

Dam Siting

(you couldn't have picked a worse place, all things considered)

Larimer County NISP 1041 Hearing

August 24, 2020

Dr. Sally Sutton

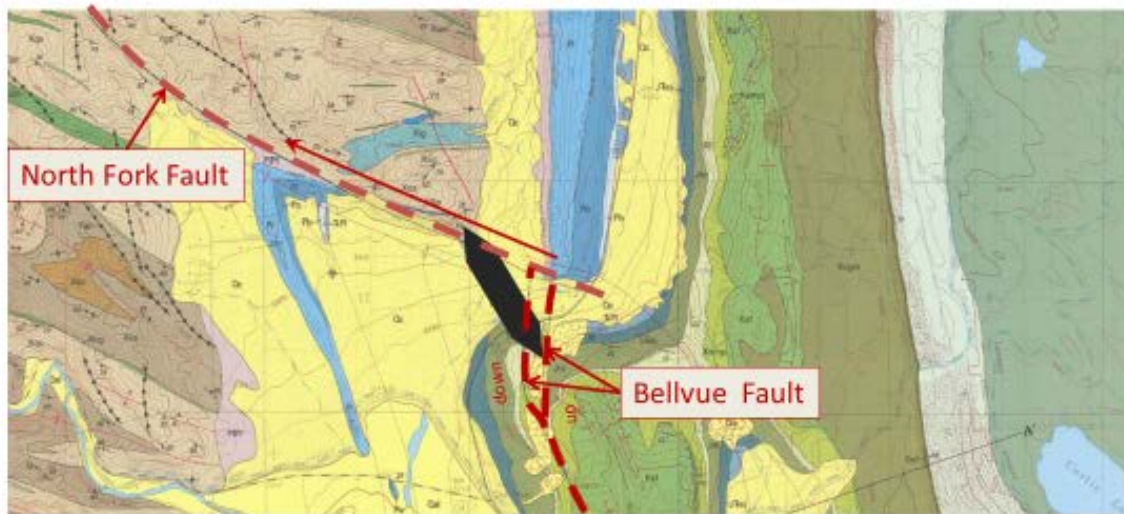
B.S., Geology and Mineralogy, University of Michigan, 1979

Ph.D., Geology, University of Cincinnati, 1987

Two major faults with large displacement pass under the proposed dam site

North Fork and Bellvue Faults

Leakage through rubblized rock along faults seems likely to lead to dissolution of soluble limestone and gypsum beds. Underflow far more severe than that observed at the North Horsetooth Dam seems certain. No discussion of the faults below the proposed dam are presented in the EIS.



GEOLOGIC MAP OF THE LAPORTE QUADRANGLE, LARIMER COUNTY, COLORADO

By
William A. Braddock, Jon J. Connor, Gordon A. Swann,
and Duane D. Wohlford
1988

• Implications

- 1) Potential water leakage along faults
 - Dam won't hold water
 - All the additional \$s thrown at grouting won't matter
- 2) Dissolution of soluble limestone and gypsum beds
 - Water losses may progressively get worse (like the North Dam on Horsetooth)
 - Large unplanned future expenditures are likely
- 3) Risk to Human Health if the dam fails
 - La Porte, Fort Collins...

NEWS

Look back: Why Horsetooth Reservoir was nearly drained

Jacy Marmaduke jmarmaduke@coloradoan.com

Published 8:01 a.m. MT Apr. 15, 2017 | Updated 11:20 a.m. MT May 9, 2017

"The story of the \$77 million repair project that nearly drained Horsetooth is one worth telling as Fort Collins approaches its rainiest season, just a few months removed from the high-profile emergency at the Oroville Dam in California."

