Texas' Brackish Resources Aquifer Characterization System (BRACS)

2016 Southwest Section AAPG Convention
Abilene, Texas
April 11

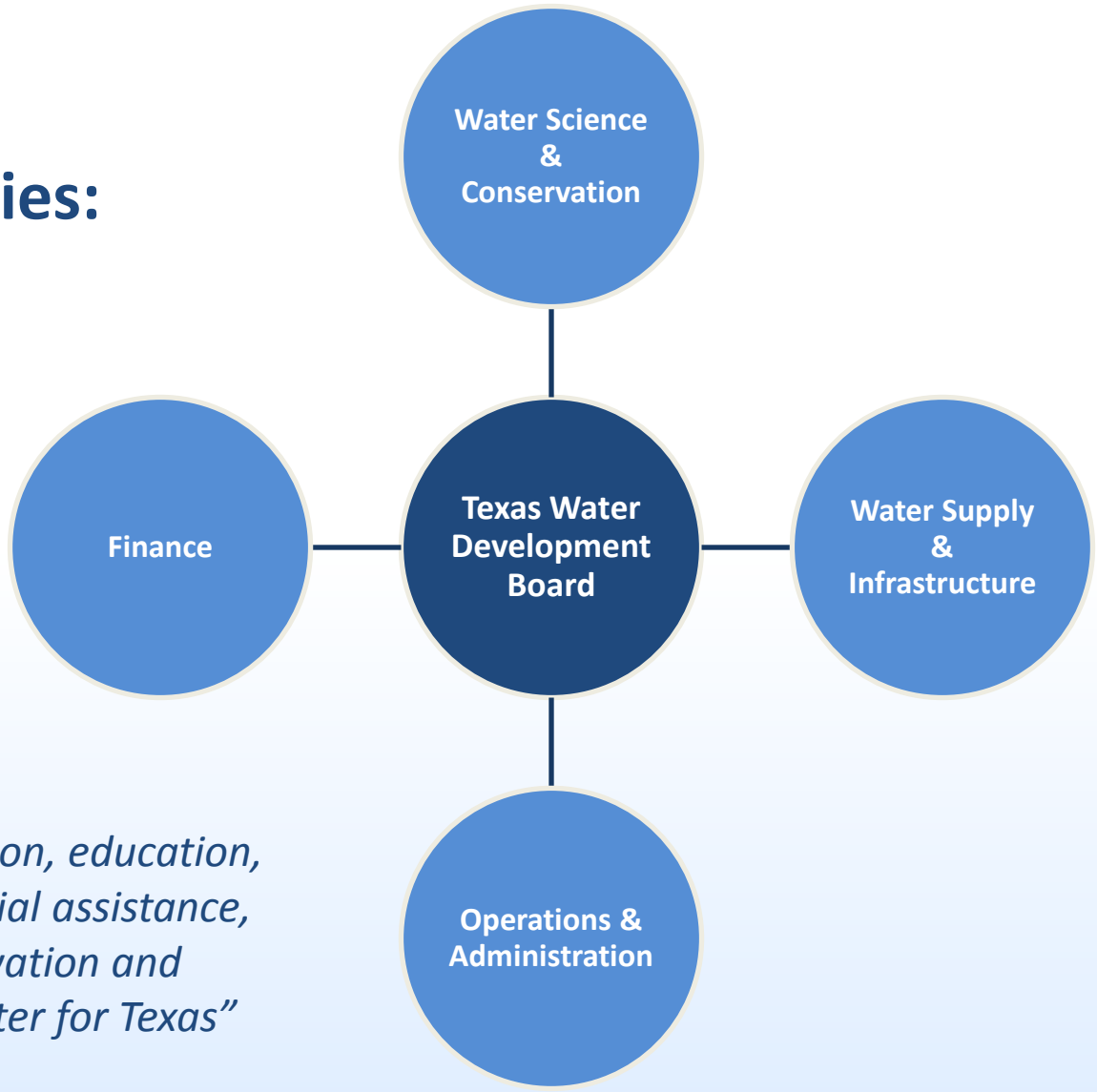
Andrea Croskrey

Texas Water Development Board

The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board's statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.

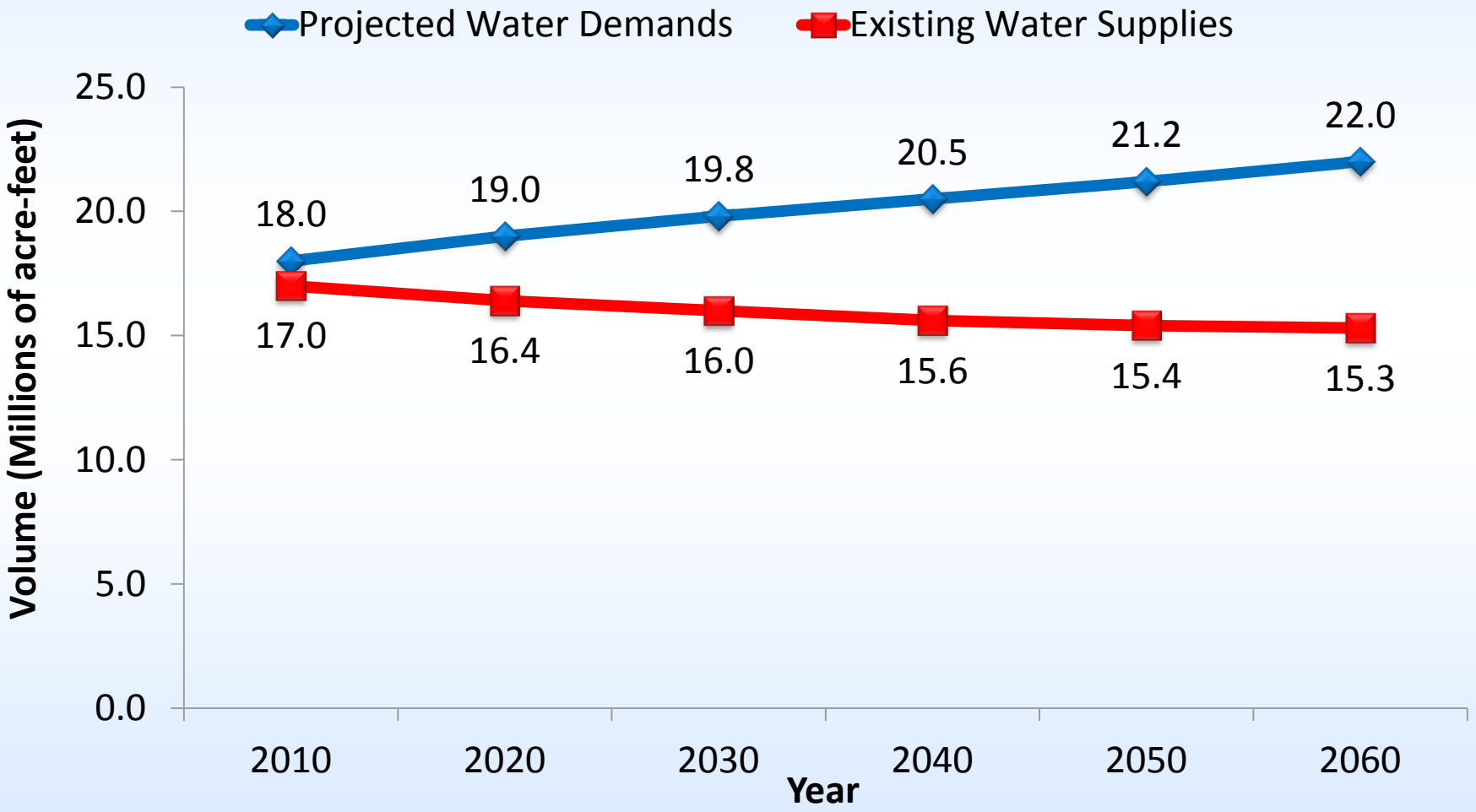
Primary Responsibilities:

