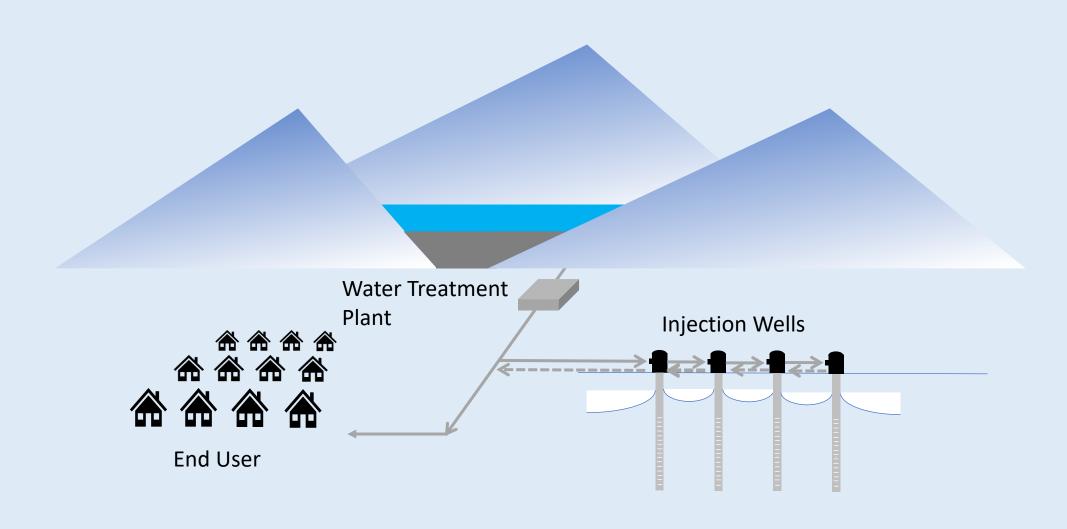
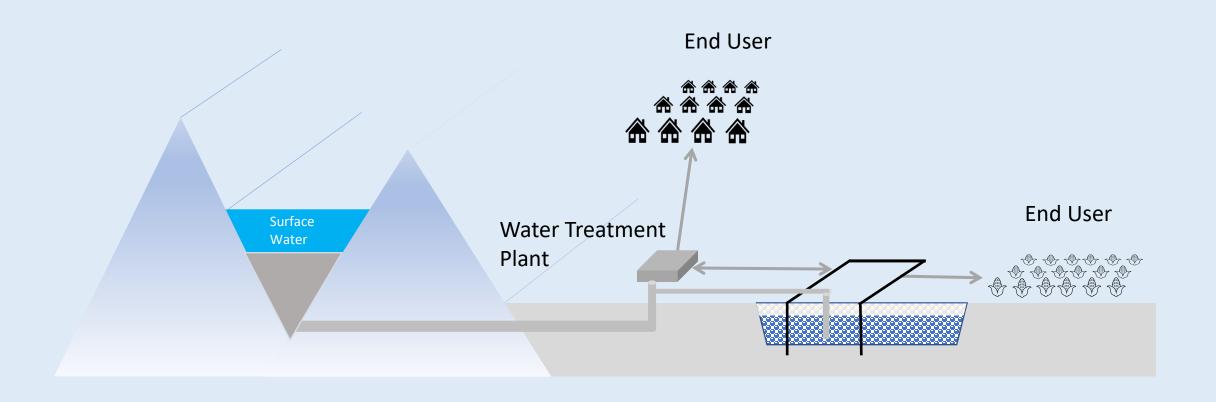
ALLUVIAL SUBSURFACE WATER STORAGE

