Reclamation Bond Optimization Using 3d-Dig Plus

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Introduction

Overview

- Reclamation Bond
- Wyoming Guideline 12
- Bond Challenges
- Simulation Software Benefits
- Case Study (2D CAD vs. Two 3D-Dig Options)

Reclamation Bond

- Requirement for Annual Report
- Reduces Liability to State
- Becoming Increasingly Important
- Large Capital Expense for Operations

Wyoming DEQ Guideline 12

Appendix F

Calculations for Moving Material with a Caterpillar D11R Dozer

These costs are for dozing only. Material requiring drilling and blasting should have an additional $0.259BCY added for D&B. If cast blasting will be used the D&B cost should be $0.400/BCY.

Material Movement by Dozing With D11R

1) Caterpillar D11R Dozer with U Blade		
2) Operating Costs	$457.68 per Hour	100% E-W
3) Labor Costs	$44.97 per Hour	WYDOT-WDD
4) Supervisor Labor Costs	$6.25 per Hour	1/8 of WYDOR-WDD
5) Supervisor Transportation	$3.35 per Hour	1/8 of 100% E-W
6) Total Hourly Costs	$512.25 per Hour	

TO USE TABLE: Locate your approximate grade by referencing "Grade" column. Determine cost per LCY by using the distance that best approximates your distance.

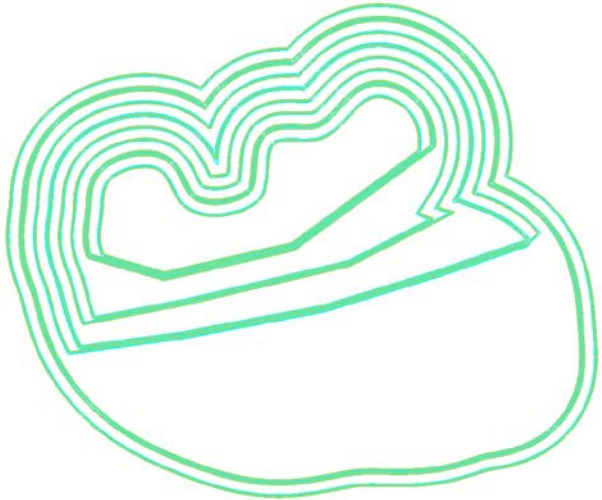
Distance (Ft.)	Productivity (LCY/Hr.)	Job Correction Factors[1]				Grade (0%)	Adjusted Productivity (LCY/Hr.)	Costs ($/LCY)
		Operator	Material	Visibility	Efficiency			
50	4500	1.0	1.0	0.90	0.83	1.00	3374	$0.152
100	3000	1.0	1.0	0.90	0.83	1.00	2249	$0.228

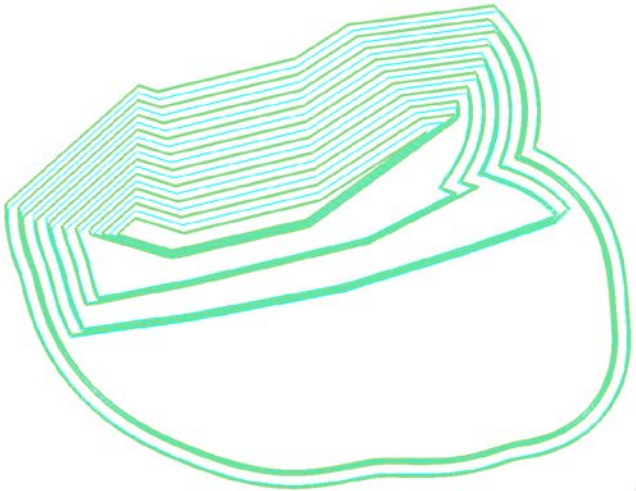
Reclamation Bond Challenges

- Designing from Contours
- Using Generic Uniform Grades
- Trying to Balance Design
- How to Best Utilize Bond Methods
- What Other Challenges Can You Think Of?