- State Water Plan
- Funding
- Water Resource Data
- Outreach

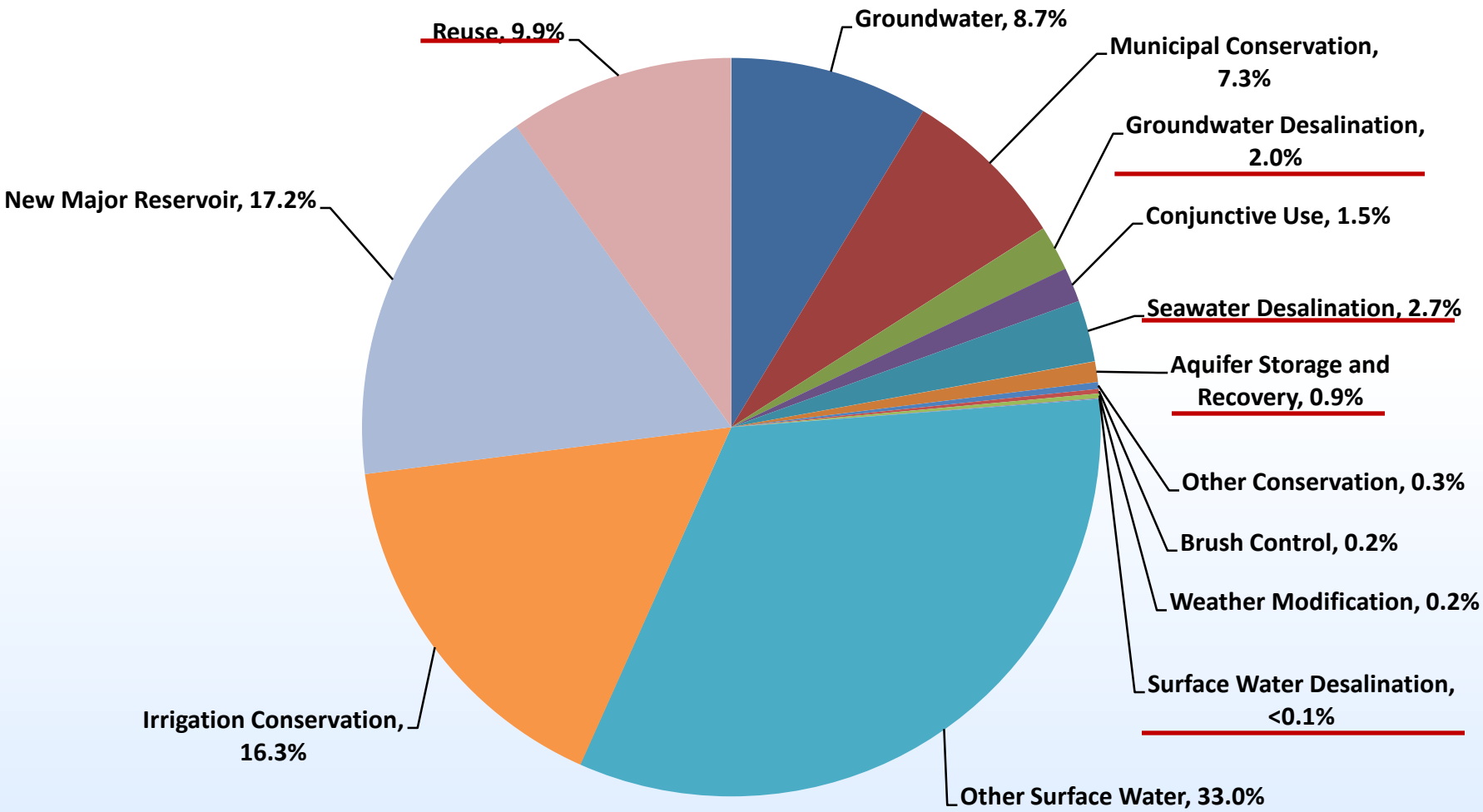


"To provide leadership, information, education, and support for planning, financial assistance, and outreach for the conservation and responsible development of water for Texas"

Projected Water Demands and Existing Supplies



Recommended Water Management Strategies by 2060



Amended 2012 State Water Plan

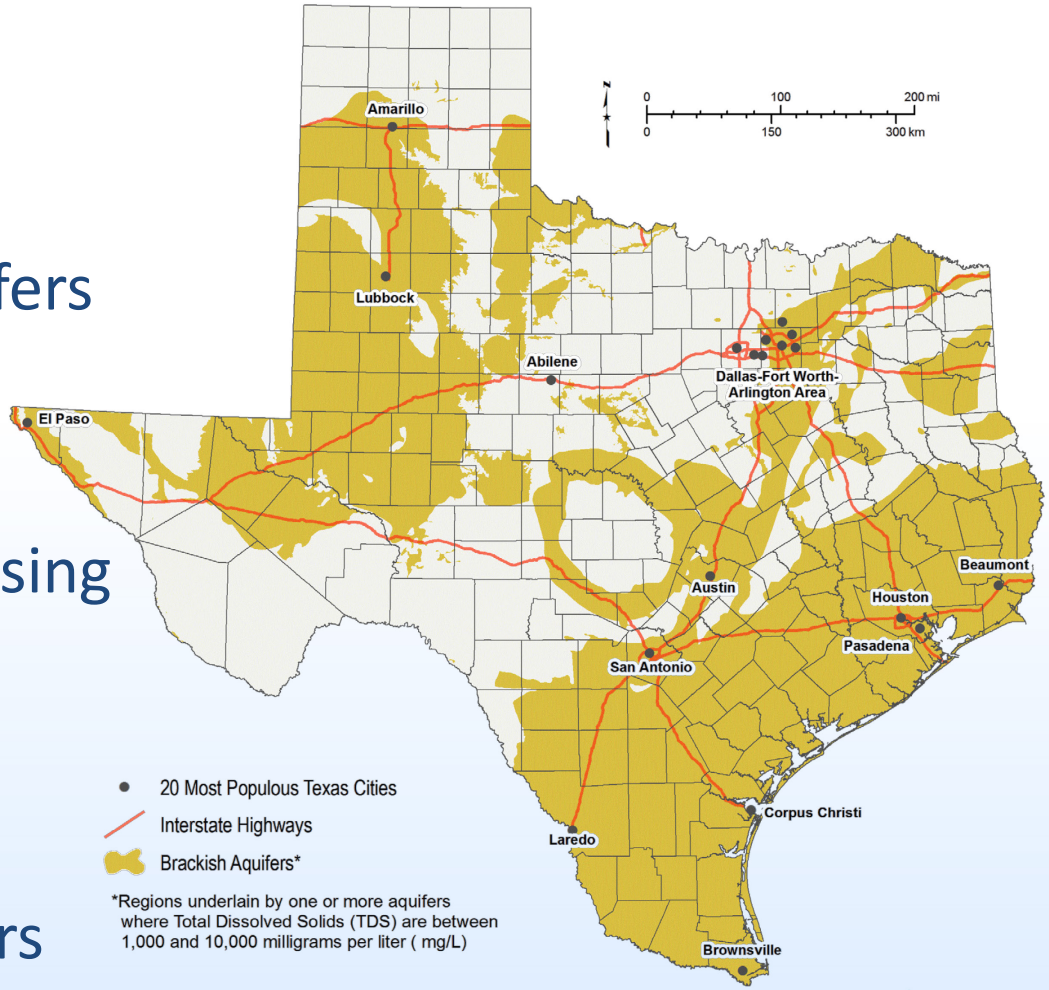
Innovative Water Technologies

"Our mission is to educate the water community on the use of nontraditional water supplies."

- Aquifer Storage & Recovery (ASR)
- Desalination
- Water Reuse
- Rainwater Harvesting
- Brackish Resources Aquifer Characterization System (BRACS)

Brackish Resources Aquifer Characterization System

- Collect data
- Map and characterize aquifers
- Map key water quality parameters
- Estimate saturated zones using net sand analysis
- Chemical parameters important to desalination
- Provide data to stakeholders



Brackish Groundwater

Saltier than fresh water, less salty than seawater

Groundwater Salinity Classification	Salinity Zone Code	Total Dissolved Solids Concentration (units: milligrams per liter)
Fresh	FR	0 to 1,000
Slightly Saline	SS	1,000 to 3,000
Moderately Saline	MS	3,000 to 10,000
Very Saline	VS	10,000 to 35,000
Brine	BR	Greater than 35,000

