

Status of the TWDB's Brackish Aquifer Mapping Program

Texas Groundwater Protection Committee

April 20, 2016

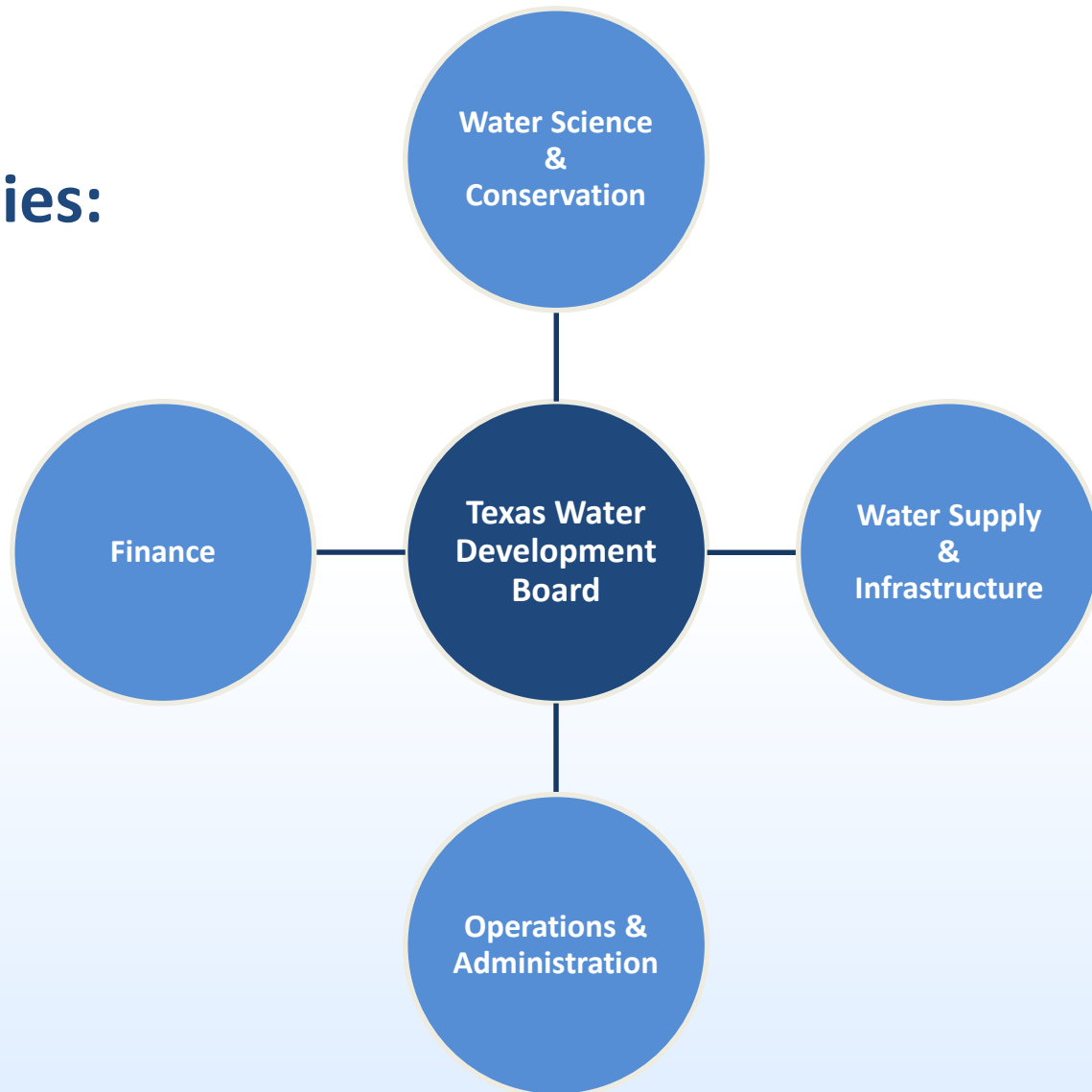
John Meyer



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:

