The Status of Brackish Aquifer Studies in Texas

2023 Annual Report to the 88th Texas Legislature on Brackish Groundwater Production Zone Designation

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Texas Water Development Board

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Introduction

The Texas Water Development Board (TWDB) Brackish Resources Aquifer Characterization System (BRACS) Program was established in 2009 to map and characterize the brackish portions of the aquifers in Texas and provide useful data to regional water planning groups and other entities interested in developing and desalinating brackish groundwater as a new water supply. The purpose of this report is to summarize progress on brackish aquifer studies and brackish groundwater production zone designations as required by Texas Water Code § 16.060.

In 2015, the 84th Texas Legislature passed House Bill 30 (now codified in Texas Water Code § 16.060), which directs the TWDB to (1) identify and designate brackish groundwater production zones in the state, (2) determine the volumes of groundwater that a brackish groundwater production zone can produce over 30- and 50-year periods without causing significant impact to water availability or water quality, (3) make recommendations on reasonable monitoring to observe the effects of brackish groundwater production within that zone, (4) work with groundwater conservation districts and stakeholders, and (5) provide a summary of brackish groundwater production zone designations in a biennial progress report on seawater and brackish groundwater desalination activities, due December 1 of each even-numbered year.

In 2019, the 86th Texas Legislature passed Senate Bill 1041, extending the deadline to complete zone designations from December 1, 2022, to December 1, 2032, and House Bill 722 that established a groundwater conservation district permitting framework for developing water supplies from TWDB-designated brackish groundwater production zones. In January 2021, the TWDB adopted rules to implement the permitting requirements codified in Texas Water Code § 36.1015.

In 2023, the 88th Texas Legislature appropriated $840,723 each fiscal year to the TWDB for fiscal years 2024 and 2025 to conduct studies regarding the designation of brackish groundwater production zones in aquifers of the state, excluding the Dockum Aquifer. Additionally, the General Appropriations Act from the 88th Texas Legislature requires the TWDB to provide a report on its progress relating to aquifer studies and brackish groundwater no later than December 1 of each odd-numbered year.

Studies on brackish aquifers

The TWDB uses legislative appropriations to complete internal studies and fund contracted work to support brackish aquifer studies and brackish groundwater production zone designations. In total, legislative appropriations to the TWDB have provided funding to complete both internal studies and 24 contracts for additional studies in the BRACS Program.

Overall, the TWDB has completed 16 brackish aquifer studies (Figure 1). Of the completed brackish aquifer studies, the TWDB completed nine internal studies and contractors completed seven. The TWDB is currently working on three brackish aquifer studies (Table 1). The TWDB has planned for future studies, which will include six aquifers that meet statutory criteria and are eligible for zone designation (Figure 2). The remaining eight aquifers that do not meet statutory criteria will be mapped and characterized after meeting the December 1, 2032, legislative deadline for completing the zone designations for qualifying aquifers.

In fiscal years 2022 and 2023, the TWDB completed internal brackish groundwater studies for the southern portion of the Trinity Aquifer and the Sparta Aquifer in East Texas. The TWDB funded six contracts totaling more than $1.6 million to support the completion of BRACS studies (Table 2). These six contracts are near completion or still ongoing.

One contract shown on Table 2 (the project to update, maintain, and host online tools) was cancelled due to the exceptionally high direct costs of annual maintenance and hosting by a third party. The funds originally intended for that project will be repurposed for a future project to migrate the BRACS Database to a new database management system. This redistribution of funds will allow the TWDB to repair and improve the tools internally.