Bond Challenges: Designing from Contours

- Can Guarantee Final Slopes
- Traditional Design Method
- Can be Difficult to Balance
- Time Intensive



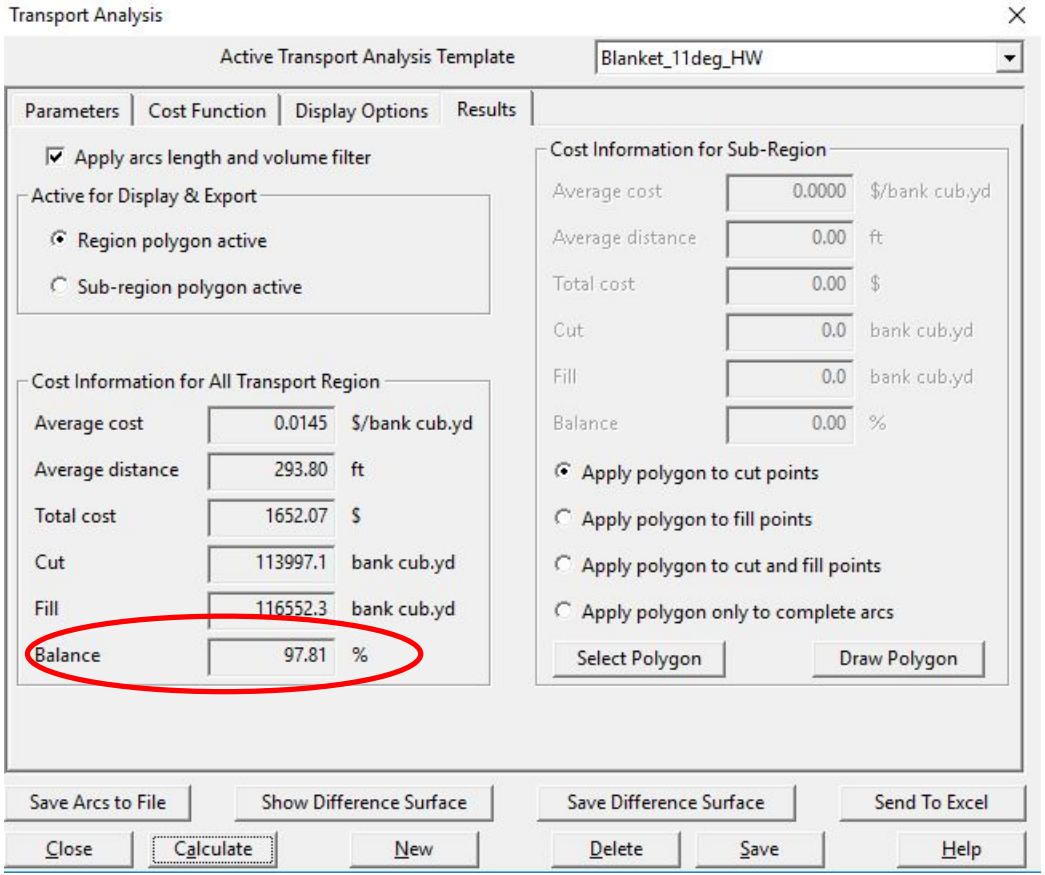


Bond Challenges: Using Generic Grades for all Slopes

- Ensures Compliance is Met
- Makes Reconciliation Easier
- “Quick” Way of Creating Bond Surface
- Hides Subtle Details for Optimization

Bond Challenges: Difficulties in Balancing Materials

- Maintaining Cut/Fill balance Through Reserves/Volume Calcs
- Spend Extra Time Justifying Balance
- Often Taking Extra Cut to Make Balance



Bond Challenges: How to Best Utilize Bond Methods

- Picking Practical Equipment/Excavation Techniques
- Analyzing Cost Benefits of Certain Techniques