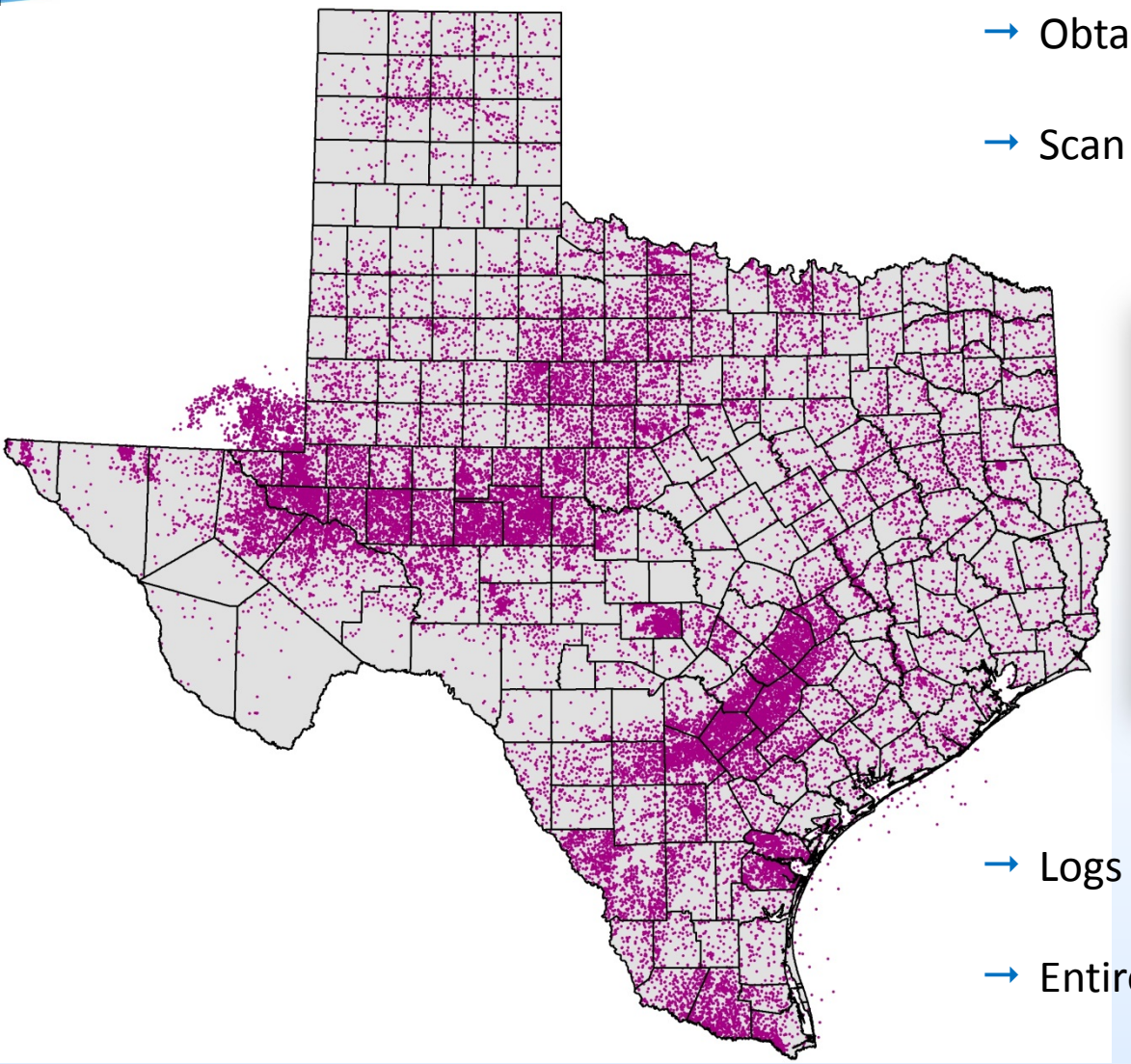
← Drinking Water Limit

← Major/Minor Aquifer (Texas) Mapped Limit

← Seawater

Modified from Winslow and Kister, 1956

BRACS Geophysical Well Log Collection

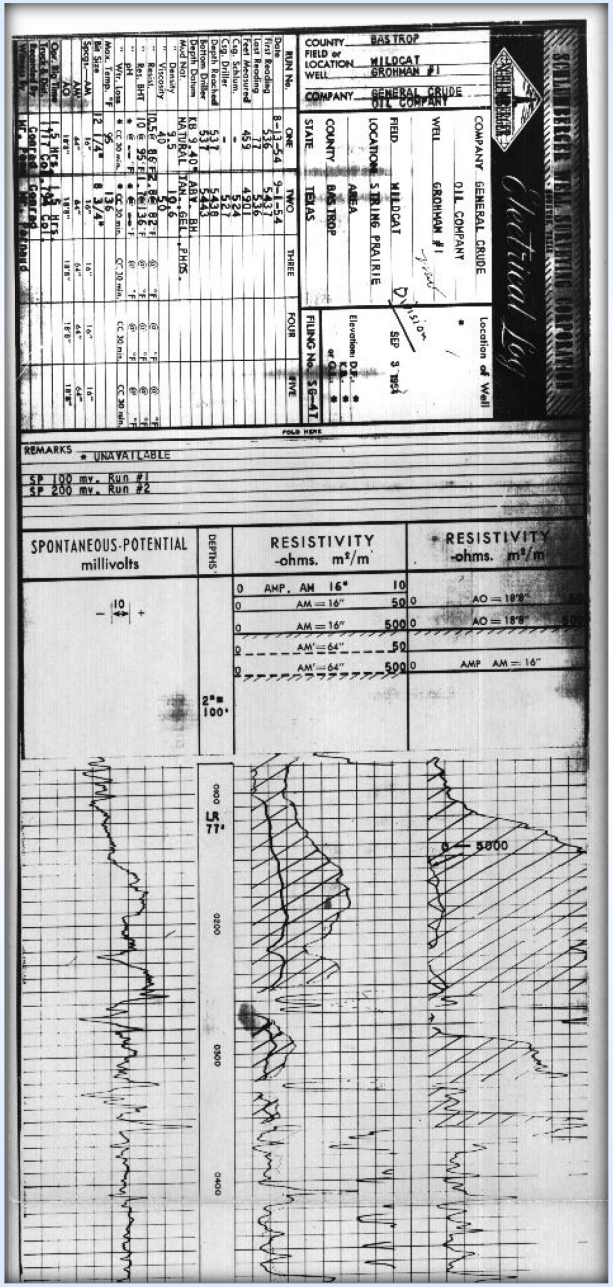


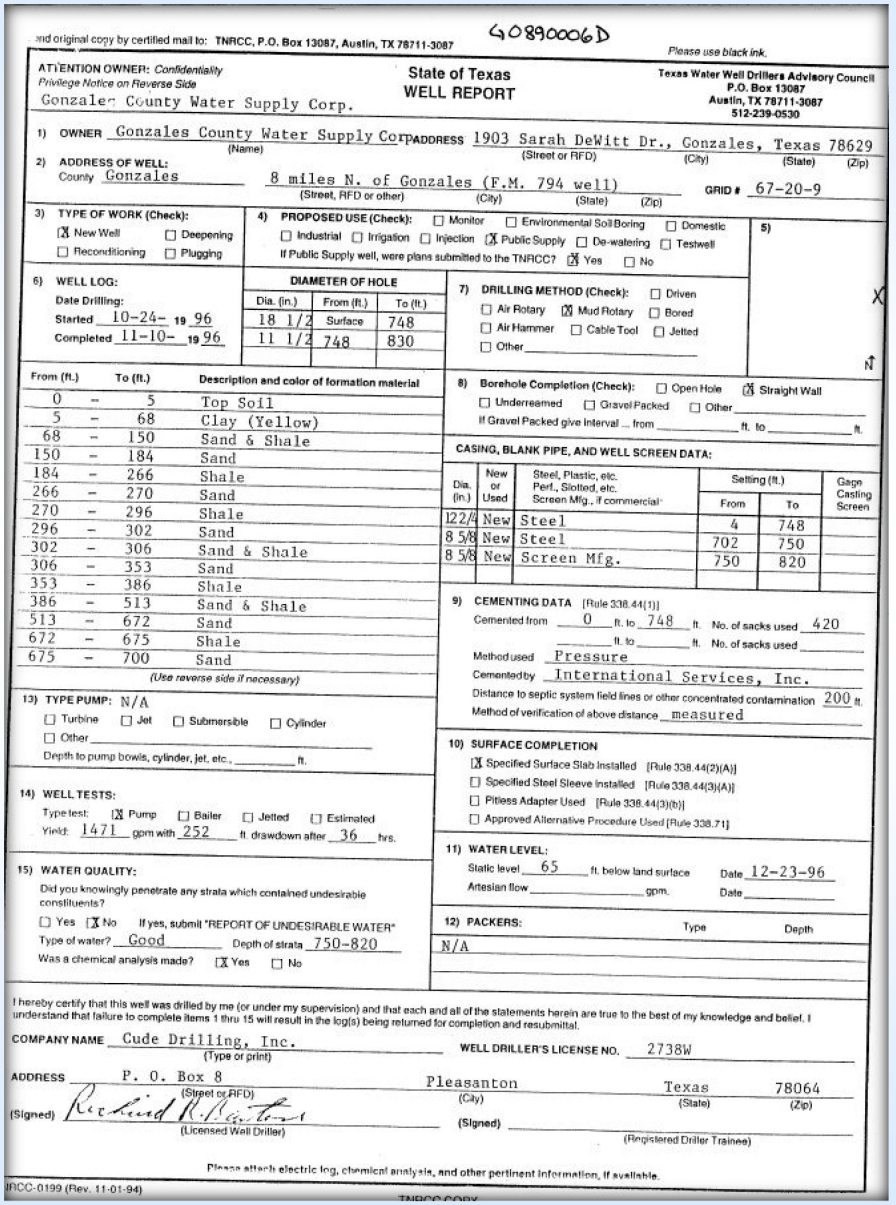
- Obtain oil, gas, and water well logs
- Scan into digital TIFF image files

- Logs must be non-confidential
- Entire collection available to the public

Total BRACS well control > 53,000 wells

Digital geophysical and water well logs





G0890006D

and original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087 — Please use black ink.

ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side

State of Texas WELL REPORT

Texas Water Well Drillers Advisory Council, P.O. Box 13087, Austin, TX 78711-3087, 512-239-0530

Gonzales County Water Supply Corp.

1) OWNER Gonzales County Water Supply Corp (Name) ADDRESS 1903 Sarah DeWitt Dr., (Street or RFD) Gonzales (City) Texas (State) 78629 (Zip)

2) ADDRESS OF WELL: County Gonzales — 8 miles N. of Gonzales (F.M. 794 well) (Street, RFD or other) (City) (State) (Zip) GRID # 67-20-9

3) TYPE OF WORK (Check): [X] New Well [ ] Deepening [ ] Reconditioning [ ] Plugging

4) PROPOSED USE (Check): [ ] Monitor [ ] Environmental Soil Boring [ ] Domestic [ ] Industrial [ ] Irrigation [ ] Injection [X] Public Supply [ ] De-watering [ ] Testwell
If Public Supply well, were plans submitted to the TNRCC? [X] Yes [ ] No

5)

6) WELL LOG:
Date Drilling: Started 10-24- 19 96 Completed 11-10- 19 96

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
18 1/2	Surface	748
11 1/2	748	830

7) DRILLING METHOD (Check): [ ] Driven [ ] Air Rotary [X] Mud Rotary [ ] Bored [ ] Air Hammer [ ] Cable Tool [ ] Jetted [ ] Other

8) Borehole Completion (Check): [ ] Open Hole [X] Straight Wall [ ] Underreamed [ ] Gravel Packed [ ] Other
If Gravel Packed give interval ... from ____ ft. to ____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	5	Top Soil
5	68	Clay (Yellow)
68	150	Sand & Shale
150	184	Sand
184	266	Shale
266	270	Sand
270	296	Shale
296	302	Sand
302	306	Sand & Shale
306	353	Sand
353	386	Shale
386	513	Sand & Shale
513	672	Sand
672	675	Shale
675	700	Sand

(Use reverse side if necessary)

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
12 1/4	New	Steel	4	748	
8 5/8	New	Steel	702	750	
8 5/8	New	Screen Mfg.	750	820	

13) TYPE PUMP: N/A
[ ] Turbine [ ] Jet [ ] Submersible [ ] Cylinder [ ] Other
Depth to pump bowls, cylinder, jet, etc., ____ ft.