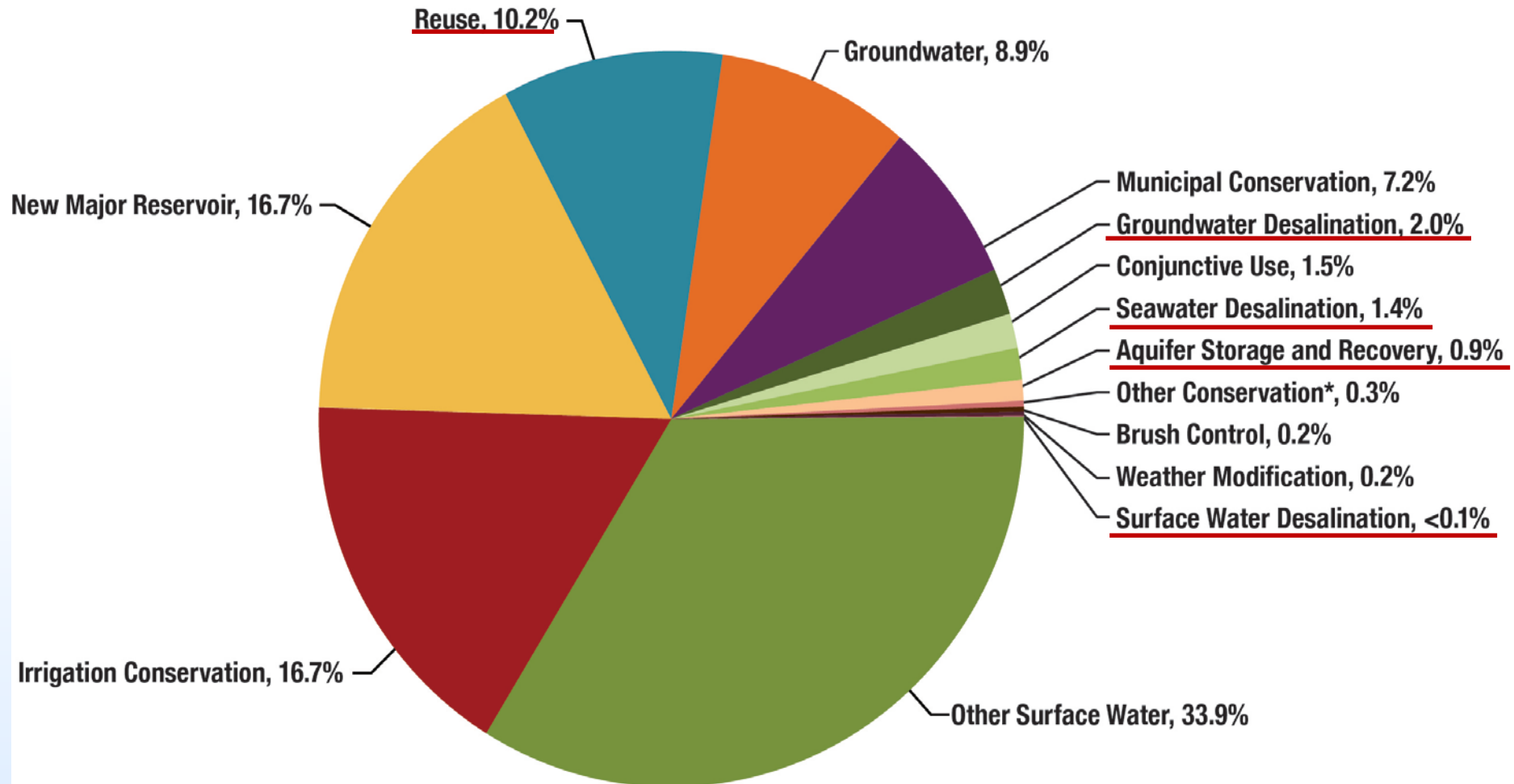
- State Water Plan
- Water Funds
- Water Resource Data
- Outreach



Innovative Water Technologies

- 💧 Aquifer Storage & Recovery
- 💧 BRACS
- 💧 Desalination
- 💧 Rainwater Harvesting
- 💧 Water Reuse