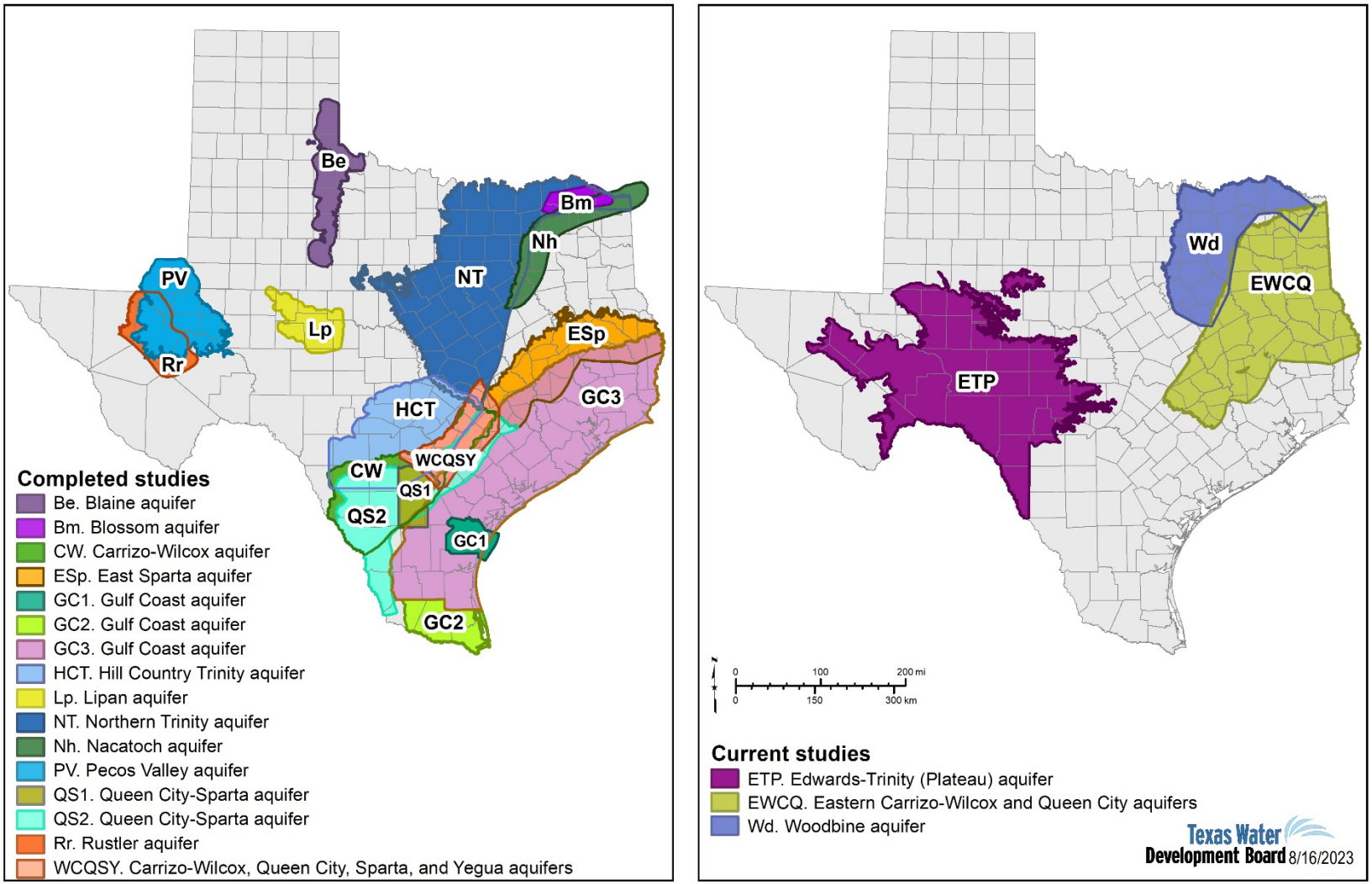

Figure 1. Completed and current brackish aquifer studies.

Table 1. TWDB brackish aquifer studies that are currently in progress.

Aquifer	Estimated completion	Scope of work
Woodbine Aquifer	Fall 2024	Evaluate publicly available water well records, geophysical well logs, and geologic reports. Enter information into the BRACS Database.
Queen City and Carrizo-Wilcox aquifers, East Texas	Summer 2025	Map brackish aquifers and their hydraulic properties. Estimate salinity of groundwater from water well records and geophysical well logs.
Edwards-Trinity (Plateau) Aquifer	Winter 2025	Estimate volumes of brackish groundwater. Prepare GIS files and report document(s).

Note: Refer to www.twdb.texas.gov/groundwater/bracs/studies.asp for status of brackish aquifer studies.

Table 2. Research studies to support brackish aquifer studies and brackish groundwater production zone designation contracted in fiscal years 2022 and 2023.