9) CEMENTING DATA [Rule 338.44(1)]
Cemented from 0 ft. to 748 ft. No. of sacks used 420
ft. to ____ ft. No. of sacks used ____
Method used Pressure
Cemented by International Services, Inc.
Distance to septic system field lines or other concentrated contamination 200 ft.
Method of verification of above distance measured

14) WELL TESTS:
Type test: [X] Pump [ ] Bailer [ ] Jetted [ ] Estimated
Yield: 1471 gpm with 252 ft. drawdown after 36 hrs.

10) SURFACE COMPLETION
[X] Specified Surface Slab Installed [Rule 338.44(2)(A)]
[ ] Specified Steel Sleeve Installed [Rule 338.44(3)(A)]
[ ] Pitless Adapter Used [Rule 338.44(3)(b)]
[ ] Approved Alternative Procedure Used [Rule 338.71]

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
[ ] Yes [X] No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Good Depth of strata 750-820
Was a chemical analysis made? [X] Yes [ ] No

11) WATER LEVEL:
Static level 65 ft. below land surface Date 12-23-96
Artesian flow ____ gpm. Date ____

12) PACKERS: Type N/A Depth

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Cude Drilling, Inc. (Type or print) WELL DRILLER'S LICENSE NO. 2738W

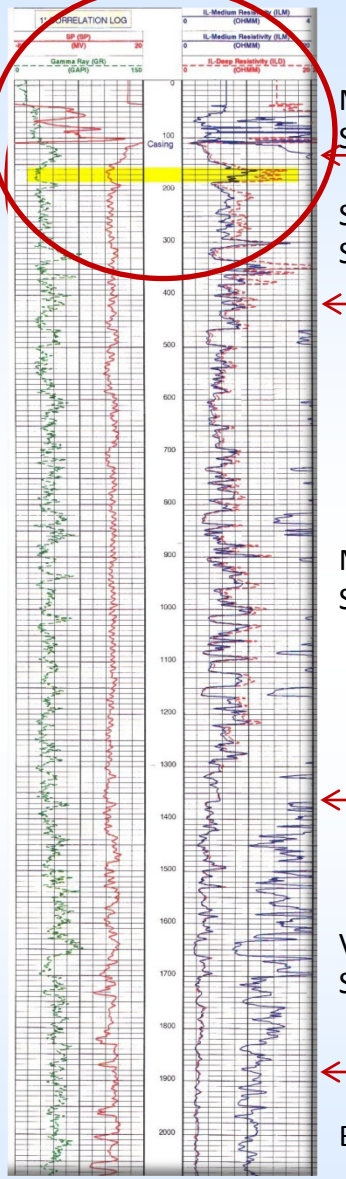
ADDRESS P. O. Box 8 (Street or RFD) Pleasanton (City) Texas (State) 78064 (Zip)

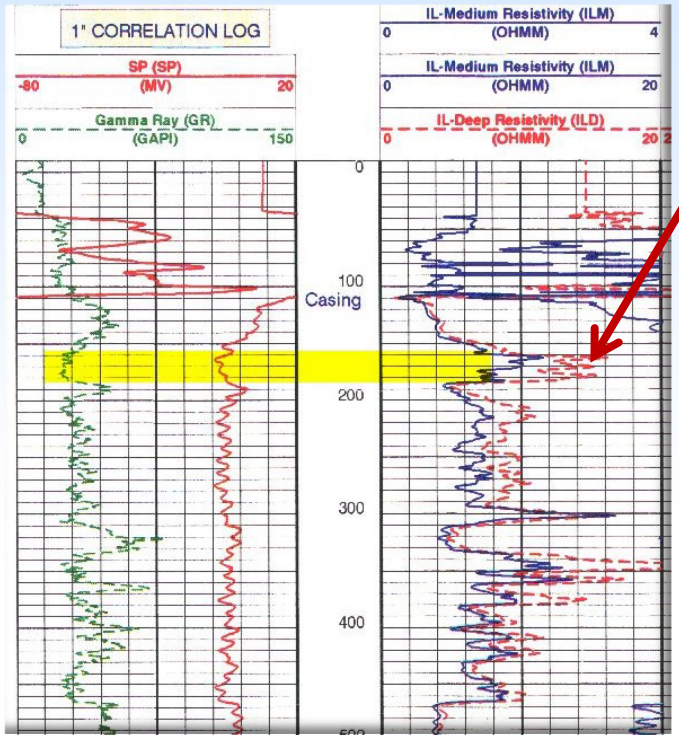
(Signed) Richard R. Cude (Licensed Well Driller) (Signed) ____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 11-01-94) TNRCC COPY