Subsurface Water Storage Symposium February 22 – 23, 2024 CSU Spur Campus

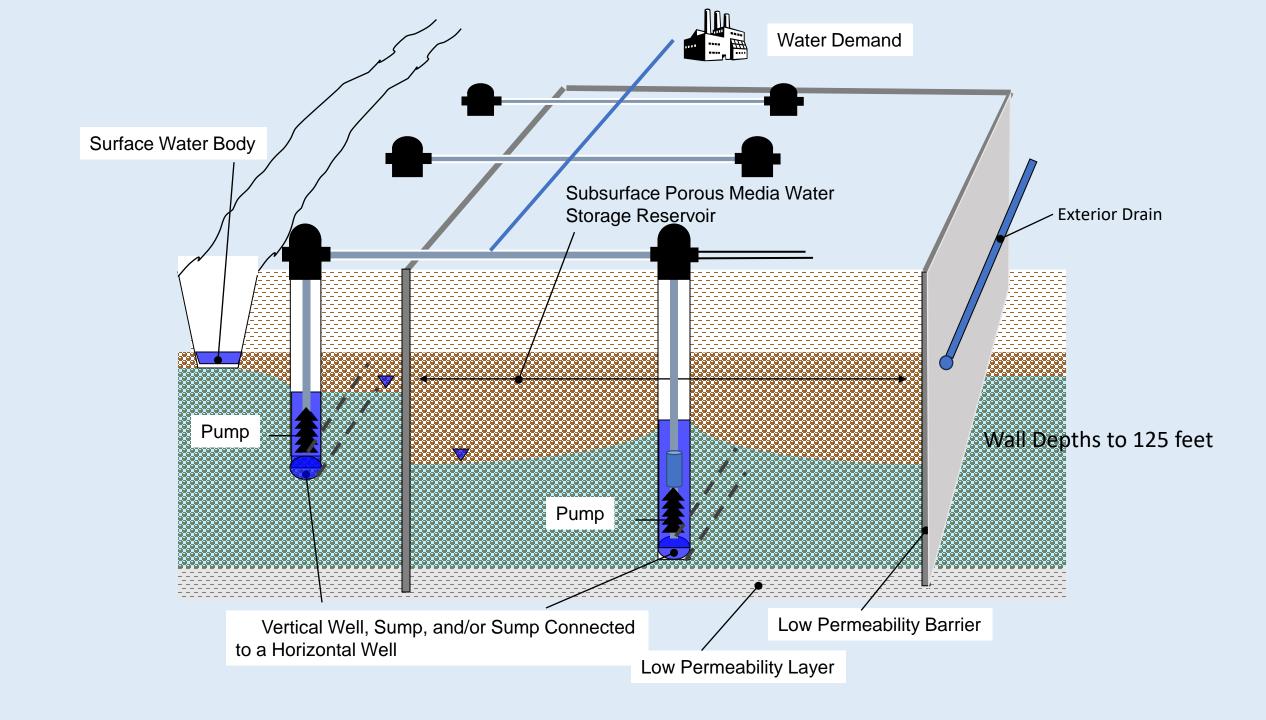




Symposium Icon – Traditional Aquifer Storage and Recovery



Alluvial Subsurface Water Storage



BENEFITS OF ALLUVIAL SUBSURFACE WATER STORAGE

- 1. No evaporation
 - * Salvaging evaporation saves water; salvage costs can pay for projects.
- 2. Lower cost versus traditional surface water storage
 - * Costs less than 10% of traditional surface water storage or plects.
- 3. No loss of stream sections or large surface areas
- 4. Permitting straightforward, relatively fast, and economical
 - * No EIS NISP permitting 2004 -2022
 - * Clear State Engineer Office permitting guidelines
 - * Months, not years to permit

STATE ENGINEER GUIDELINES FOR LINING CRITERIA FOR GRAVEL PITS AUGUST 1999

<u>, 0</u> Design Standard

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The explorest must demonstrate that the constructed fixer makes the registratement of the design by performing participating quality control closerations are taken. This applicant and provide without documentation of the work performed and results of quality control fals and laboration (seed. Tests performed staff ment or accessor but estimations statisticated by the American Portoloum Institute (API) addict the American See ety of Trecting and Materials (ASTM) as exploration.

3 D Pe formanco Standaro

The Portfornance Standard shall be three times the Design Standard as described above. The Performance Standard shall be applied to an initial test of compotency of the first as we'll as to the origing operation of the cessoroit.

3.1 Initial Liner Test

mined pits: The unregulated ground water inflow to the reservoir will be tested by executating the contents of the reservoir and conserving the inflow of water over a portfold intect year. The start of the test will be under essentially dry conditions.

For unmined pits:

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BENEFITS OF ALLUVIAL SUBSURFACE WATER STORAGE

- 5. Flexible through modular development
 - * Responds to economic conditions and needs.
- 6. Minimal land disturbance



