Private Water Well Basics and Screening Interpretation

TWON
TEXAS
Well Owner
NETWORK

Joel Pigg
Texas A&M AgriLife Extension Service

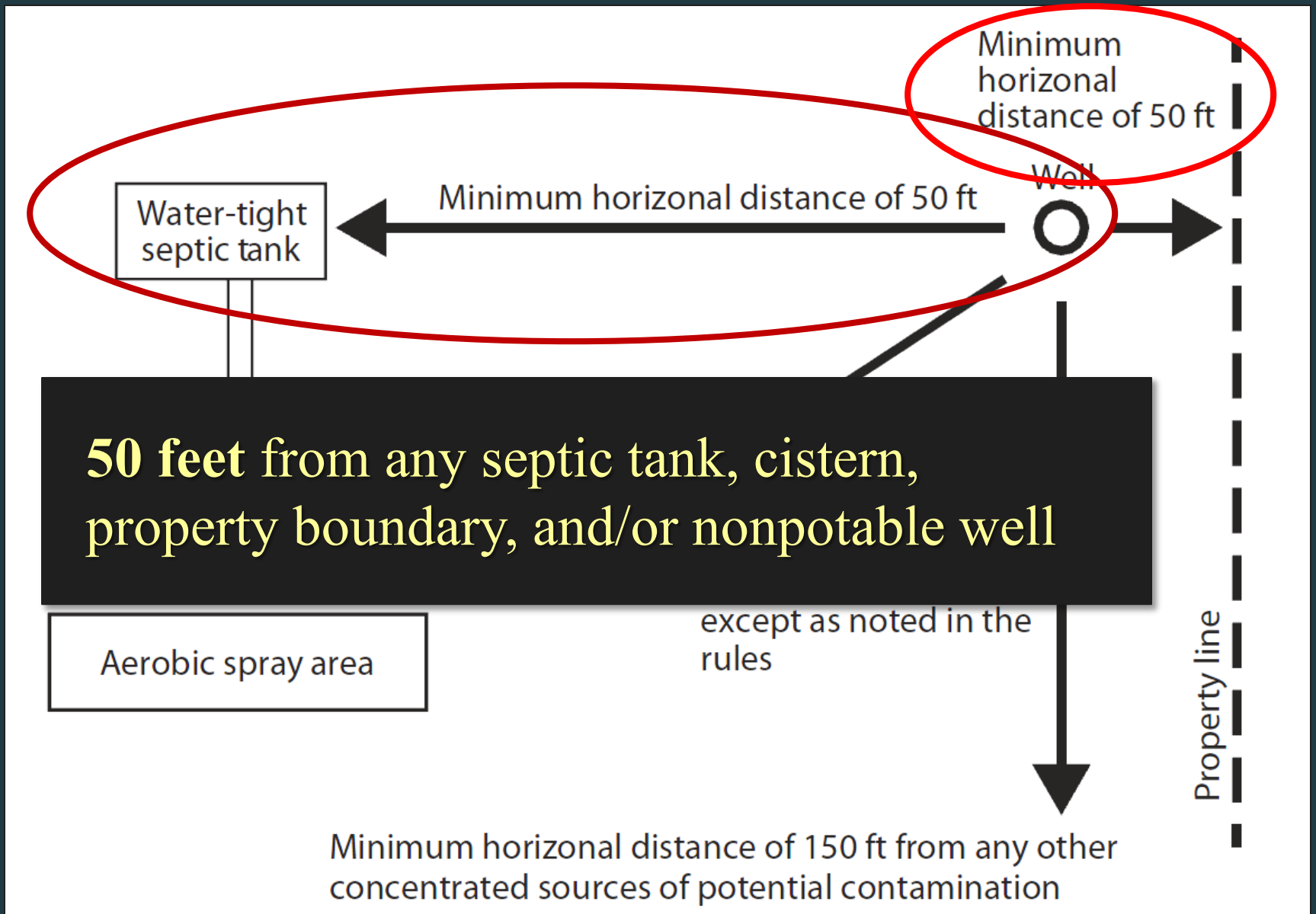
Milam and Burleson Counties Groundwater Summit
July 18, 2024

