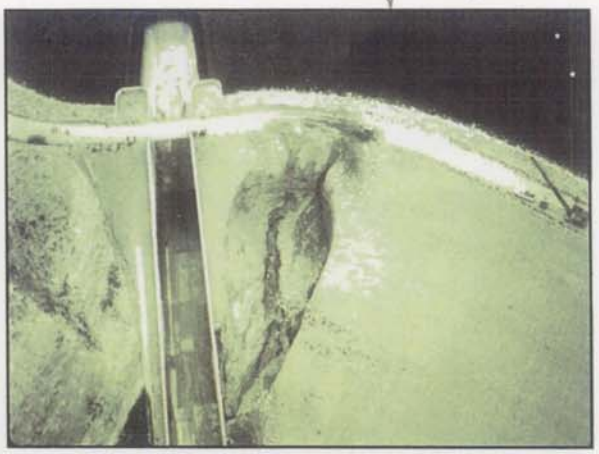
sinkhole & erosion hole at downstream side



rehabilitation

gypsum found in foundation caused problems with seepage

Cracks caused by grouting

Fontenelle Dam – Lessons

- Importance of foundation treatment – sealing foundation against erodible fill
- Importance of rapid reservoir drawdown capability
- Not fully investigating the causes of the near-failure and sharing with staff led to a continuation of inappropriate practices

Finally constructed vertical concrete central cutoff wall, 50' into foundation! $50,000,000

Teton Dam

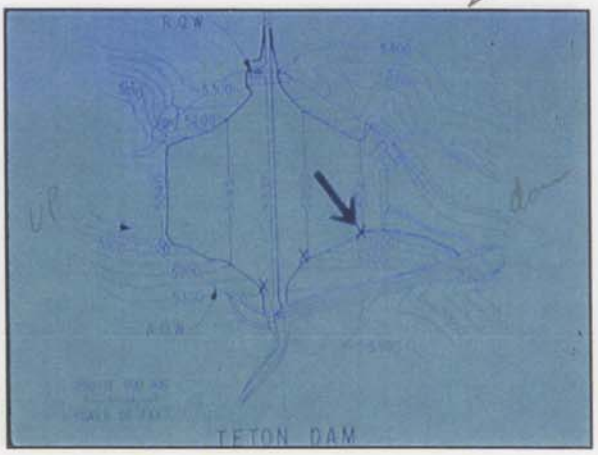
Idaho

"the Biggie"

300' high built 1975

PO not functional at 1st filling!

arrow shows leak 25cfs seepage!



breach in progress! warning issued 10:30

2- dozers lost!

newly formed alluvial fan

sinkhole & whirl pool observed

NOON 1,000,000 cfs

drained in 6 hours

250,000 AF IMPOUNDED

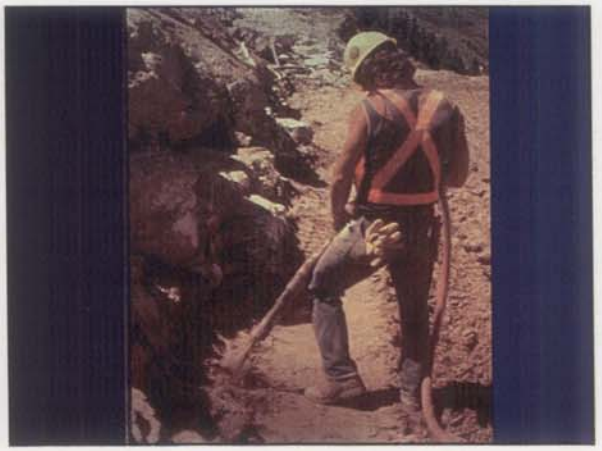
downstream flood wave

6PM

11 dead

Rexburg & Sugar City Idaho

Key trench ↓



Single line grout curtain along ℄ dam

Seepage/Piping failure

No filter material in the dam!

Teton Dam – Lessons

- Importance of foundation treatment – sealing of foundation against erodible fill
- Importance of multiple lines of defense against seepage erosion/piping
- Avoid narrow steeply-sloped cutoff trenches
- Importance of ability to control reservoir filling
- Design engineer must visit site at critical times during construction to substantiate conditions and adjust design accordingly

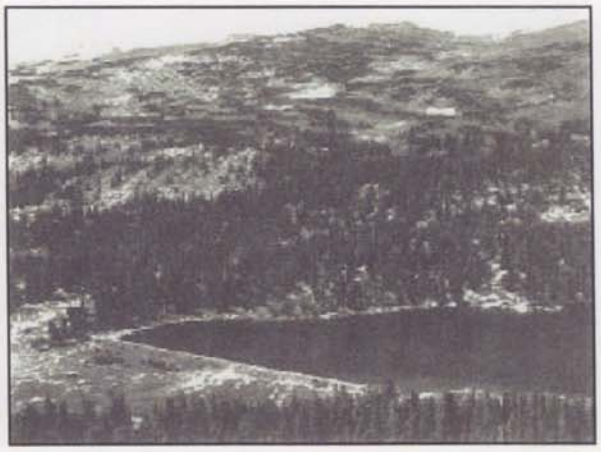
Key lesson - Design engineer must be on site

Lawn Lake Dam

Colorado

1903

IN Rocky Mountain Nat. Park



24' HIGH

700 AC-FT

FAILED 1982

Roaring River