Study	Description	Contracted budget
Core testing for Upper Coastal Plains and Llano Uplift aquifers	Tested and analyzed cores of brackish aquifers for mineralogy, porosity, permeability, and cementation properties.	$130,000
Core testing for the Woodbine and Maverick Basin aquifers	Tested and analyzed cores of brackish aquifers for mineralogy, porosity, permeability, and cementation properties.	$175,000
Seismic data for Upper Coastal Plain System Aquifers in East Texas	Seismic data quality ranking, purchase, and post-processing for BRACS aquifer study areas of interest.	$374,963
Seismic data for the Edwards-Trinity (Plateau) Aquifer	Seismic data quality ranking, purchase, and post-processing for BRACS aquifer study areas of interest.	$374,777
Maverick Basin report	Prepare a resource document that details what is known about the Maverick Basin aquifer.	$49,698
Update, maintain, and host online injection well tools	Maintenance and hosting for a tool for BRACS staff to use in designating brackish groundwater production zones.	$514,000 (canceled contract)

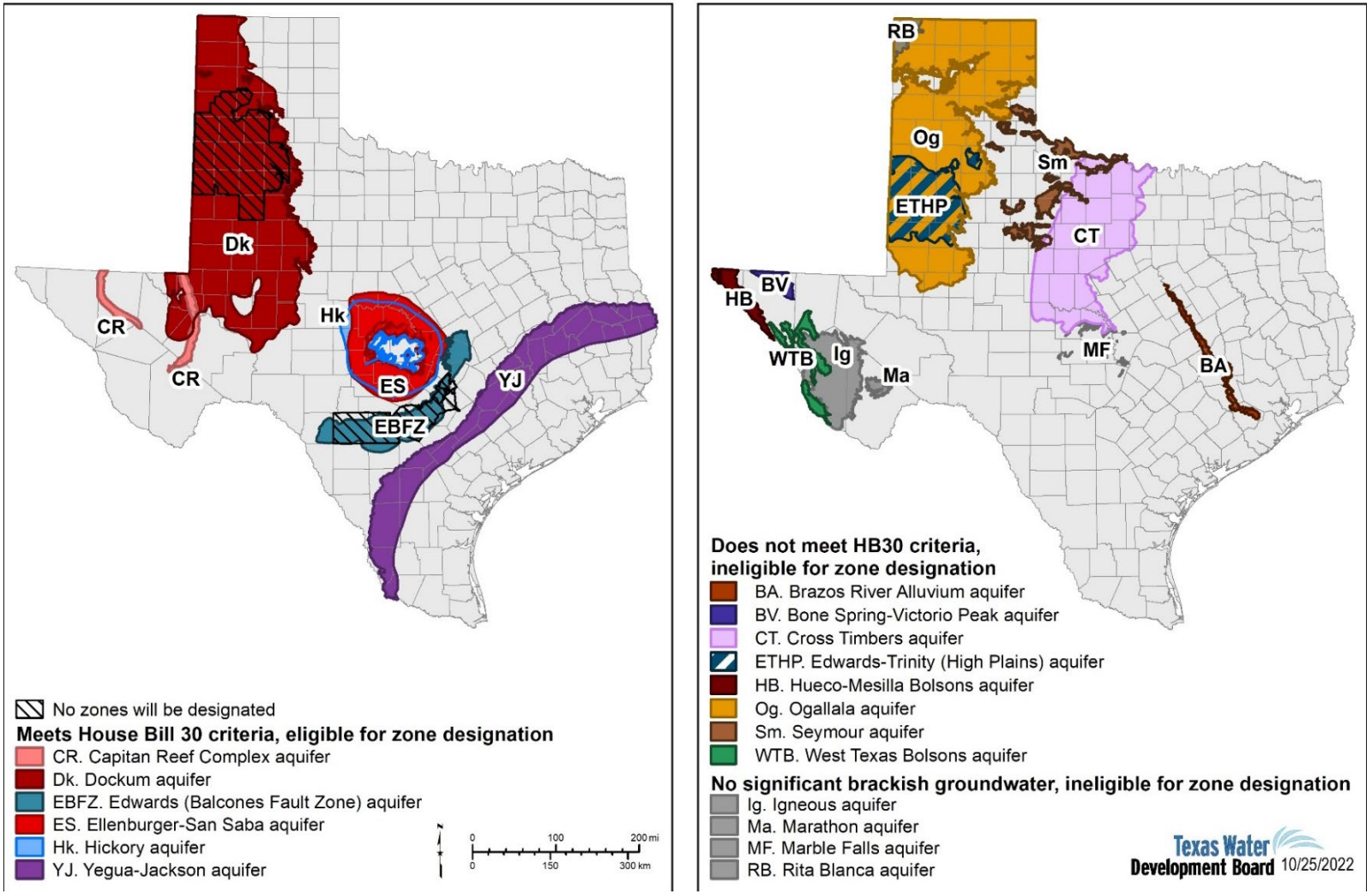

Figure 2. Future aquifer studies eligible for brackish groundwater production zone designation and the remaining aquifers to be characterized after December 1, 2032. Note: Several aquifers and geographic areas are excluded from zone designations by statute.