Recommended Water Management Strategies by 2060





BRACS

Brackish Resources Aquifer Characterization System

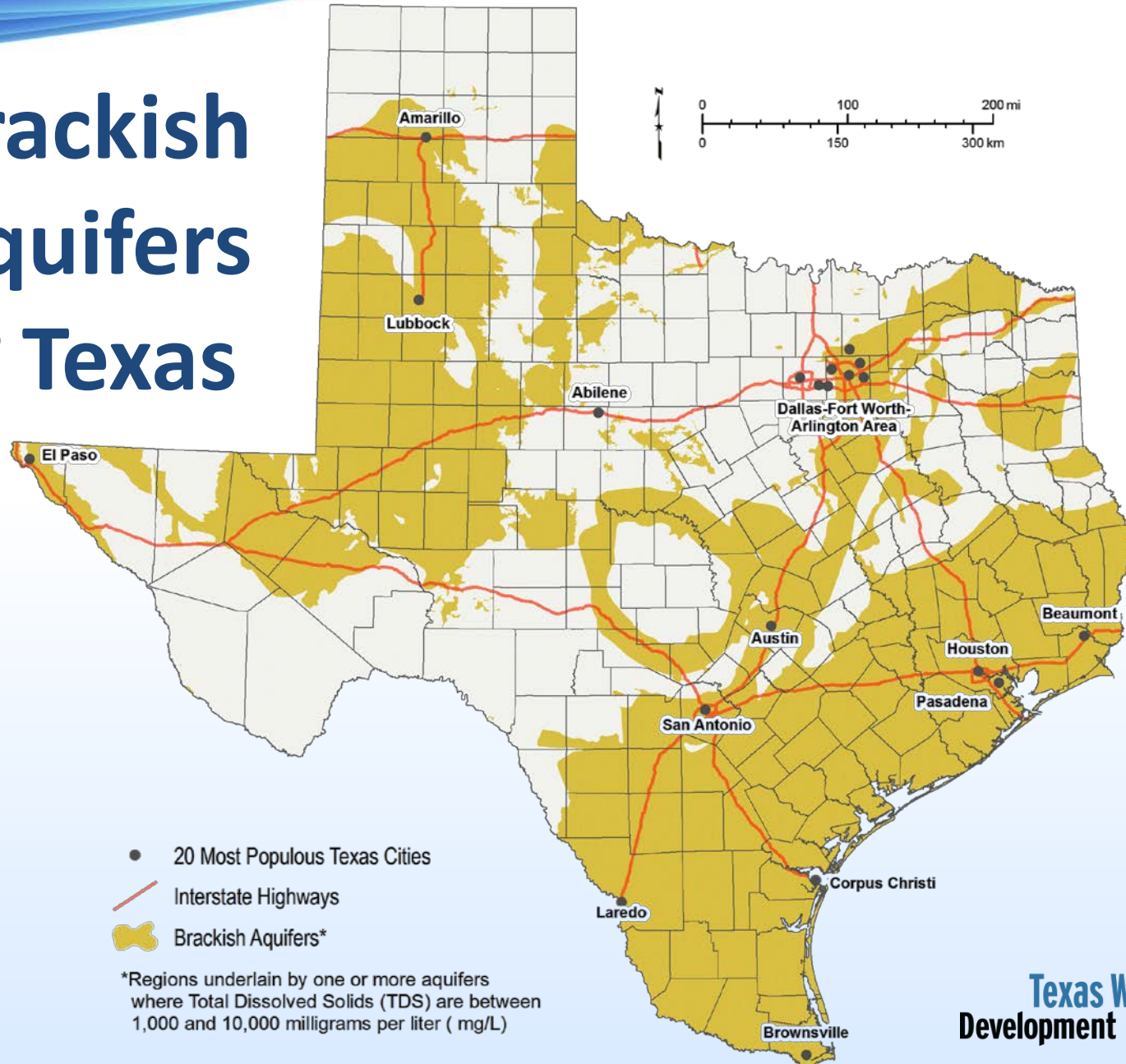
- Collect data
- Map and characterize existing brackish aquifers
- Map key water quality parameters
- Estimate saturated zones using net sand analysis
- Chemical parameters important to desalination
- Provide data to stakeholders

Brackish Groundwater

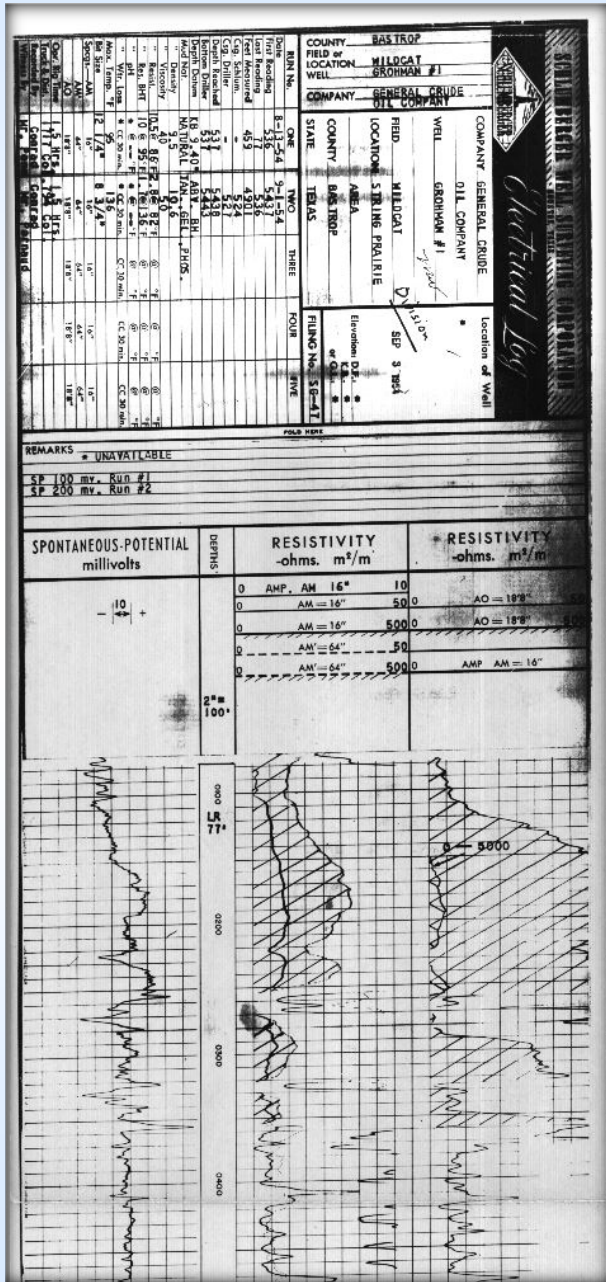
Saltier than fresh water, less salty than seawater

