



Aquifer Storage and Recovery & Aquifer Recharge

Aquifer storage and recovery (ASR) is the use of an aquifer to store water from a different source or location for later use. Aquifer recharge (AR) is the intentional recharge of an aquifer by means of an injection well or other enhanced infiltration. There are more than 200 ASR and AR systems in 27 states across the United States, and one of the largest ASR systems is located in San Antonio, Texas.

ASR or AR in Texas

There are five ASR and three AR systems operational in Texas. The oldest system is El Paso Water's hybrid facility established in 1985, which uses a spreading basin, one shallow vadose well, and a down-gradient Hueco Bolson Aquifer production well field to recharge and store reclaimed water.

The ASR system in the City of Kerrville began operating in 1998 and has two ASR wells that store surface water from the Guadalupe River in the lower Trinity Aquifer—and have a recovery capacity of about 2.6 million gallons per day.

The San Antonio Water System's ASR facility at the H2Oaks Center began operating in 2004 and has 29 ASR wells that store groundwater from the Edwards Aquifer in the Carrizo-Wilcox Aquifer—and have a recovery capacity of about 60 million gallons per day.

The Ruby Ranch Water Supply Corporation ASR well was authorized for operations in 2020, and most recently, the City of Buda ASR well was authorized in 2024.

AR systems in Texas include the Edwards Aquifer Authority recharge dams (built 1974-1982), the Dell City flood and recharge dams (built 1982-1987), and the Onion Creek recharge structures (built 1997-2009).

Can I do ASR or AR?

The ability to build an ASR or AR facility depends on several factors, which include: (1) a source of water to store or recharge, (2) an aquifer nearby that is physically able to store your desired volumes, and (3) the capacity to treat the source water to ensure it is chemically compatible with the aquifer and does not degrade its quality.

Sources of water to store may include surface water, groundwater, or reclaimed water and may only be available seasonally. Ideally, the candidate aquifer is nearby—to reduce pipeline costs—and must be able to physically receive the volume of water to be stored. Different aquifers can receive different amounts of water, and infrastructure must be designed to meet the physical capabilities of the aquifer. For example, less permeable aquifers or high demand projects may need many wells spread over a larger area to handle the desired volume. The aquifer doesn't have to be fresh—brackish (and more saline) aquifers are also potential hosts for ASR.

Water that is stored underground cannot degrade the native water in the aquifer. Chemical compatibility between the stored water, the aquifer's water, and the host rock is required. Chemically incompatible water can cause clogging or liberate unwanted constituents, such as arsenic, iron, and manganese, into the water. Source water for an ASR or AR facility may also need pretreatment to ensure compatibility with the aquifer—which may increase project costs.

State Regulations

Allocation of surface water for ASR was authorized in 1995 by the 74th Texas Legislature with House Bill 1989. 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 statute provides the Texas Commission on Environmental Quality (TCEQ) with exclusive jurisdiction over the regulation and permitting of ASR wells. It also 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 TCEQ.

In May 2016, TCEQ adopted rules that amended the Title 30 of the Texas Administrative Code in line with 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).

TCEQ evaluates ASR and AR projects based on factors unique to each project rather than relying on prescriptive standards. For example, projects with wells, trenches, enhanced sinkholes, or other infrastructure regulated by the Underground Injection Control (UIC) program will need a Class V well authorization. Projects for public water supply or that utilize reclaimed water must coordinate permits with the TCEQ Office of Water's Water Supply and Water Quality divisions. For more information on authorizations and permitting, visit www.tceq.texas.gov.

ASR and AR Program

In 2019, the 86th Texas Legislature passed House Bill 721 directing the Texas Water Development Board (TWDB) to

(1) conduct a statewide suitability survey of aquifers for ASR or AR projects, (2) perform studies for ASR or AR projects, (3) work with appropriate interested persons, and (4) share the results of these studies (Texas Water Code §11.155). Also in 2019, House Bill 720 passed allowing for unappropriated water, including stormwater and floodwater, to be appropriated for ASR and AR projects (Texas Water Code §11.023, 11.157, and 11.158).

Feasibility and Demonstration Projects

The 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. 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 aquifer properties, system design, and system operation and maintenance for possible ASR projects.

Most recently, staff have completed an aquifer characterization study that included geologic mapping, groundwater data collection, and a groundwater modeling study. The TWDB continues to conduct studies that are relevant to ASR and AR projects in Texas.

ASR and AR in the State Water Plan

In the 2022 State Water Plan, 10 regional water planning groups (A, C, E, G, H, J, K, L, N, and O) recommend 27 ASR projects and four additional projects with an AR component.

These projects include 34 new or expanded well fields or infiltration basins. If implemented, ASR projects could create about 193,000 acre-feet of new water supply per year by 2070, and constitute about 2.5 percent of all recommended water management strategies.

How We Can Help

Our experts are ready to discuss the potential for ASR or AR in your part of Texas. To determine how suitable ASR or AR may be for a specific area, visit the statewide survey at www.twdb.texas.gov/innovativewater/asr/projects/Statewide/index.asp.

More Information

For more information about the TWDB's aquifer storage, recovery and recharge activities, visit www.twdb.texas.gov/innovativewater/asr

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