Designation of brackish groundwater production zones

To date, the TWDB has designated a total of 31 brackish groundwater production zones (Figure 3). In October 2016, the TWDB designated eight brackish groundwater production zones: one zone in the Carrizo-Wilcox Aquifer south of the Colorado River, four zones in the Gulf Coast Aquifer and bordering sediments, and three zones in the Rustler Aquifer. No zones were identified in the Blaine Aquifer. Summaries of each aquifer study were included in the *2016 Biennial Report on Seawater and Brackish Groundwater Desalination* submitted to the Texas Legislature on December 1, 2016.

In March 2019, the TWDB designated a total of 23 brackish groundwater production zones: 3 zones in the Blossom Aquifer, 5 zones in the Nacatoch Aquifer, and 15 zones in the Northern Trinity Aquifer. No zones were identified in the Lipan Aquifer. Summaries of each aquifer study were included in the *2022 Biennial Report on Seawater and Brackish Groundwater Desalination* submitted to the Texas Legislature on December 1, 2022. No brackish groundwater production zones have been designated since 2019.

The TWDB plans to evaluate four additional brackish aquifer studies for zone designation using the tools and research funded by legislative appropriations: Pecos Valley Aquifer (study completed in 2012); Carrizo-Wilcox, Queen City, Sparta, and Yegua aquifers of the Upper Coastal Plains in Central Texas (study completed in 2020); southern portion of the Trinity Aquifer (study completed in 2022); and the East Sparta aquifer (study completed in 2023). In addition, a secondary analysis of zone designations for the Gulf Coast Aquifer, the southern portion of the Carrizo-Wilcox Aquifer, and the Queen City and Sparta aquifers that were all contracted in 2016 may be warranted.

