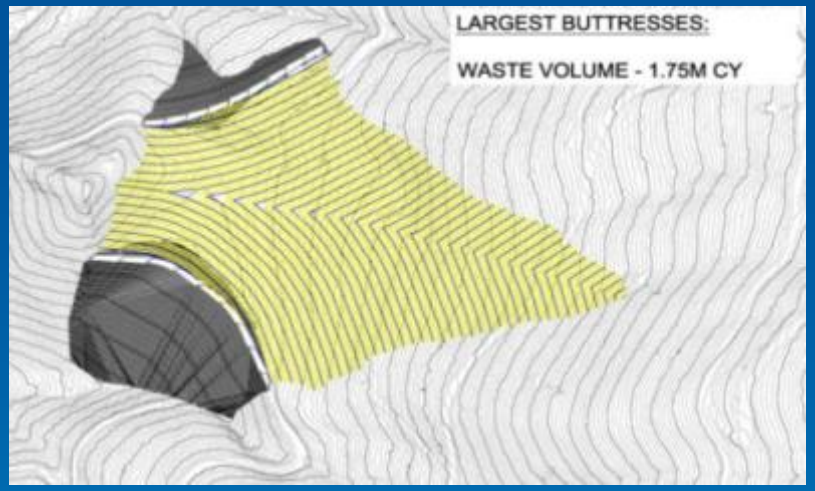
- Graph
  - Volume (x-axis) vs. top of buttress elevation (y-axis)
- North buttress
  - Not really enough data there to make a clear cut decision
  - Need more data about volume of waste storage capacity created
- South buttress
  - Very clear definition of maximum size

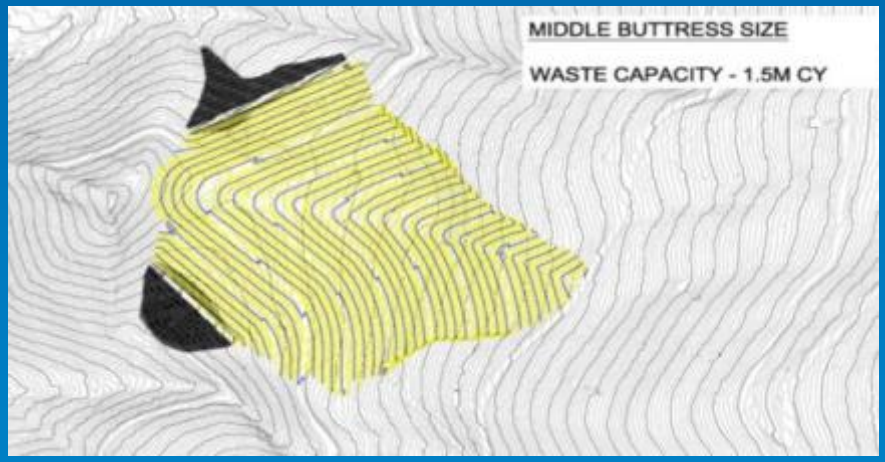




Buttress Size vs. Waste Capacity Trial

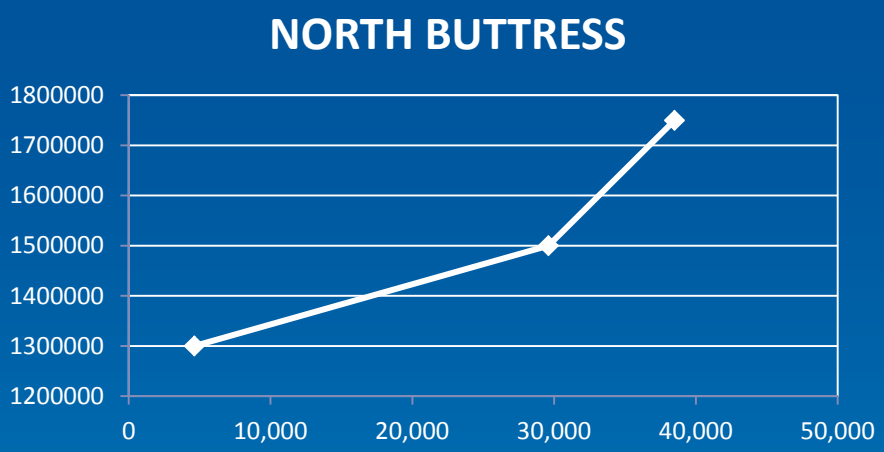


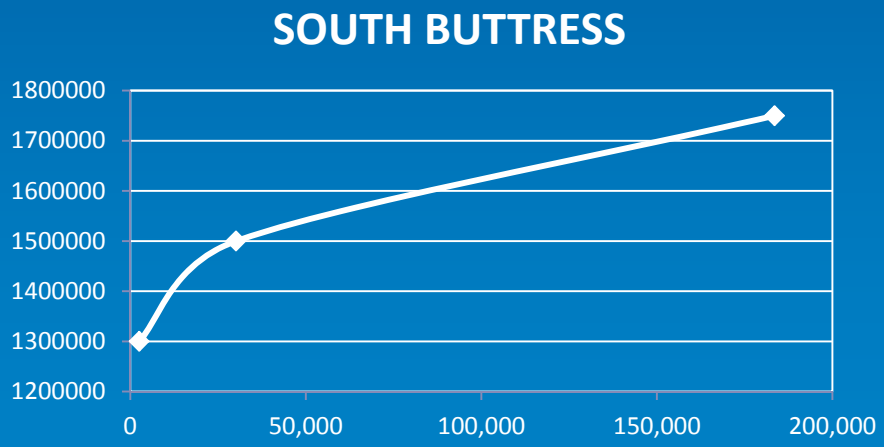




Buttress Size vs. Waste Capacity – Evaluate

- Graph
  - Buttress size (x-axis)
  - Waste capacity (y-axis)
- North buttress
  - The larger the better
- South buttress
  - Obviously the limiting factor
  - Cost benefit analysis
  - Pretty clear definition of beneficial size





EFNM WCA Final Configuration

Design Information

- 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?

Tamarack, IC, Success WCAs

- Max Capacity
  - 300K - 1.05M CY
- Surface Area
  - 9 - 24 Acres
- Average Depth
  - 21 FT
- 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
- Estimate Cost
  - $17.12 / CY
- **SAVINGS**
  - **$17 M**

Questions?

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