PROJECTIONS FACTS

- **2,744 FT** Total Length Of Project
- **938,469 CY** Roadway Excavation
- **5,896 TN ¾” Asphalt**
US 89 Reconstruction  Bitter Springs – Utah State Line Hwy
CONSTRUCTION MANAGER AT RISK
PRECONSTRUCTION

• Eliminate Risk for all Parties
  – Test Shot To Determine:
    • Drill Rate
    • Drill Spacing
    • Powder Factor
    • Fluff Factor
    • Ground Vibration
    • Fragmentation Of Rock
PRECONSTRUCTION

– Test Embankment To Determine
  • Lift Thickness
  • Compaction Effort
  • Water Usage
  • Shrink/Swell Factor
PRECONSTRUCTION

• Exploration
  – Rippability Of Material
  – Test Drill Other Areas
PRECONSTRUCTION

• Rippability Analysis
  – Cost of Ripping vs. Drill and Shoot
  – Material Size Within Specification
  – Workability Of Material
PRECONSTRUCTION

Haul Road And Haul Unit Analysis

• Analyze Different Haul Road Scenarios
  – Haul Road Dimensions For Truck Sizes
    • Slope And Width

• Analyze different haul units (rigid frame vs articulating trucks)

• Cost, Production, Feasibility Comparison
ENVIRONMENTAL

• SWPPP
  – Access To Install Swppp

• Birds
  – Mating Season
  – How Many Are There?
    • Drone To Investigate
CULTURAL AVOIDANCE AREAS

- Historical Sites
- Religious Sites
- Fenced Or Marked With Flagging
  - Controlled Haul Road Locations
ACCESS TO TOP

- Pioneer Access For Drills
- Create Haul Road With Safe Slope For Trucks
- Unstable Material
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CONSTRUCTION MANAGER AT RISK
ACCESS TO BUTTRESS

- Maintenance Road
- Access To Keyway Excavation
- Construct Haul Road For Trucks
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CONSTRUCTION MANAGER AT RISK
ACCESS FOR DRILLS AND MATERIALS

- One Way In/Out
- Access To Get Water And Explosives To Drills
- Coordination With Mass Excavation
- Minimizing Production Loss
ACCESS AND INSTALL SUBDRAIN PIPE

• Steep Slopes

• Access Prior To Embankment
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CONSTRUCTION MANAGER AT RISK
EMERGENCY VEHICLE ACCESS

• Maintain Emergency Access Thru Project
  – Flagger At Each End Of Work Area
  – Radio Communication
  – Stop All Work
  – Use Of Sirens To Give Advanced Notice
DRILL AND SHOOT

- Drill Production Varied Daily
- Wasted Holes
- Powder Factor Due To Voids In Rock
- Inconsistent Fragmentation Due To Nature Of Material
- Oversize Material
SLIDE 28

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CONSTRUCTION MANAGER AT RISK
DRILL AND SHOOT

• North End vs South End

• Material Needed For Both Spreads

• Multiple Daily Meetings
DRILL AND SHOOT

• Drill Access

• Reaching Front Face
FRONT FACE

• FRACTURED, UNSTABLE MATERIAL
• SAFETY CONCERN TO ACCESS
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CONSTRUCTION MANAGER AT RISK
VARIABLE PRODUCTION RATES

• Mass Exc Production Rates Varied
• Dozer Push Production Varied
• Varied Production Rates Effected Other Operations for the Next Day
  – Production Rates Varied Dependent on the Type of Material Created by Each Shot
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CONSTRUCTION MANAGER AT RISK
OVERSIZE MATERIAL

• Too Big To Load Into Trucks
• Slowed Production
• Additional Sizing Required
• Working Under Other Operations
VISIBILITY / SITE CONTROL

- Pushing Material Over Top
- Oversize Material
- Making Sure Nobody Was Below Work
- Full Time Spotter
- 2 “Flaggers”
DUST CONTROL

- CLOGGED AIR FILTERS ON EQUIPMENT
- LOW VISIBILITY
  - SAFETY CONCERN
  - SLOWED PRODUCTION
- ENVIRONMENTAL CONCERNS
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CONSTRUCTION MANAGER AT RISK
DUST CONTROL

• WATER TRUCK SPRAYING WITH HOSE
  – NOT ENOUGH ROOM
  – LOW VISIBILITY SAFETY CONCERN
• NIGHT SPRINKLER SYSTEM
  – LACK OF PENETRATION
• FLOOD PREWET
  – HARD TO CONTROL WITH CRACKS
  – BEST RESULTS
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CONSTRUCTION MANAGER AT RISK
SOUTH EXCAVATION

• LACK OF ROOM FOR HAUL ROAD
  – ELEVATION CHANGE

• MATERIAL STOOD UP INSTEAD OF SLIDING
  – CREATED HIGH WALL

• INCREASED DOZER PUSH
  – COULD NOT PUSH AS FAST AS COULD LOAD
  – DRILL AND SHOOT DAYS
THE “FLIP FLOP”

- Drill And Shoot Moved To North End
- Trucks Drove Thru Drill Area
- Half Width At A Time
- Slowed Production
WEATHER

• Snow Storms
• Falling Rock
• Freezing Temperatures
• 2 Week Inversion
• Rain
  – Created Slick Haul Roads
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CONSTRUCTION MANAGER AT RISK
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CONSTRUCTION MANAGER AT RISK
AC PAVING

- Steep Grades
- Cross Slopes
- Cool Temperatures
- Long Haul
QUESTIONS