



Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) is the use of an aquifer to store water from a different source or location for later use. Water providers have successfully implemented ASR around the world, including at about 175 locations in the United States. In Texas, there are three facilities currently serving the cities of El Paso, Kerrville, and San Antonio. With legislation passed in 2015, it's now easier to permit and operate an ASR system in Texas, so ASR may become a more important part of Texas' water management portfolio in the near future.

Can I do ASR?

Your ability to use ASR to meet your water needs depends on several factors, including having (1) a source of water to store, (2) an aquifer nearby that is chemically compatible with your water and physically able to store your desired volumes, (3) capacity to treat the water before injection, and (4) an affordable project.

For an ASR system to work, you have to have a source of water to store. For example, of the three ASR systems in Texas, Kerrville uses surface water, San Antonio uses groundwater, and El Paso uses treated wastewater.

Favorable aquifer characteristics are essential to the success of ASR. Ideally your candidate aquifer is nearby; otherwise pipeline costs could become prohibitive. The aquifer doesn't have to be fresh—brackish (and more saline) aquifers are also potential hosts for ASR. Chemical compatibility between the stored water and the aquifer—both the aquifer's water and the host rock—is necessary. Chemically incompatible water stored in an aquifer could clog up the well and aquifer or could liberate unwanted constituents from the aquifer such as arsenic, iron, and manganese. Source water for an ASR system may need to be modified to ensure its compatibility with the aquifer; however, modifications may increase project costs.

The aquifer must also be able to physically receive the volume of water to be stored. Different aquifers can receive different amounts of water. Less permeable aquifers may not be able to receive large volumes of water or may need many more wells spread over a larger area to handle the desired volume. For example, San Antonio's ASR facility, the second largest ASR in the United States, uses 29 wells to store 35 billion gallons of water in the permeable Carrizo Aquifer. In general, an ASR project will lose

some of the injected water to the surrounding aquifer. How much water an ASR system loses depends on the volume of stored water, the time of storage, and properties of the aquifer. Although an ASR system loses some water, lost water recharges the broader aquifer.

Water that is stored underground in an aquifer must be of equal or better quality than native water in the aquifer. This will often require treatment, especially if the source is surface water. Therefore, communities considering ASR must also consider excess treatment plant capacity or constructing new water treatment plants.

Affordability is a local issue that is not only impacted by the previously mentioned factors, but also by the other available water supply options. In general, the cost of ASR is competitive with other water supply strategies such as water reuse, brackish groundwater desalination, and new reservoirs.

ASR in the State Water Plan

Water providers across the state have showed increased interest in ASR. In the 2017 State Water Plan, seven regional water planning groups (regions E, F, G, J, K, L, and O) included ASR as a recommended water management strategy. The state water plan includes 49 individual strategies that help meet or meet the water needs of various water user groups. In total, the plan projects that ASR could create about 152,000 acre-feet of new water supply per year by decade 2070, constituting about 1.8 percent of all recommended water management strategies. Capital costs for projects range from \$1.2 million to \$736 million depending on the size of the project.

State Regulations

In 2015, the 84th Texas Legislature passed House Bill 655 that amended the Texas Water Code to make the statute more conducive to implementing ASR projects. The act provides the Texas Commission on Environmental Quality with exclusive jurisdiction over the regulation and permitting of ASR wells. The act stipulates that groundwater conservation districts cannot require permits for the drilling and operation of aquifer injection or recovery wells for ASR except when the amount of groundwater recovered from the wells is greater than the amount authorized by the Commission. In May 2016, the Commission adopted rules that amended the

following sections in Title 30 of the Texas Administrative Code to incorporate requirements of House Bill 655: public notification for ASR projects (§39.651), source water permitting process (§§295.21, 295.22, 295.202), new definitions (§§297.1, 297.13, 297.19), and requirements of a Class V injection well for ASR projects (§§331.2, 331.7, 331.11, 331.181–331.186).

How We Can Help

The Texas Water Development Board (TWDB) has supported the development of ASR projects since the early 1990s with feasibility studies and research. For example, we funded early feasibility studies for Kerrville and San Antonio and funded a study on impediments to ASR in Texas. More recently, we've provided funding to the Victoria County Groundwater Conservation District, the Edwards Aquifer Authority, and the Corpus Christi Aquifer Storage and Recovery Conservation District to acquire information about local geological conditions, water quality, aquifer properties, system design, and system operation and maintenance for possible ASR projects.

Our experts are ready to sit down with you to discuss the potential for ASR in your area. Geologic mapping work we are doing on brackish aquifers across the state, groundwater data collection, and groundwater modeling are all relevant to ASR projects and are available for communities to use in assessing ASR in your area.

More Information

To learn more about the TWDB's aquifer storage and recovery activities, please visit www.twdb.texas.gov/innovativewater/asr.

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