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	← Drinking Water Limit
Moderately Saline	MS	3,000 to 10,000	← Major/Minor Aquifer (Texas) Mapped Limit
Very Saline	VS	10,000 to 35,000	
Brine	BR	Greater than 35,000	← Seawater

Brackish Aquifers of Texas



Digital geophysical and water well logs



4089006D

Please use black ink.

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

State of Texas
WELL REPORT

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

ATTENTION OWNER: Confidentiality
Privilege Notice on Reverse Side
Gonzales County Water Supply Corp.

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

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

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

4) PROPOSED USE (Check):
 Industrial Irrigation Injection Public Supply De-watering Testwell
If Public Supply well, were plans submitted to the TNFCC? Yes No

5) DRILLING METHOD (Check):
 Driven
 Air Rotary Mud Rotary Bored
 Air Hammer Cable Tool Jetted
 Other

6) WELL LOG:
Date Drilling: Started 10-24-1996 Completed 11-10-1996

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

7) DRILLING METHOD (Check):
 Open Hole Straight Wall
 Underreamed Gravel Packed Other
If Gravel Packed give Interval ... from _____ ft. to _____ ft.

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
12 7/8	New	Steel	4	748	
8 5/8	New	Steel	702	750	
8 5/8	New	Screen Mfg.	750	820	

8) BOREHOLE COMPLETION (Check):
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

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

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

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

12) PACKERS:
Type _____ Depth _____
N/A

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

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

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

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. WELL DRILLER'S LICENSE NO. 2738W
(Type or print)

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

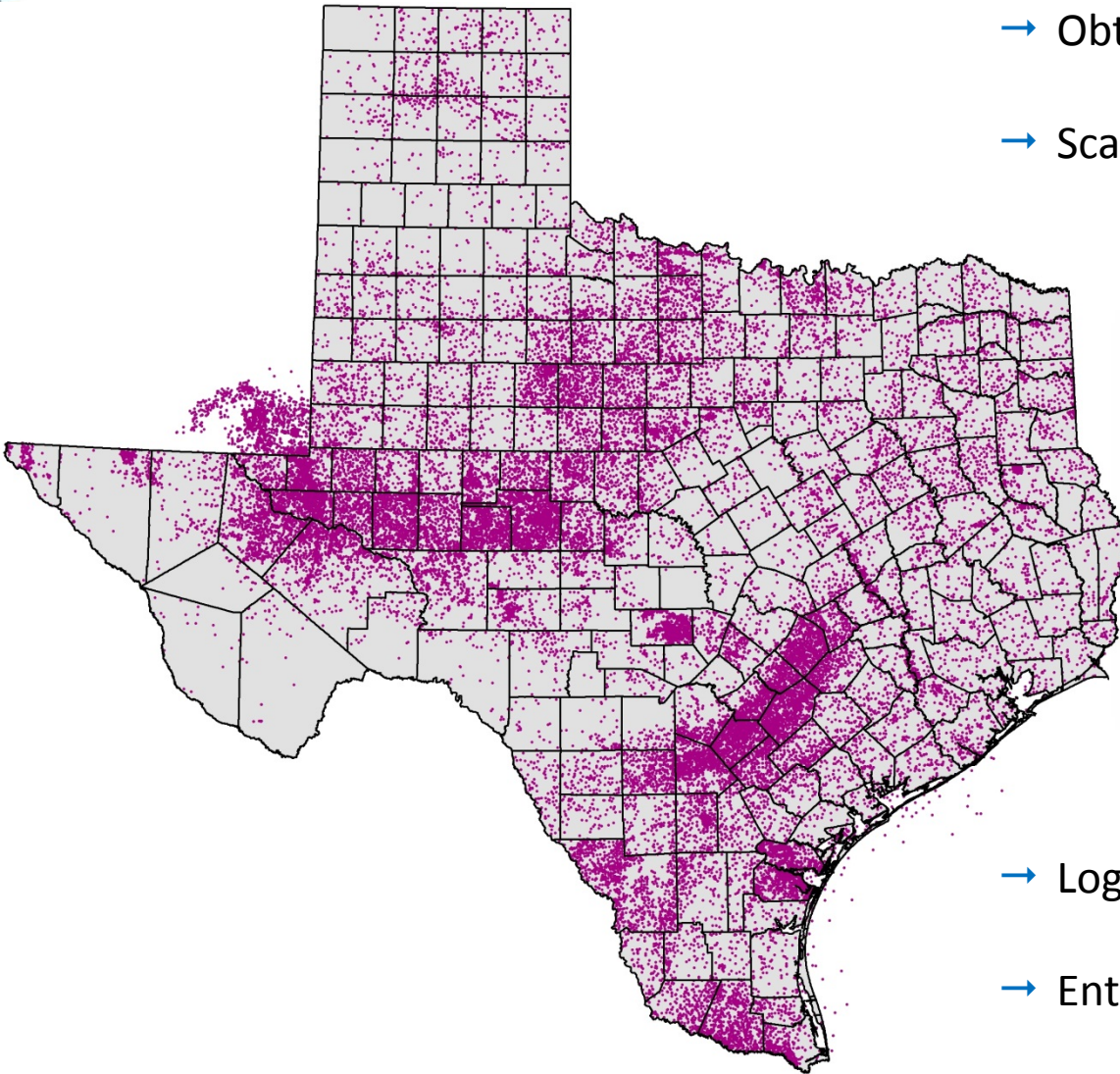
(Signed) Richard R. Banters (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