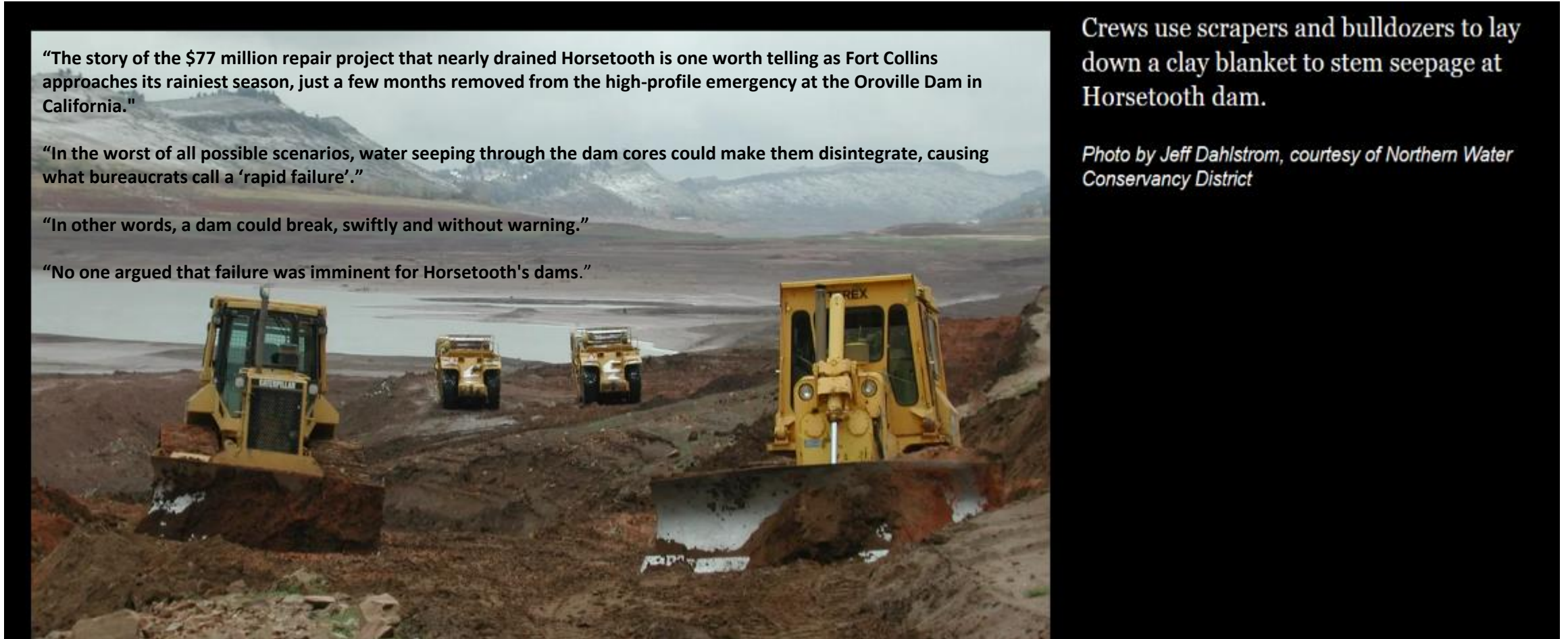
"In the worst of all possible scenarios, water seeping through the dam cores could make them disintegrate, causing what bureaucrats call a 'rapid failure'."

"In other words, a dam could break, swiftly and without warning."

"No one argued that failure was imminent for Horsetooth's dams."

Crews use scrapers and bulldozers to lay down a clay blanket to stem seepage at Horsetooth dam.

Photo by Jeff Dahlstrom, courtesy of Northern Water Conservancy District

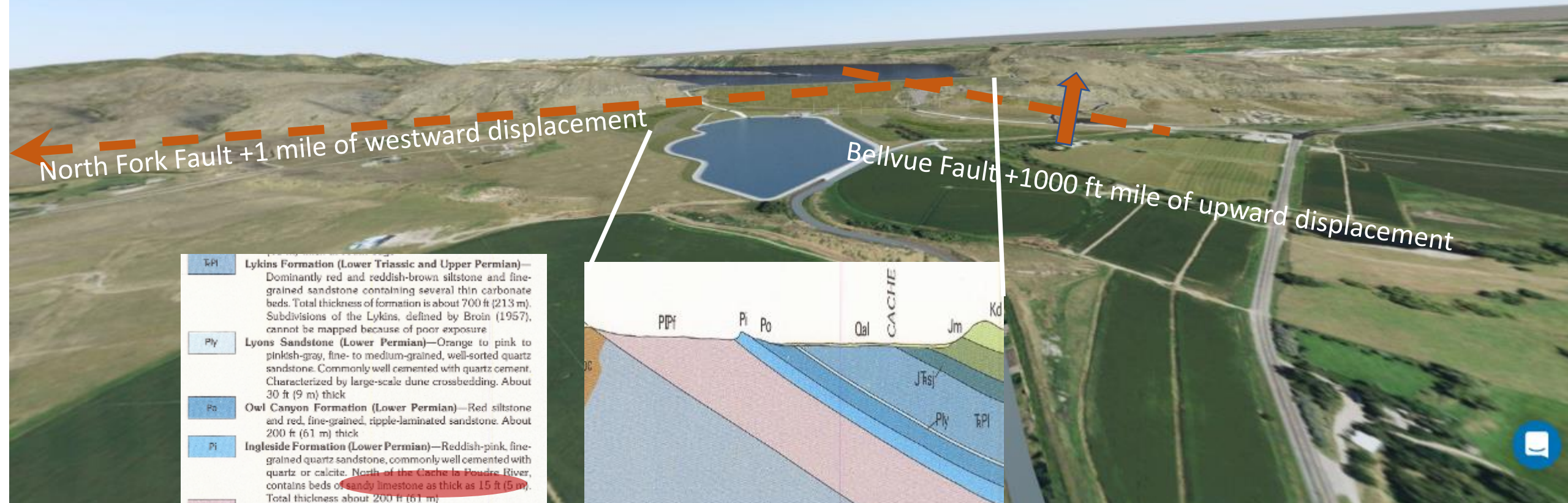


Geologically, Glade is a worse setting than the North Dam... yet solutions (\$\$\$\$) Northern needed at the North Dam are absent at Glade