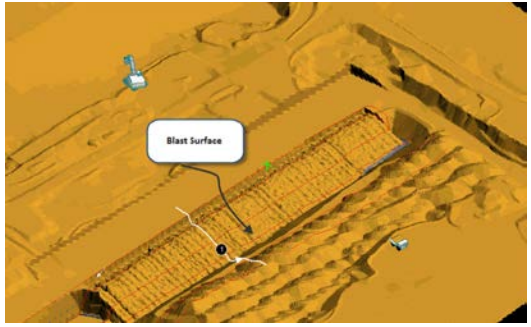
DEPARTMENT OF ENVIRONMENTAL QUALITY
LAND QUALITY DIVISION

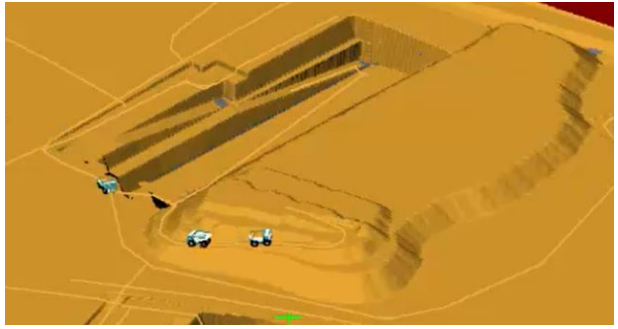
GUIDELINE NO. 12

STANDARDIZED RECLAMATION
PERFORMANCE BOND FORMAT AND COST
CALCULATION METHODS

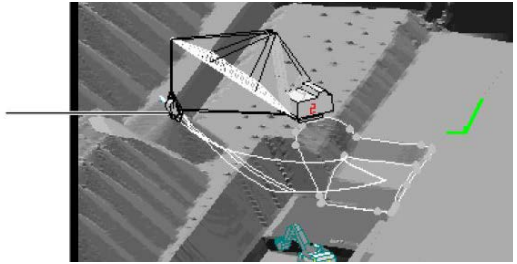
Benefits of Using a Simulation Software (3d-dig)

- Material is Transported to Design or Depletion
- Balance Checks are Simple (Excess Fill Remains in Material Log)
- Shows How Material is Transported Realistically
- Creates Simulation Videos to Share with DEQ/Shareholders/Superiors
- Decreased Learning Curve





Dump point

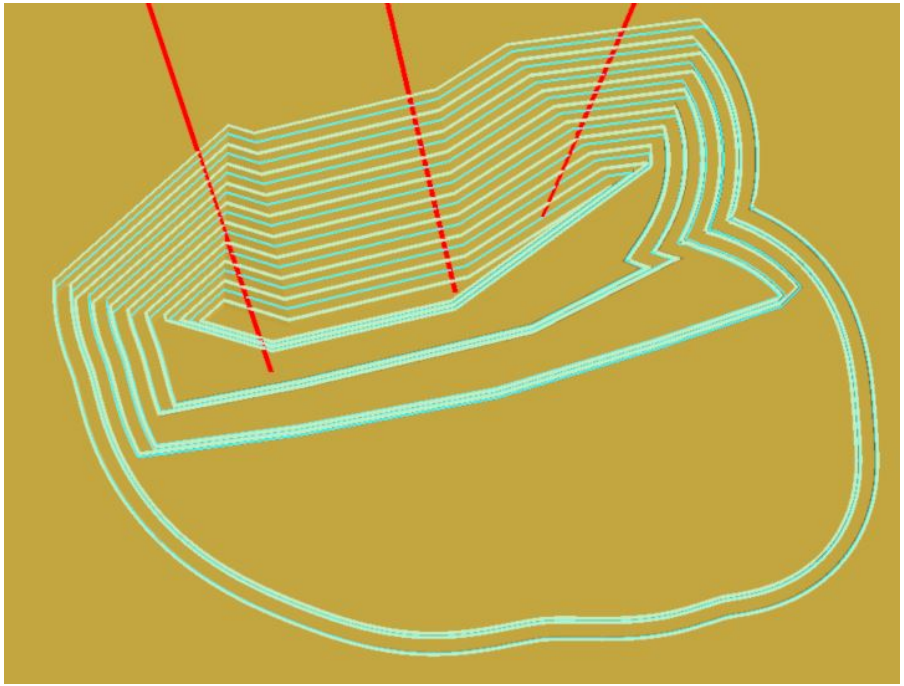


Case Example: 2D CAD vs. Reshape Tool vs. Dozer Simulation

- Generic Pit Design
- 11 degree slope
- Comparison is in LCY (1.1 Swell Factor)
- Area of Case Study
  - 11,000,000 ft^2
  - ~ 250 acres