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

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

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

TWDB Water Data Interactive website, showing BRACS wells and geophysical well log

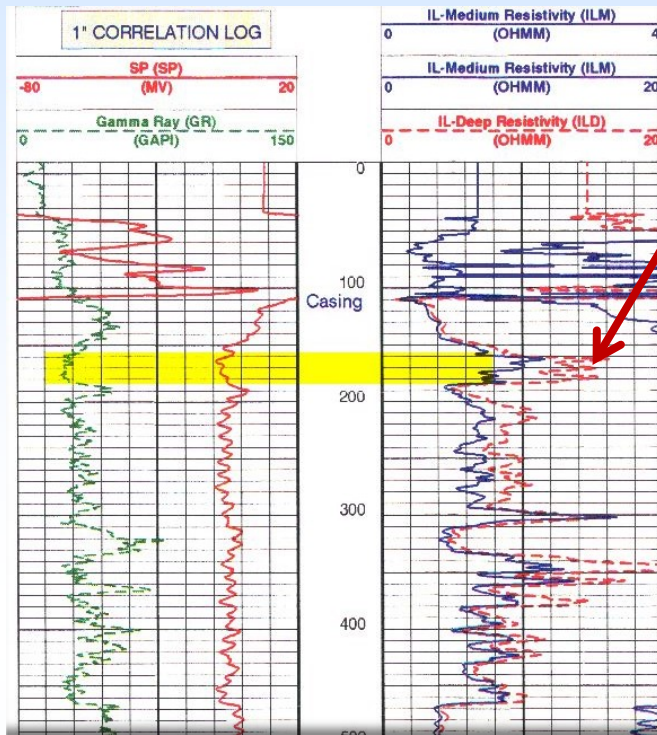
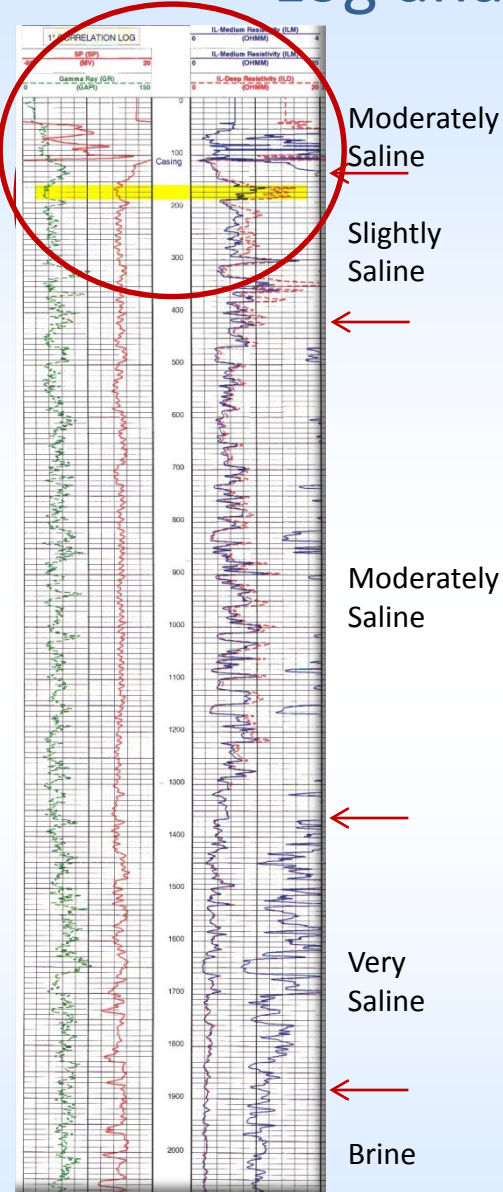
<http://www2.twdb.texas.gov/apps/waterdatainteractive/groundwaterdataviewer#>