Log analysis to interpret Total Dissolved Solids

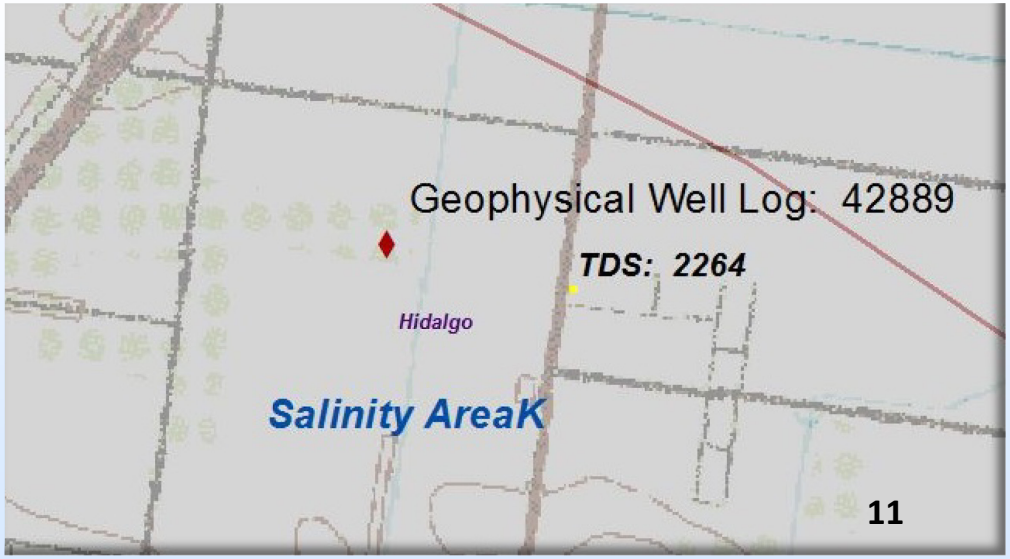




At 160 ft = 15 ohm-meter

R_{wa} Minimum Method interpreted TDS = 2,500 mg/L

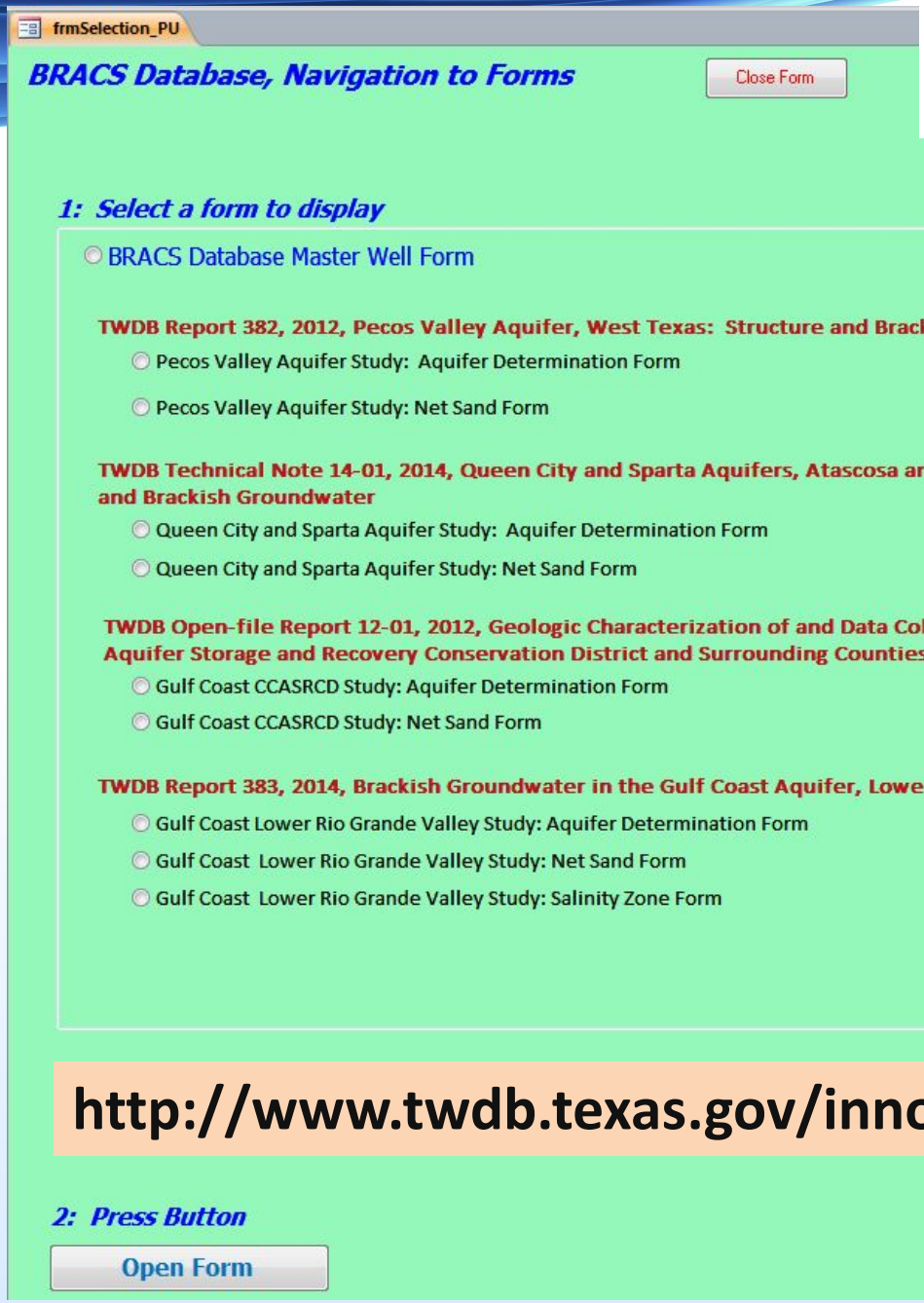
Water Well
TDS concentration = 2,264 mg/L
(well screen 170-349 ft)



BRACS Well ID 42889

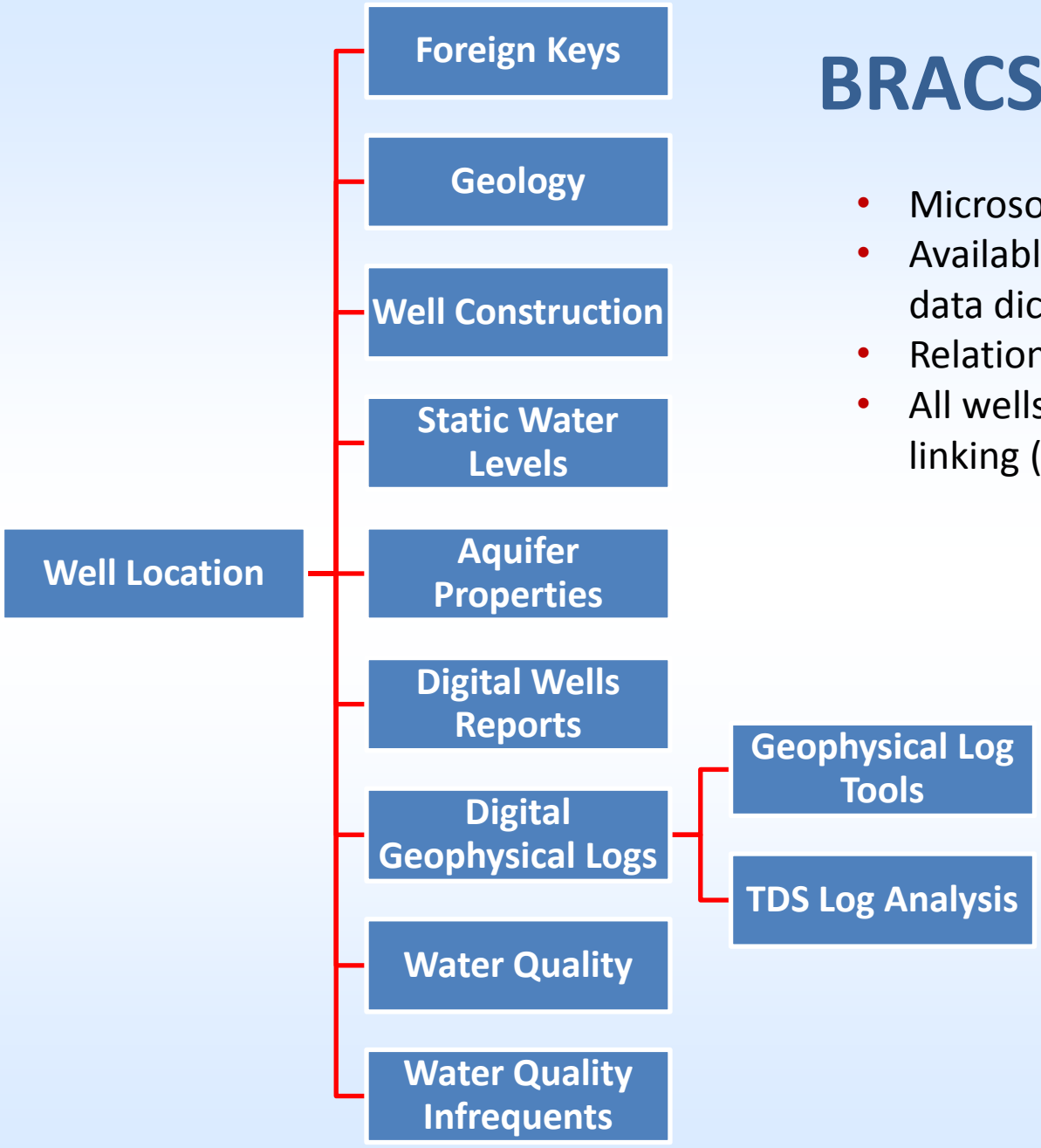
Source: Lower Rio Grande Valley BRACS Study

BRACS Public Database



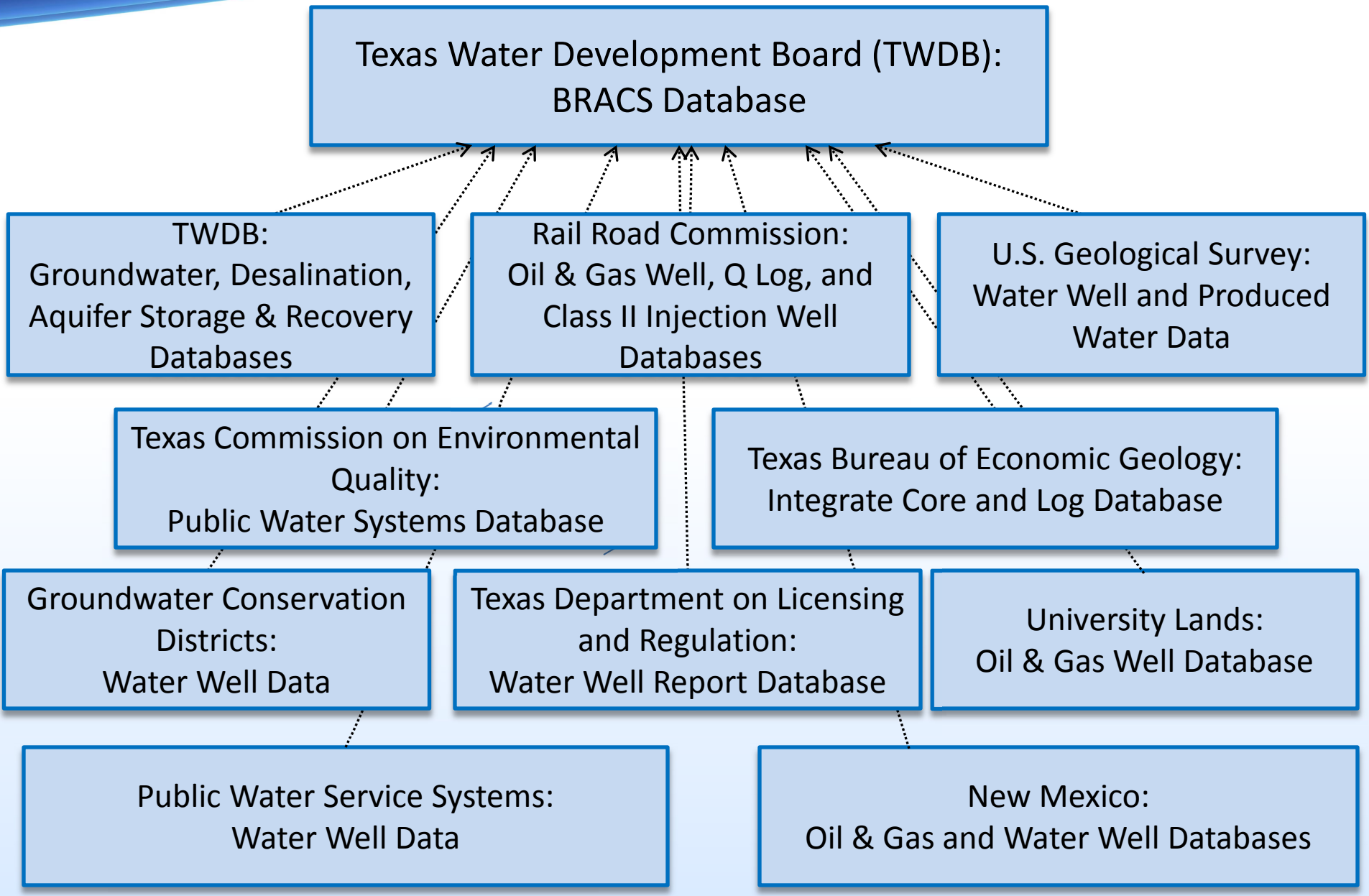
http://www.twdb.texas.gov/innovativewater/bracs/database.asp