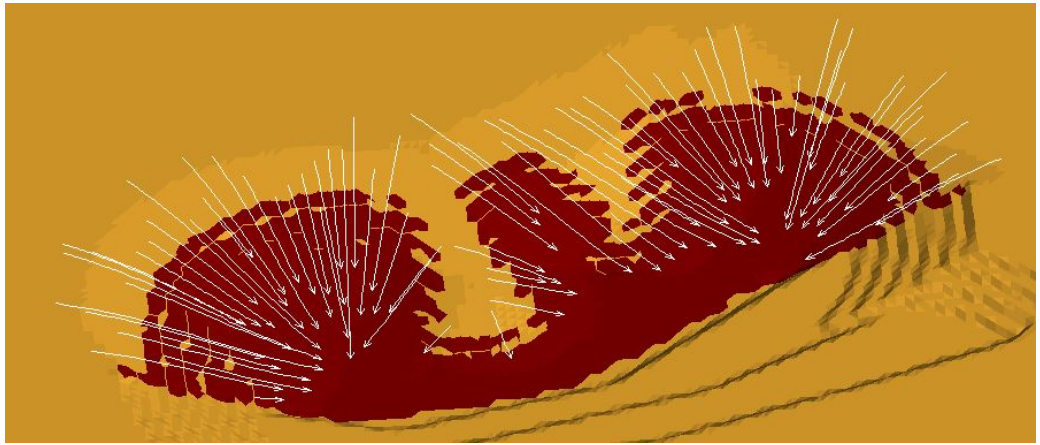
2D CAD Results

- Total Cut: 121,000 LCY
- Average Distance: 490 ft
- WYO DEQ Guideline 12 Cost (D11R Dozer) = $91,000
- Time: 70 minutes



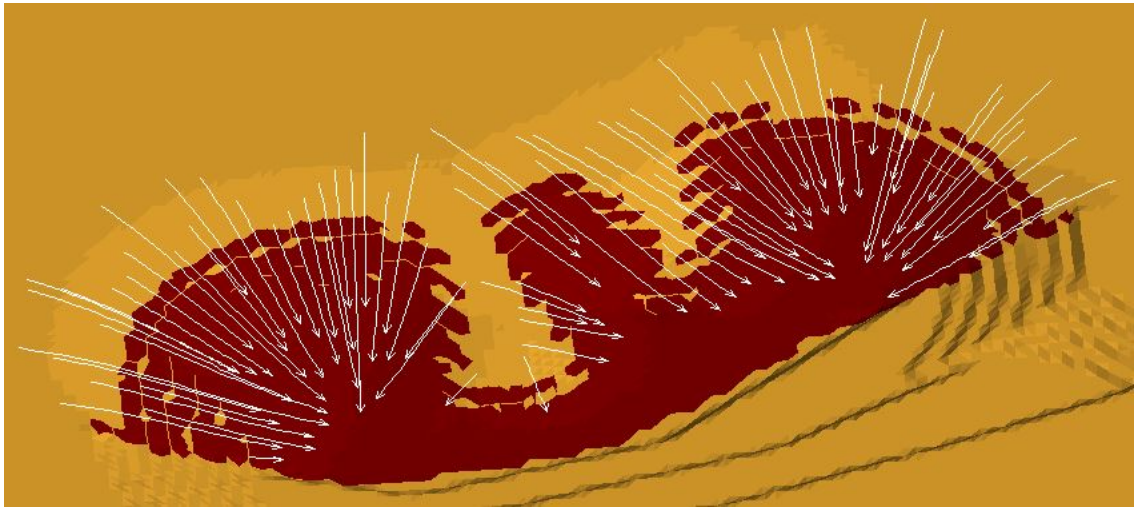
Reshaping Tool Results

- Total Cut: 125,000 LCY
- Average Distance: 294 ft
- WYO DEQ Guideline 12 Cost (D11R Dozer) = $56,700
- Time: 5 minutes



Dozer Simulation Results

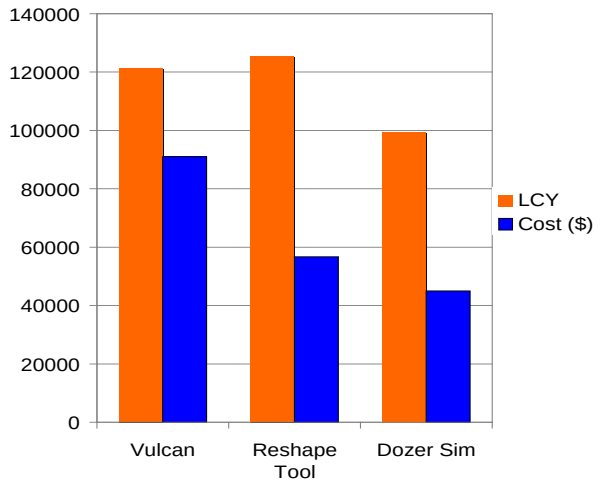
- Total Cut: 99,000 LCY
- Average Distance: 295 ft
- WYO DEQ Guideline 12 Cost (D11R Dozer) = $45,000
- Time: 15 minutes (Including Reshaping Tool)



