GEOLOGIC CONTROL OF SPILLWAY EROSION FEATURES, SIERRA NEVADA FOOTHILLS, CALIFORNIA

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Takeaways

Single episode of spillway flows an opportunity to gage effect of geologic variability on erodibility—

- Rock type and mineralogy
- Fabric
- Brittle shears
New Exchequer Gated Spillway
(Lake McClure)
Broadly similar geology shared by multiple dams along Foothills metamorphic belt.
Accreted terranes - mainly metavolcanic, strong fabric(s)

From Barry (1993)
1967 Erosion (no natural channel)

1968 Armoring
Process:
- Map Lithology
- Clean subgrade
- Riprap/Concrete
Bedrock Fluvial Erosion

- Abrasion - ~N/A this site (no bedload)
- Cavitation - ~N/A this site
- Solution - N/A this site
- Plucking - exposed, jointed/fractured rock
Bedrock Fluvial Erosion

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- Solution – N/A this site

Modelling a challenge – what criteria most influential?
Challenges include:

- **Highly irregular channel bottom** (shear flow, plunging flow)
- **Variable rock type**
- **Variable joint set number, spacing, orientation** → variable block size/shape

Model factors include:
Siliceous Slate w/ Schist in foreground

Siliceous Slate at L
Schist at R
Siliceous slate at L
Schist at R

SC HIST
Map Structure

- Metamorphic (ductile) fabric
- Brittle shears/fractures
Brittle Shear Zone (typ.)

Brittle Shear Expression (Erosion Area 2)
Brittle Shear Expression (Erosion Area 3)
Brittle Shear Expression (Erosion Area 4)
1967 Flows + 2017 Cleaning Enhanced Structural Grain
Generalized Brittle Shears, Metamorphic Fabric
Process:
- Map Structure
- Clean subgrade
- Riprap/Concrete
Process:
- Map Structure
- Clean
- Riprap/Concrete
Test Flows
Questions?