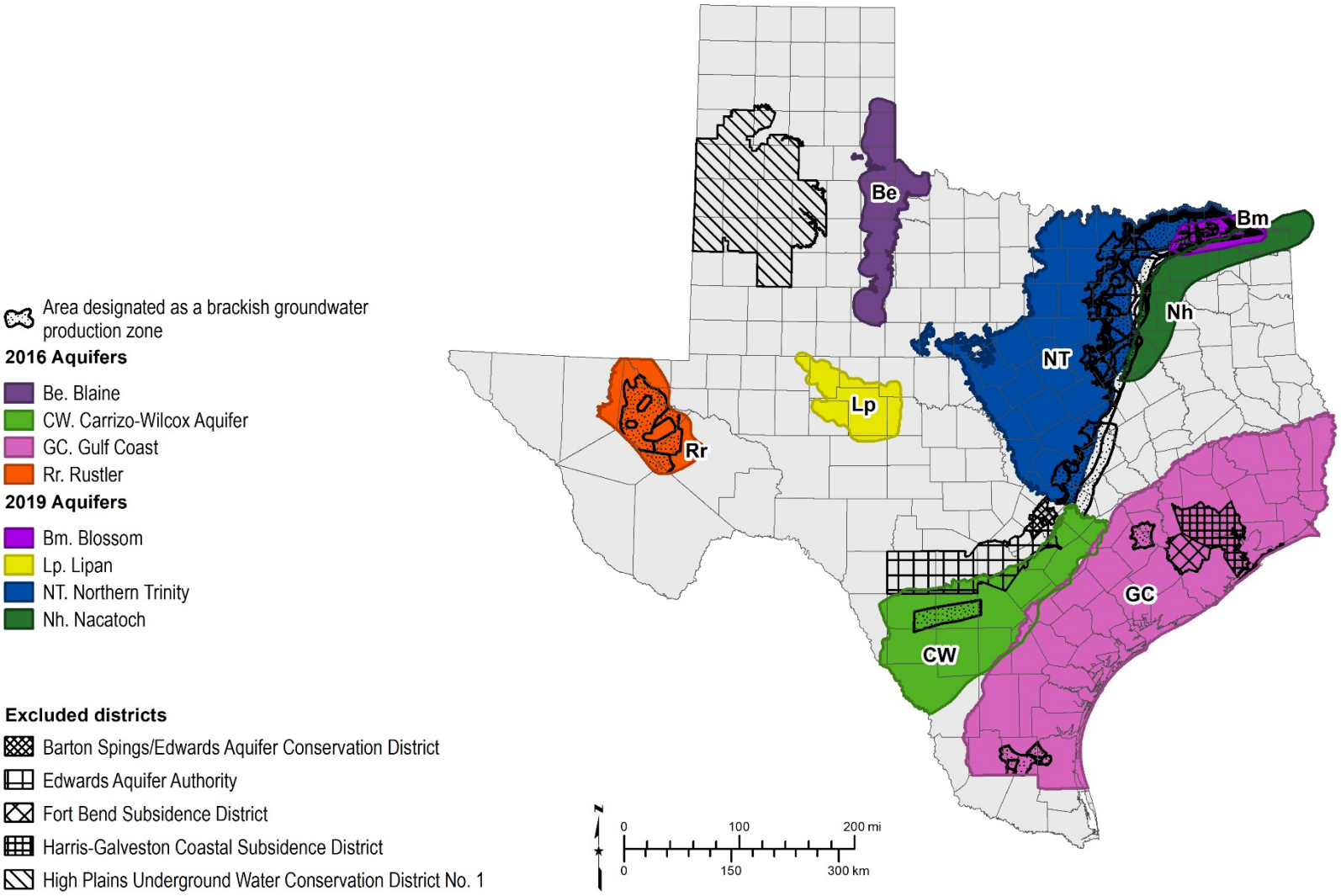

Figure 3. Brackish aquifer studies evaluated for brackish groundwater production zone designation and excluded districts per statute.

Status of legislative implementation

To achieve the goals of Texas Water Code § 16.060, the TWDB follows the following work process for current and future studies, updating as needed:

1. Conduct an aquifer characterization study (brackish aquifer study) of the whole or a portion of the aquifer
2. Apply statutory requirements and exclusion criteria and evaluate areas for brackish groundwater production zone designation
3. Receive stakeholder input on proposed brackish groundwater production zones
4. Recommend proposed brackish groundwater production zones to the agency's Board for approval and designation

At each step, work is documented and the deliverables are made publicly available as downloads from the TWDB website. The TWDB makes reasonable efforts to engage groundwater conservation districts and stakeholders at each step of the process, allowing ample opportunities to review and comment on materials. Throughout a study, TWDB staff give presentations at local groundwater management area and regional water planning group meetings within the vicinity of each aquifer. Information pertaining to all stakeholder meetings is posted on each of the BRACS study webpages in a timely manner.

The TWDB executed contracts in fiscal years 2022 and 2023 with consulting firms qualified to perform specific tasks (Table 2) for brackish aquifer studies such as core analysis, 2D seismic data ranking, purchasing, and post-processing, and to conduct a study of the Maverick Basin in South Texas. The TWDB also executed a contract with a firm to update and host the class II injection well buffer tool. However, due to an exceptionally high proposed annual cost, this contract was canceled, and the necessary work will be completed internally to use these funds more effectively. The $1,681,446 appropriated in fiscal years 2024 and 2025 from the 88th Session General Appropriations Act, Article VI, TWDB Rider 4, will be used to continue this work. Five new contract studies for fiscal years 2024 and 2025 have been approved by the agency's Board and will be solicited by January 2024 (Table 3).

Table 3. Planned contracted projects to support brackish aquifer studies and brackish groundwater production zone designation in fiscal years 2024 and 2025.

Project	Description	Contracted budget
Develop a BRACS study for the Ellenburger-San Saba and Hickory aquifers	Characterize hydrogeology and water quality, calculate salinity using logs, delineate zones, calculate volumes, and identify potential production areas.	not to exceed $550,000
Develop a BRACS study for the Yegua-Jackson Aquifer	Characterize hydrogeology and water quality, calculate salinity using logs, delineate zones, calculate volumes, and identify potential production areas.	not to exceed $400,000
Brackish groundwater pilot well	Collaborate with an entity that has a brackish groundwater strategy in the 2022 State Water Plan for data collection: logging tools, water quality analytes, and appropriate aquifer tests.	not to exceed $400,000
Develop a story map for a selected brackish study with brackish groundwater production zones	Showcase BRACS studies with designated brackish groundwater production zones using a story map, which is an effective interactive web interface, for stakeholders.	not to exceed $150,000
Digitize selected porosity logs	This work will help capture data that is not widespread in the historic water well geophysical log datasets. These data are necessary to determine aquifer properties that will be used for both the salinity and volume calculations.	not to exceed $100,000