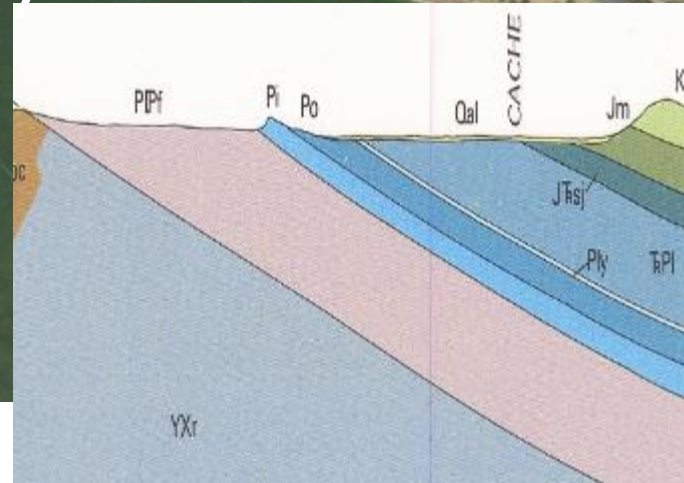
The sedimentary layers underlying the site include permeable conglomerates (ancient gravel deposits) as well as soluble carbonate and gypsum-rich layers. Large seepage losses are likely and there is a risk of dam failure....

WHY BUILD A DAM ON FAULTED, WATER-SOLUBLE, PERMEABLE ROCK??

WILL THE PARTICIPANTS COVER DAMAGES TO DOWNSTREAM COMMUNITIES.....



TrP1	Lykins Formation (Lower Triassic and Upper Permian) —Dominantly red and reddish-brown siltstone and fine-grained sandstone containing several thin carbonate beds. Total thickness of formation is about 700 ft (213 m). Subdivisions of the Lykins, defined by Broin (1957), cannot be mapped because of poor exposure
Ply	Lyons Sandstone (Lower Permian) —Orange to pink to pinkish-gray, fine- to medium-grained, well-sorted quartz sandstone. Commonly well cemented with quartz cement. Characterized by large-scale dune crossbedding. About 30 ft (9 m) thick
Po	Owl Canyon Formation (Lower Permian) —Red siltstone and red, fine-grained, ripple-laminated sandstone. About 200 ft (61 m) thick
Pi	Ingleside Formation (Lower Permian) —Reddish-pink, fine-grained quartz sandstone, commonly well cemented with quartz or calcite. North of the Cache la Poudre River, contains beds of sandy limestone as thick as 15 ft (5 m). Total thickness about 200 ft (61 m)
PP1	Fountain Formation (Lower Permian and Upper and Middle Pennsylvanian) —Reddish-brown to purplish-gray arkosic conglomerate, medium- to coarse-grained feldspathic sandstone, and dark-reddish-brown siltstone and shale. Minor thin limestone. Total thickness about 800 ft (244 m)



Anecdotal reports from drillers indicate high capacity water wells, supporting concerns about permeability in the underlying rocks. Outcrops display dissolution voids that will be difficult to find and/or address.

A request for the Site-Specific Seismic Hazard analysis for the site dated May 21, 2019, including all support geologic logs, photographs, and downhole video was denied.

Northern's response was that after consultation with both state and federal agencies, we have determined the remainder of the documents **cannot be released because of concerns related to security** of critical infrastructure.

Dam Safety for Downstream Safety: Revisiting the Oroville Dam Spillway Failure

In the face of aging infrastructure and climate change, we need to be more proactive about making updates to the structures we rely on.

Daisy Schadlich | March 4, 2020



It's been three years since our nation's tallest dam, Oroville Dam, partially failed, forcing downstream evacuations, environmental damage, and costly emergency repairs. |

“... this dam’s failure had serious ramifications for communities and ecosystems downstream. The Association of State Dam Safety Officials ([ASDSO](#)) stated that, “The Oroville Dam spillway incident was caused by a long-term systemic failure to recognize and address inherent spillway design and construction weaknesses, **poor foundation bedrock quality**, and deteriorated service spillway chute conditions.” **It is now clear that the spillway was built on unstable bedrock** ([Independent Forensic Team Report Oroville Dam Spillway Incident](#))”

The 1041 Permit should be denied!

2. The applicant has presented reasonable siting and design alternatives or explained why no reasonable alternatives are available.

The applicant has failed to consider dam sites on crystalline rock (e.g. Halligan and Seaman) where the underlying rock is less permeable and is not water soluble.

4. The proposal will not have a significant adverse affect on or will adequately mitigate significant adverse affects on the land or its natural resources, on which the proposal is situated and on lands adjacent to the proposal.

6. The proposal will not negatively impact public health and safety.

The applicants' inability to control dissolution of carbonate and gypsum beds will lead to a dangerous dam regardless of approval from the State of Colorado and/or hired professional engineers.