BRACS Database Tables



- Microsoft Access Database
- Available on the TWDB web site (with data dictionary)
- Relational table design
- All wells are assigned a unique well id, linking (red line) records together

BRACS Supporting Databases



Water Data Interactive

File Edit View History Bookmarks Tools Help

Data, Apps and Maps | Texas W...

www.twdb.texas.gov/mapping/index.asp

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WATER DATA Interactive

- Interactive Apps and Maps
- TWDB Maps
- GIS Data
- Map Resources
- Data Services

State Water Implementation Fund for Texas (SWIFT)

Groundwater Data Viewer

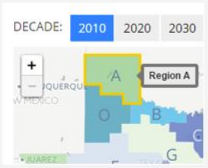
This interactive mapping application provides access to water-related data for Texas. The viewer contains several GIS datasets relating to water resources, including TWDB groundwater data, brackish groundwater data, and data

click to show more

Major Aquifer 3D Viewer

A three dimensional interactive viewer for exploring the major aquifers of Texas. After choosing an aquifer, users can choose to be re-directed to a 3D viewer that allows visual manipulation of the subsurface model. The

click to show more



2012 State Water Plan

This application displays water planning information on which the 2012 State Water Plan is based. Each water user group is mapped to a single point near its primary location; therefore, an entity with a large or multiple

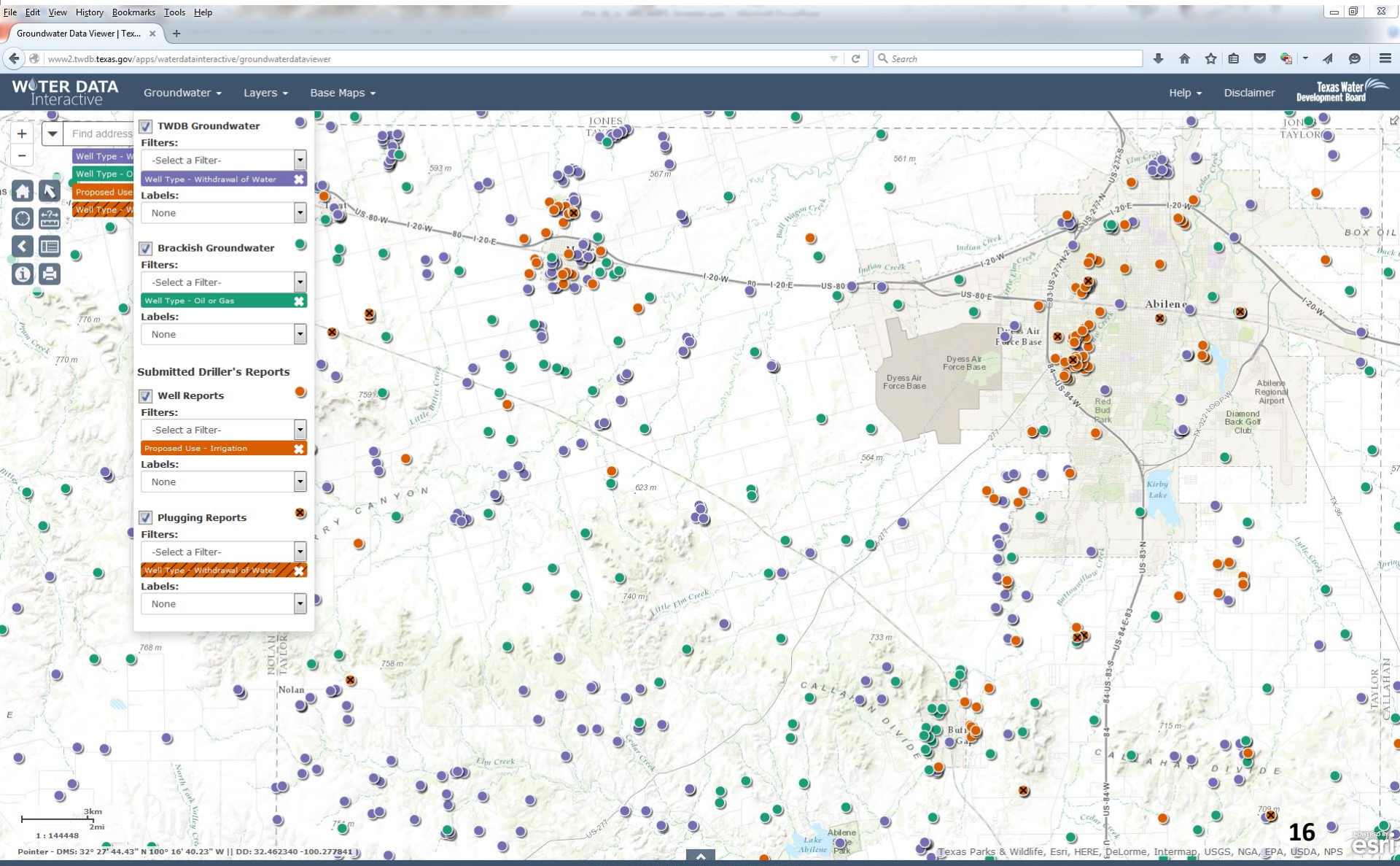
click to show more

Water Data for Texas

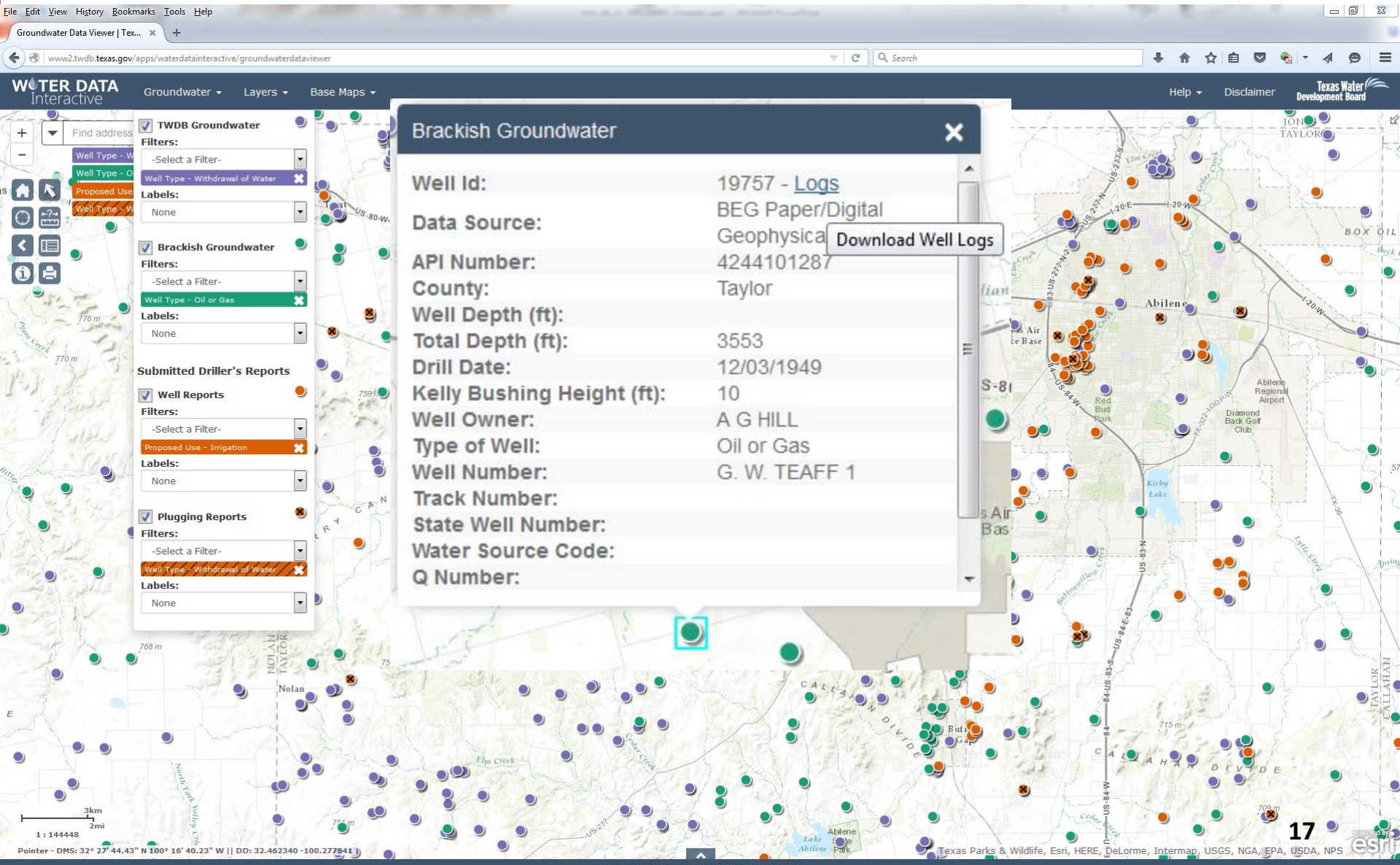
This website is a product of the Texas Water Development Board (TWDB) Water Science Conservation Division and is made possible by the support of management and staff at TWDB. This project is part of our ongoing efforts to