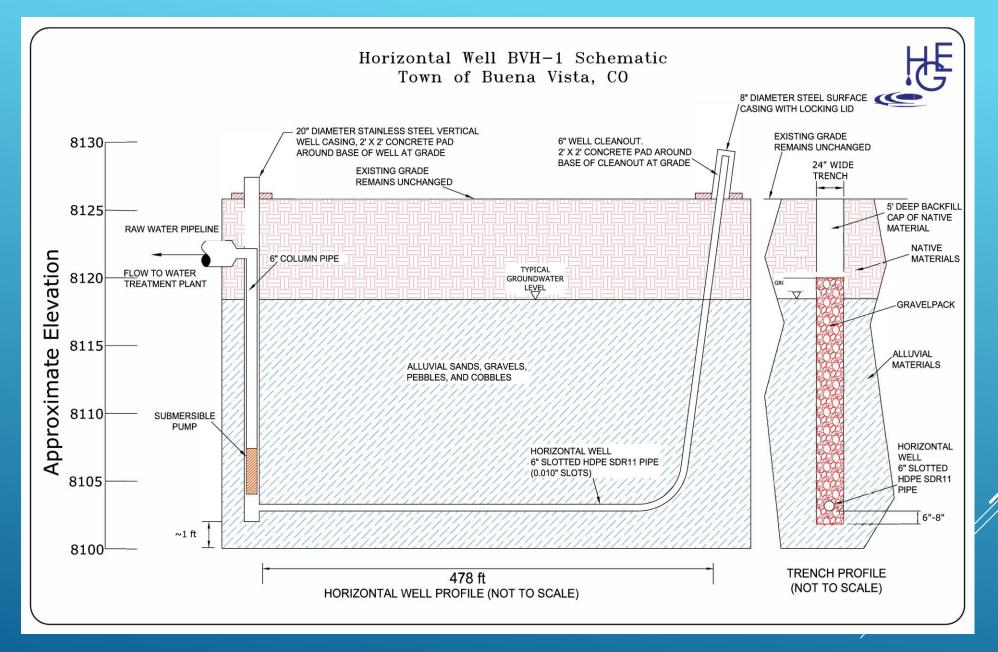
PHOTO FROM DEWIND ONE-PASS TRENCHING



PHOTO FROM DEWIND ONE-PASS TRENCHING

BENEFITS OF ALLUVIAL SUBSURFACE WATER STORAGE

- 4. Flexible development through modular construction*Responds to economic conditions and needs
- 5. Minimal land disturbance
- 6. Secure water storage in a shallow alluvial system
- 7. Minimal contamination concerns or mixing with fative groundwater
- 8. Can be developed in a wide range of all aquifer systems.
- 9. Vertical or horizontal wells can be used for high-capacity flows into and out of alluvial storage reservoirs.



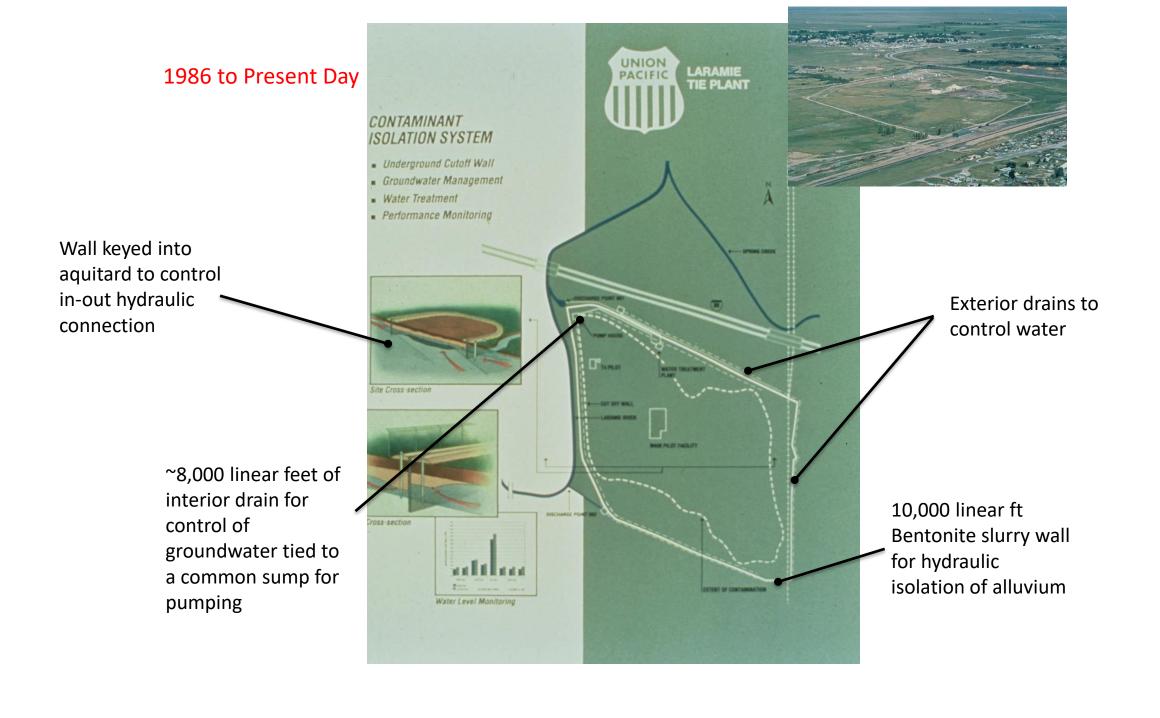
HORIZONTAL WELL INSTALLATION





RELIABILITY, DURABILITY, AND LONGEVITY OF ALLUVIAL SUBSURFACE WATER STORAGE FACILITIES

- 1. No impact from stream flows with debris from forest fires
- 2. No loss of storage due to sedimentation over time
- 3. Minimal maintenance
- 4. Minimal surface facilities minimizing security issues and visual impacts
- 5. Long-lasting storage
 - Case History: Laramie Tie-Treating Facility





► Questions?

Courtney Hemenway, P.E.
President
Hemenway Groundwater Engineering, Inc.

<u>chemenway1@msn.com</u> 303-901-2287