The screenshot displays the TWDB Water Data Interactive website interface. The top navigation bar includes "Groundwater", "Layers", "Base Maps", "Help", and "Disclaimer". The main map area shows a distribution of wells, with well 386 highlighted. A pop-up window titled "Brackish Groundwater" provides details for well 386:

Well Id:	386 - Logs	
Geophysical Well Logs for Well Id: 386		
Log Id	File Type	File Size
165	tif	18.6 MB
For Geophysical Well Log assistance contact: BRACS@twdb.texas.gov		
Data Source:	ULUTS Digital Geophysical Logs	
API Number:	4249510699	
County:	WINKLER	
Well Depth (ft):	3335	
Total Depth (ft):	3335	
Drill Date:	12/20/1965	

On the right, a Schlumberger BlueView window displays a geophysical well log for well 386. The log is titled "GAMMA RAY" and "NEUTRON" and shows depth in feet on the y-axis (0 to 3200) and API units on the x-axis. The log includes a "Field Level" and a "Neutron Zero" line. The bottom of the image shows the Texas Water Development Board logo and image properties: 9.02 W x 191.76 H (in) : 2705 W x 57528 H (dots) : 300 DPI : 1 bit color : X=0, Y=1008.

Log analysis to interpret Total Dissolved Solids



At 160 ft = 15 ohm-meter

Rwa 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

frmSelection_PU

BRACS Database, Navigation to Forms Close Form

1: Select a form to display

BRACS Database Master Well Form

TWDB Report 382, 2012, Pecos Valley Aquifer, West Texas: Structure and Brackish Groundwater

- Pecos Valley Aquifer Study: Aquifer Determination Form
- Pecos Valley Aquifer Study: Net Sand Form

TWDB Technical Note 14-01, 2014, Queen City and Sparta Aquifers, Atascosa and McMullen Counties, Texas: Structure and Brackish Groundwater

- Queen City and Sparta Aquifer Study: Aquifer Determination Form
- Queen City and Sparta Aquifer Study: Net Sand Form

TWDB Open-file Report 12-01, 2012, Geologic Characterization of and Data Collection in the Corpus Christi Aquifer Storage and Recovery Conservation District and Surrounding Counties

- Gulf Coast CCASRCD Study: Aquifer Determination Form
- Gulf Coast CCASRCD Study: Net Sand Form

TWDB Report 383, 2014, Brackish Groundwater in the Gulf Coast Aquifer, Lower Rio Grande Valley, Texas

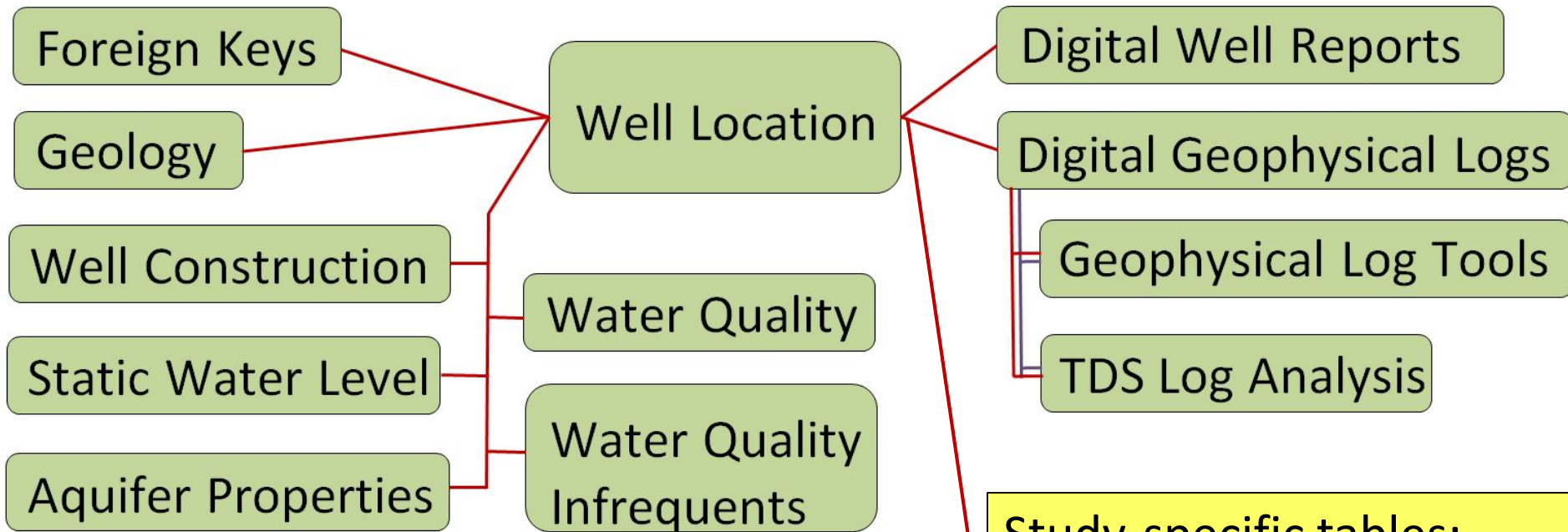
- Gulf Coast Lower Rio Grande Valley Study: Aquifer Determination Form
- Gulf Coast Lower Rio Grande Valley Study: Net Sand Form
- Gulf Coast Lower Rio Grande Valley Study: Salinity Zone Form