click to show more

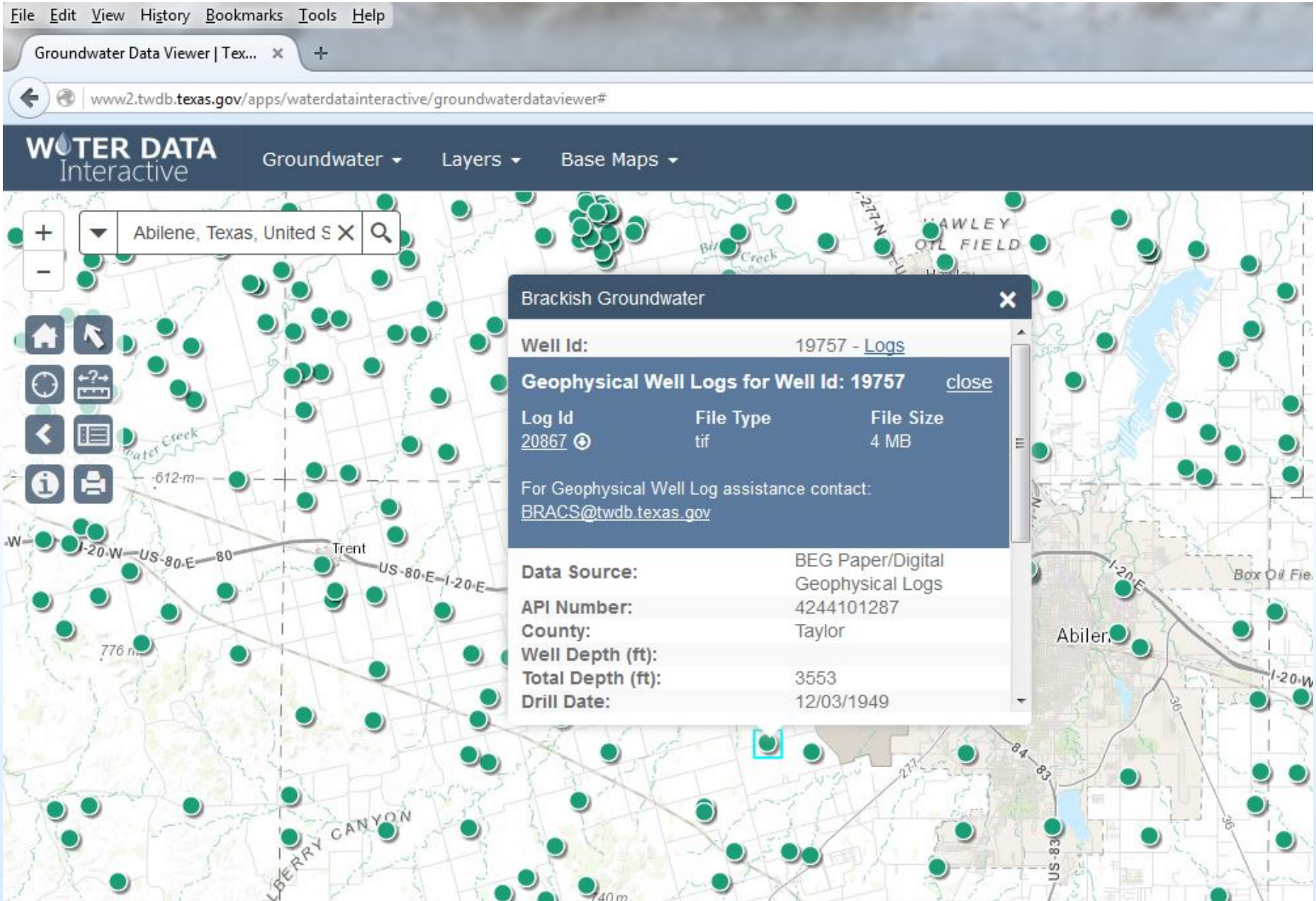
Groundwater Data Viewer



Groundwater Data Viewer

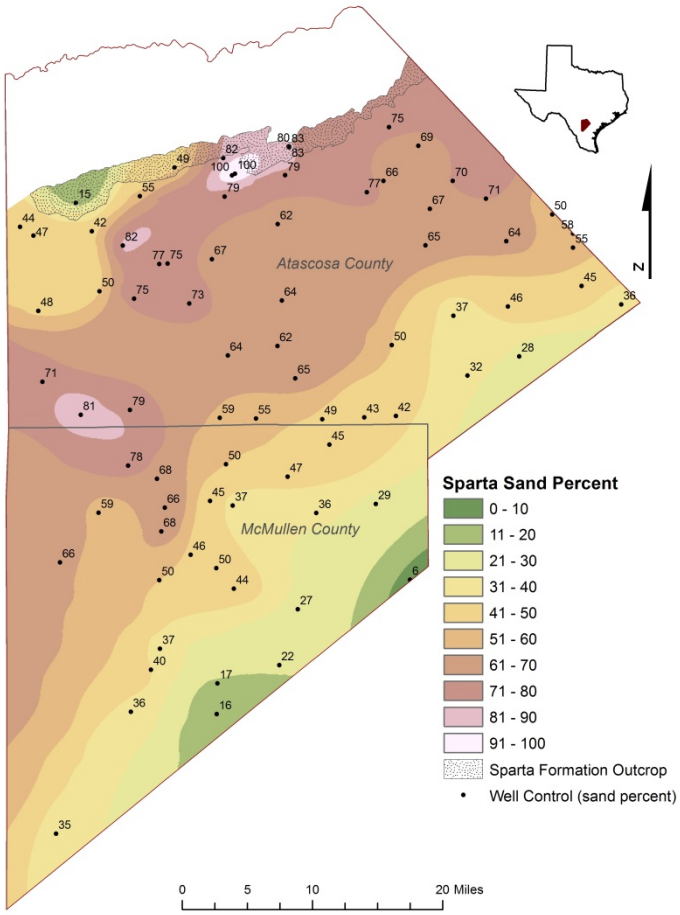


Groundwater Data Viewer



BRACS Data

- GIS data
  - Locate geophysical well logs
  - Lateral extent of brackish aquifers
    - Stratigraphy and Lithology Interpolation
    - Water quality parameters
    - Saturated Zones
  - Rasters and shapefiles
  - Available for download online



BRACS Studies

- Published reports

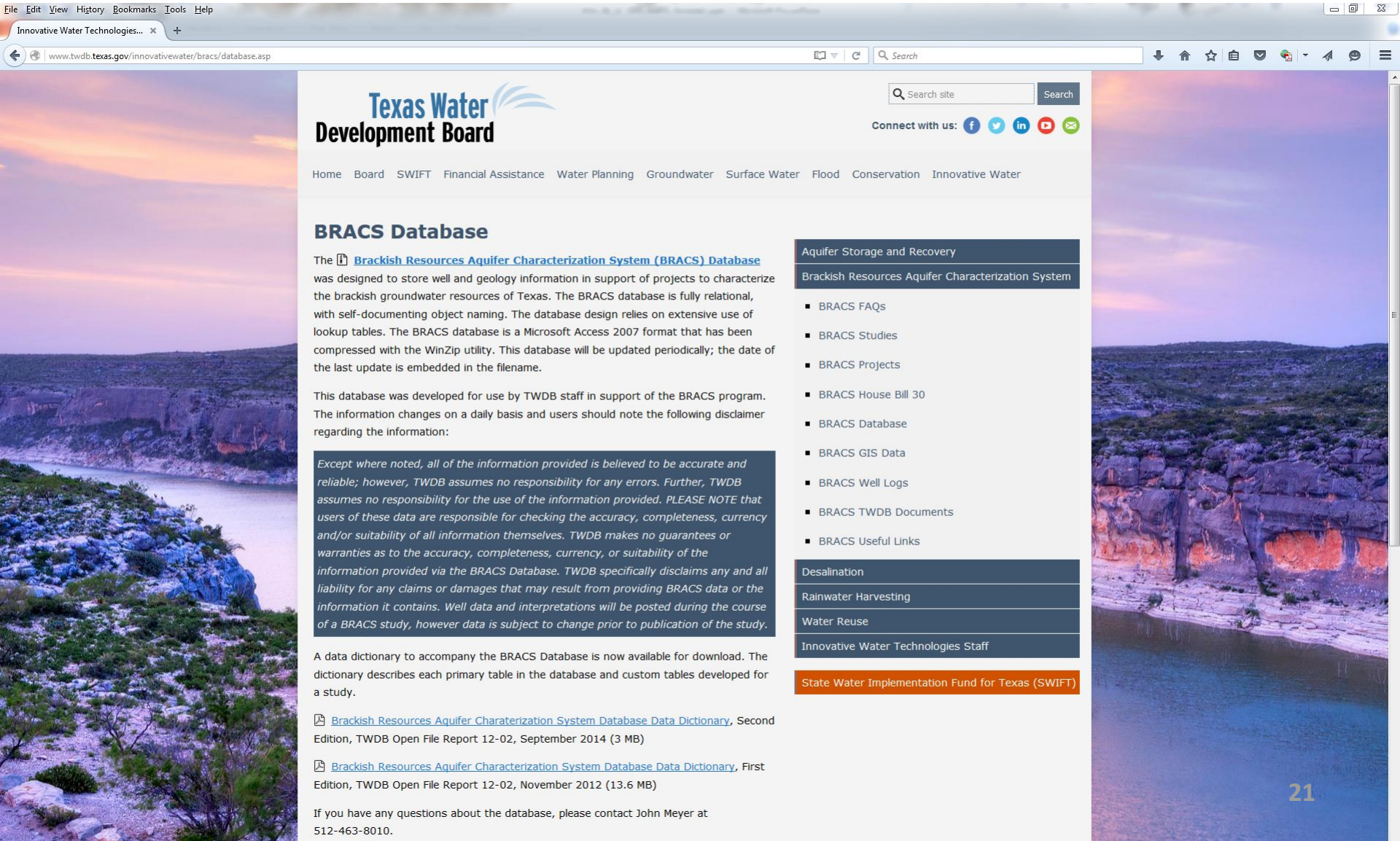
http://www.twdb.texas.gov/innovativewater/bracs/docs.asp