2D CAD vs. Reshaping Tool vs. Dozer Sim Volume Results

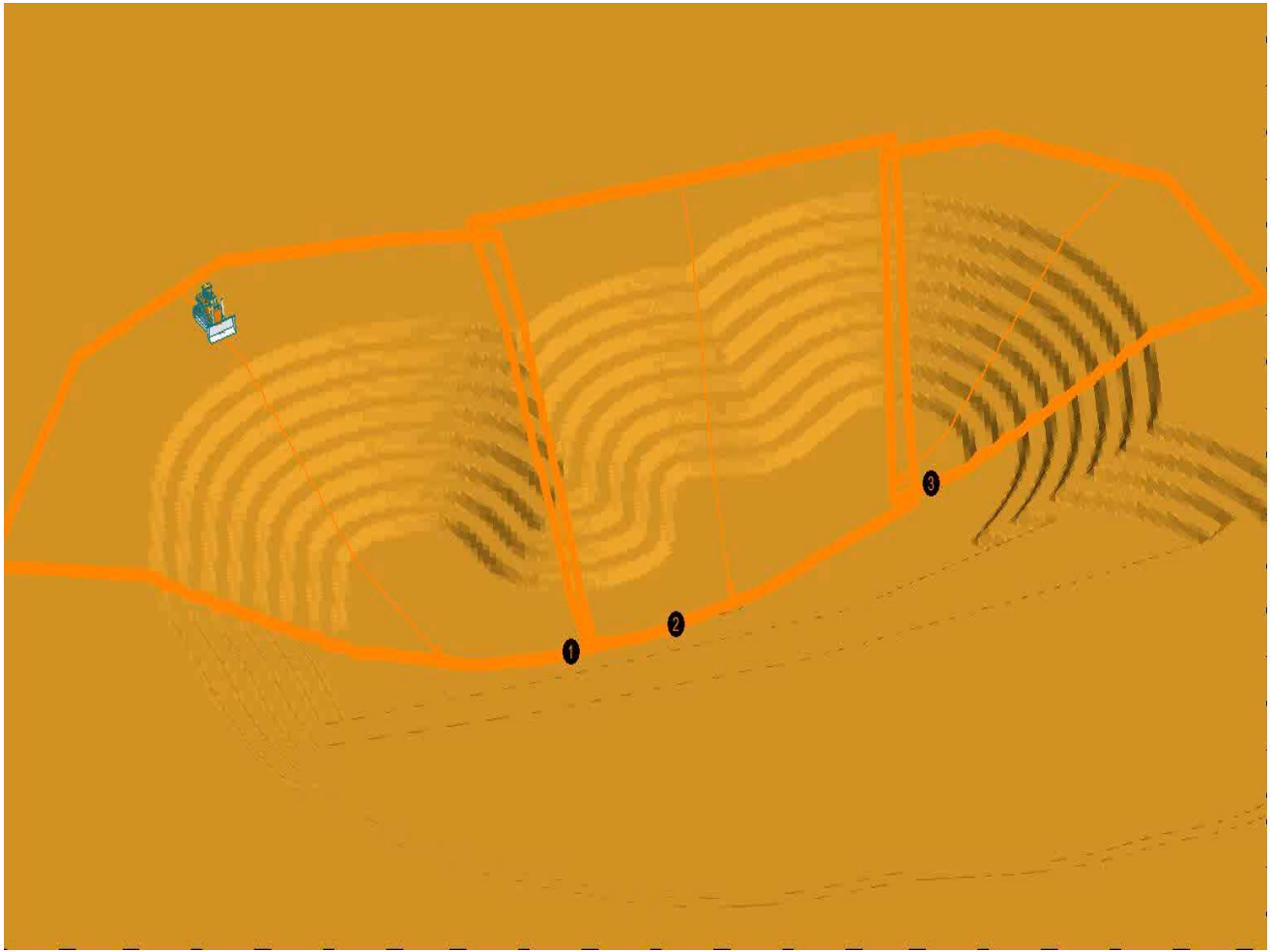
Results

- Simulation:
  - 22,000 LCY (19%) less material moved
  - $46,000 total savings (50%)
- Reasons Why
  - Localizing Pushes to Shorter Lengths
  - Each Zone Builds into Each Other
  - Replicates “Real World” Scenarios



Conclusion

- Reclamation Bonds are an Important Task
- Optimizing Bond Designs Increase Efficiency and Present a Cost Benefit
- Using Simulation Software allows a 3D Solution for a 3D Problem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Thank you

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