2: Press Button

Open Form

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

BRACS Database Tables



Study-specific tables:

Stratigraphic picks
Aquifer determination
Net sand analysis
Master water quality

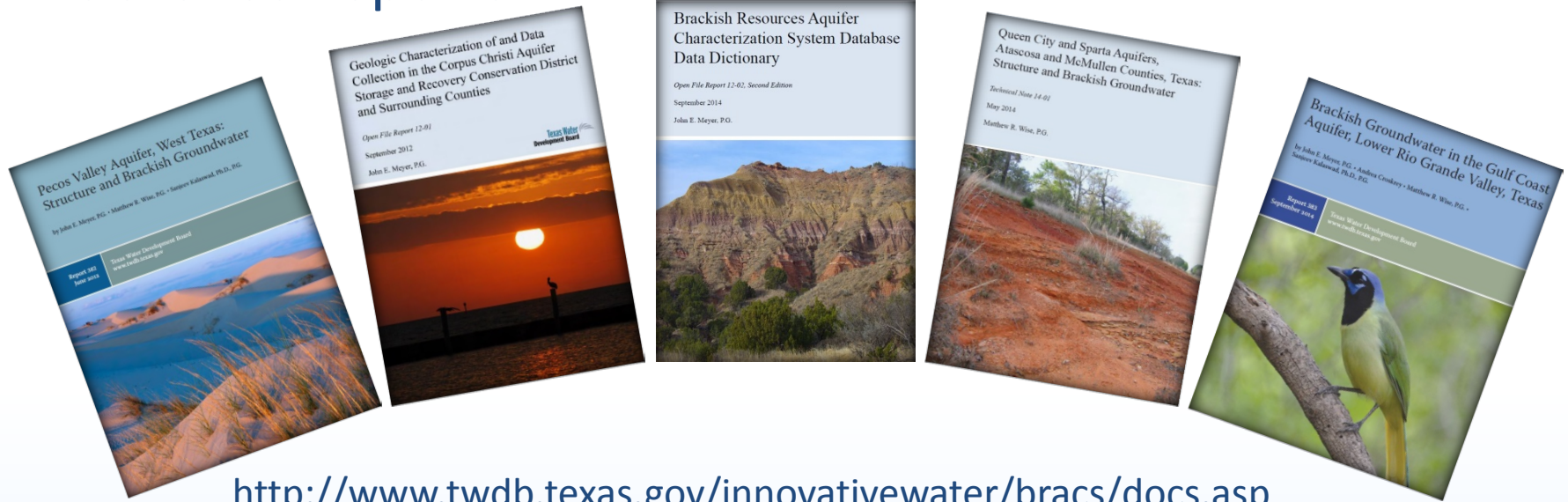
- Microsoft Access Database
- Available on the TWDB web site (with data dictionary)
- Relational table design
- All wells are assigned a unique well id, linking (red line) records together

BRACS Data

- GIS data
 - Locate geophysical logs
 - Lateral extent of brackish aquifers
 - Lithology
 - Water quality parameters
 - Salinity Zones
 - Rasters and shapefiles
- Published Reports

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.