- GIS Datasets
- BRACS Database
- Well logs

The real value is in the data:

Stakeholders can use this to evaluate potential groundwater exploration areas.

BRACS Website for Database



Study Reports and GIS Data

File Edit View History Bookmarks Tools Help

Innovative Water Technologies...

www.twdb.texas.gov/innovativewater/bracs/studies.asp

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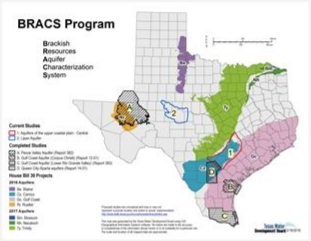
BRACS Studies



- Current Studies
- Completed Studies

Current Studies

Project	Start Date	End Date	Total Cost	Keywords
Wilcox, Carrizo, Queen City, Sparta, and Yegua Aquifers, Central Texas: Structure and Brackish Groundwater	Spring 2013	August 2016	In-house	Brackish, Groundwater, Aquifers
Lipan Aquifer: Structure and Brackish Groundwater	Summer 2014	August 2016	In-house	Brackish, Groundwater, Aquifers

Completed Studies

Complete Date	Project	Report Number	Funding
09/ 2014	Brackish Groundwater in the Gulf Coast Aquifer, Lower Rio Grande Valley, Texas Gulf Coast Aquifer GIS Datasets (127.0 MB)	383	In-house
05/ 2014	Queen City and Sparta Aquifers, Atascosa and McMullen Counties, Texas:	14-01	In-house

Aquifer Storage and Recovery

Brackish Resources Aquifer Characterization System

- BRACS FAQs
- BRACS Studies
- BRACS Projects
- BRACS House Bill 30
- BRACS Database
- BRACS GIS Data
- BRACS Well Logs
- BRACS TWDB Documents
- BRACS Useful Links

Desalination

Rainwater Harvesting

Water Reuse

Innovative Water Technologies Staff

State Water Implementation Fund for Texas (SWIFT)

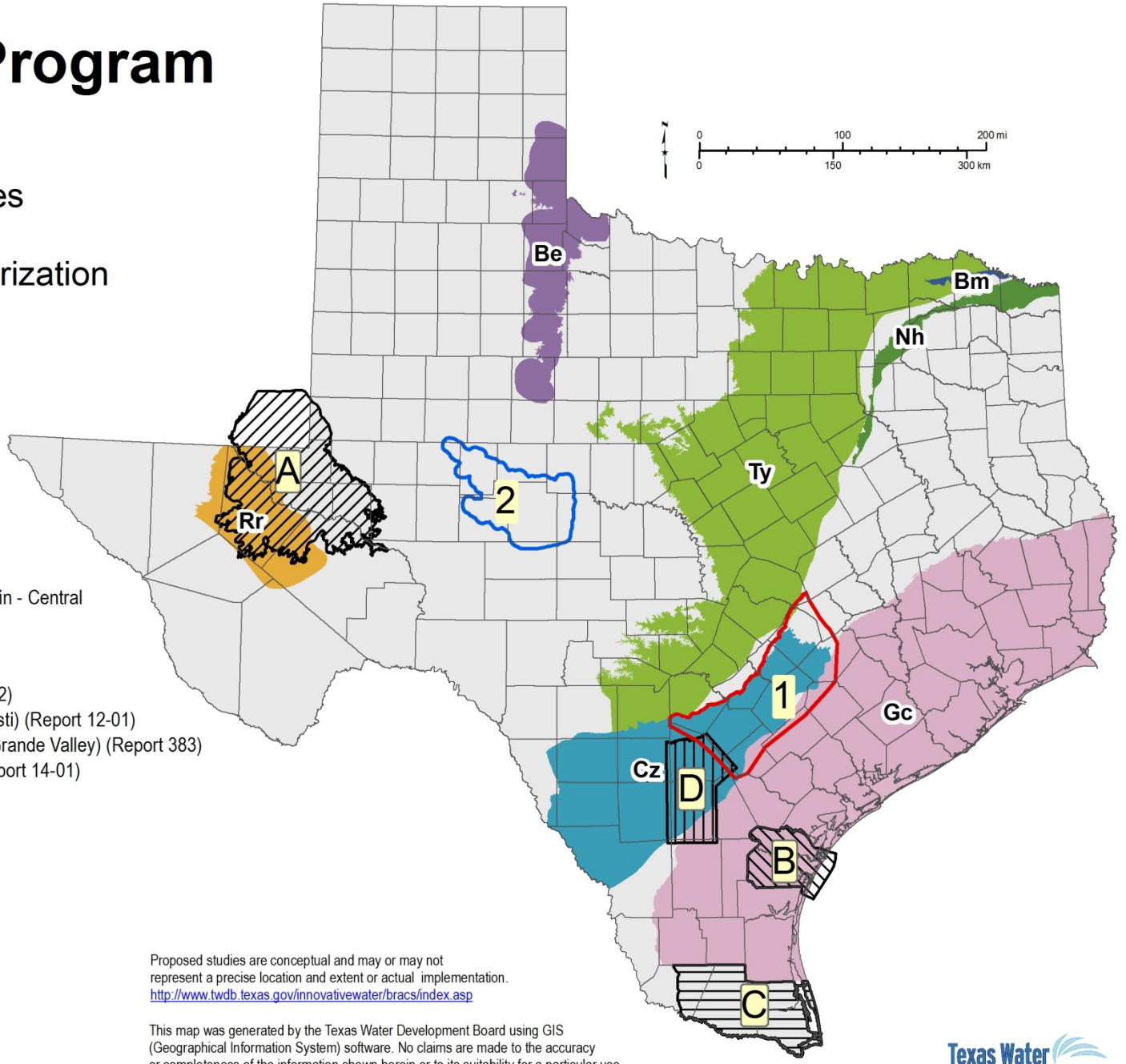
Development of Brackish Groundwater

House Bill 30 (84th Texas Legislature, 2015)

- $2,000,000 appropriated from General Revenue Fund
- Note that $1,681,446 was dedicated to funding the BRACS studies. The remainder paid for two FTE.
- Four aquifer projects must be completed by December 1, 2016
- Three other contracted projects - must be completed by August 31, 2017
- Map brackish groundwater production zones and estimate 30- and 50-year production without causing significant impact to water quality or water quantity in freshwater aquifers
- Include status report in every biennial desalination report, next report due December 1, 2016 (Water Code Sec. 16.060)
- Remaining aquifers in the state required to be mapped by December 1, 2022

BRACS Program

Brackish
Resources
Aquifer
Characterization
System



Current Studies

- 1. Aquifers of the upper coastal plain - Central
- 2. Lipan Aquifer

Completed Studies

- A. Pecos Valley Aquifer (Report 382)
- B. Gulf Coast Aquifer (Corpus Christi) (Report 12-01)
- C. Gulf Coast Aquifer (Lower Rio Grande Valley) (Report 383)
- D. Queen City-Sparta aquifers (Report 14-01)

House Bill 30 Projects

2016 Aquifers

- Be. Blaine
- Cz. Carrizo
- Gc. Gulf Coast
- Rr. Rustler

2017 Aquifers

- Bm. Blossom
- Nh. Nacatoch
- Ty. Trinity

Proposed studies are conceptual and may or may not represent a precise location and extent or actual implementation.
http://www.twdb.texas.gov/innovativewater/bracs/index.asp

This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein or to its suitability for a particular use. The scale and location of all mapped data are approximate.

Texas Water Development Board 2/18/2016

We appreciate data!

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Texas Water Development Board

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(512) 463-2865

http://www.twdb.texas.gov/innovativewater/index.asp

Draft 2017 Water Plan:
https://2017.texasstatewaterplan.org/statewide