House Bill 30 (84th Texas Legislature, 2015)

- Map brackish groundwater production zones (BGPZ) separated by hydrogeologic barriers from fresh water aquifers
- Estimate 30- and 50-year production without causing significant impact to water quality or water quantity in fresh water aquifers
- Four aquifers must be completed by December 1, 2016 – contracted work
- Three other contracted studies - must be completed by August 31, 2017
- Remaining aquifers in the state will be mapped by December 1, 2022
- Stakeholder involvement; BGPZ approved by TWDB Board
- TWDB staff increased to 7.5 FTE to map aquifers and manage contracts
- \$2,000,000 appropriated to TWDB from General Revenue Fund
- Include status report in every biennial desalination report to Texas Legislature (next report due December 1, 2016)



TWDB Website for HB 30 activities

<http://www.twdb.texas.gov/innovativewater/bracs/HB30.asp>

- History of HB 30 implementation
- Copy of HB 30 Legislation
- Stakeholder meeting video
- Copies of written stakeholder comments
- Contract documents
- Notice of future stakeholder meetings
- Links to current and completed contracted studies

BRACS Studies

Brackish Resources Aquifer Characterization System

House Bill 30 Excluded Aquifers

Edwards BFZ

House Bill 30 Excluded GCDs

- Barton Springs/Edwards Aquifer CD
- Edwards Aquifer Authority
- Fort Bend Subsidence District
- Harris-Galveston Coastal Subsidence District

Current

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

Completed

- 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)

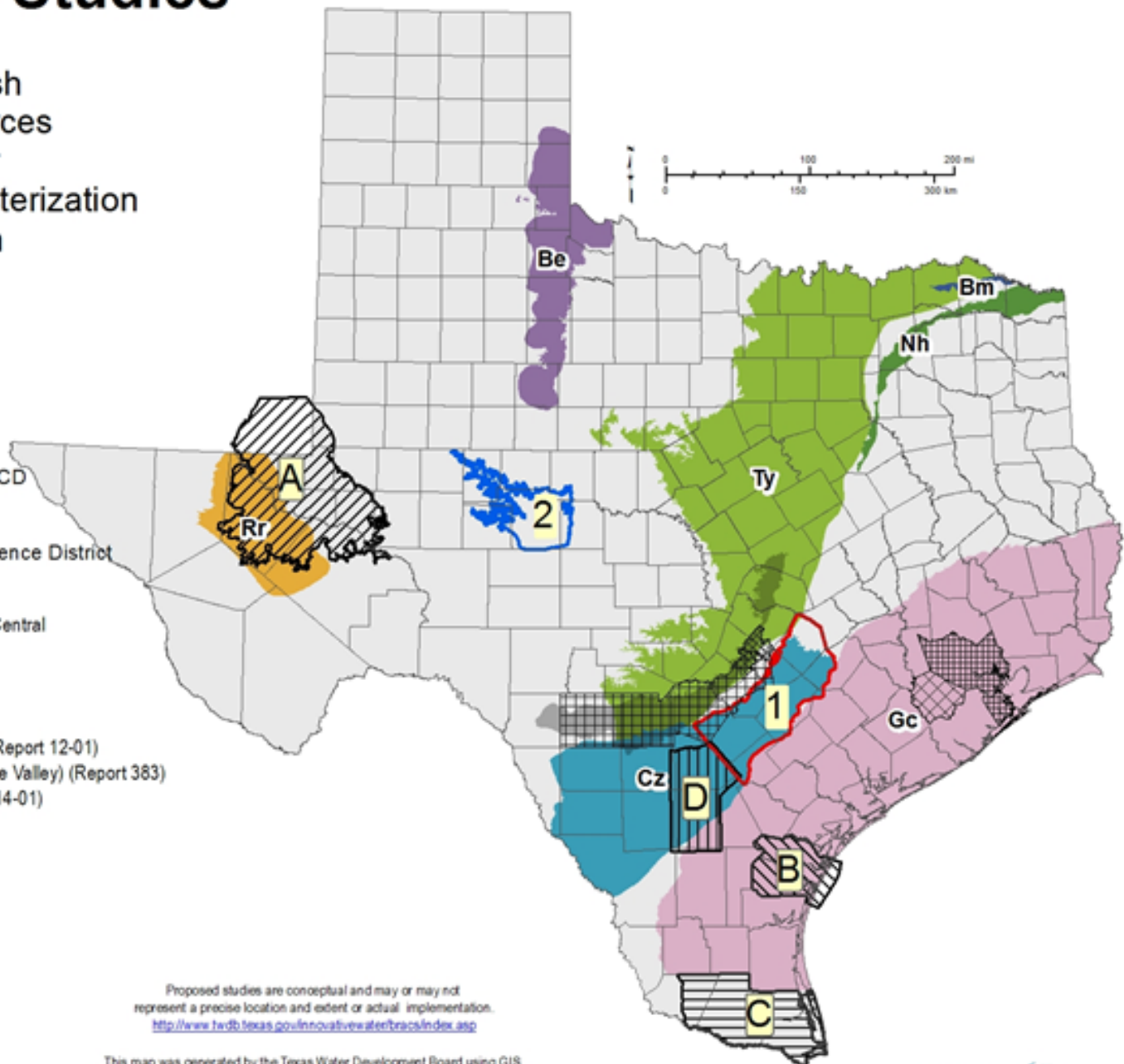
House Bill 30

2016

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

2017

- 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.

Questions

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