Texas A&M AgriLife Extension
Texas Water Resources Institute — make every drop count
Texas State Soil & Water Conservation Board
TAGD

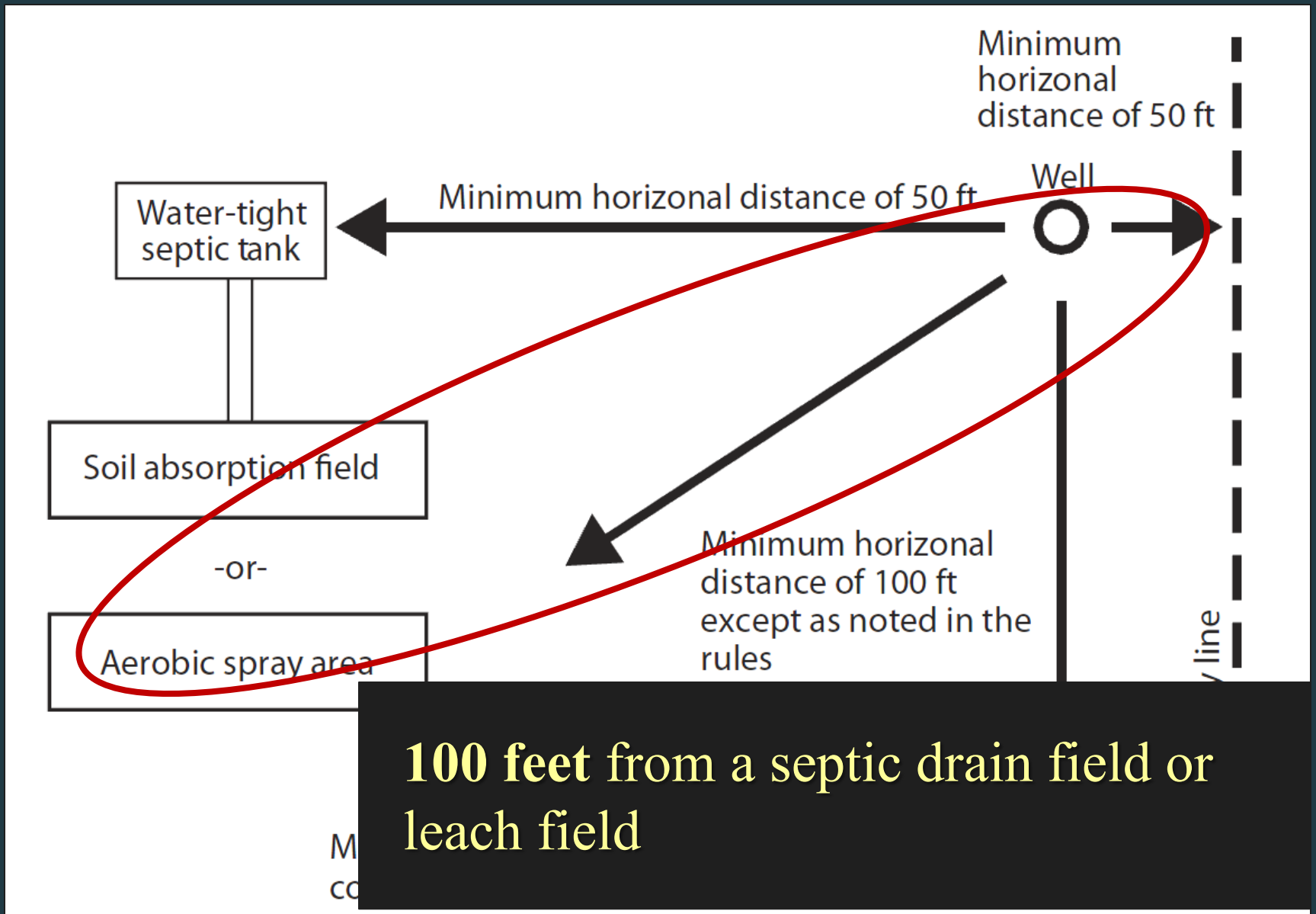
Information about Your Well

- Record the Locations (GPS)
- Keep Well Logs
- Registration or Permit with Groundwater Conservation District
- TWDB and TCEQ

Well Siting Regulations



Well Siting Regulations

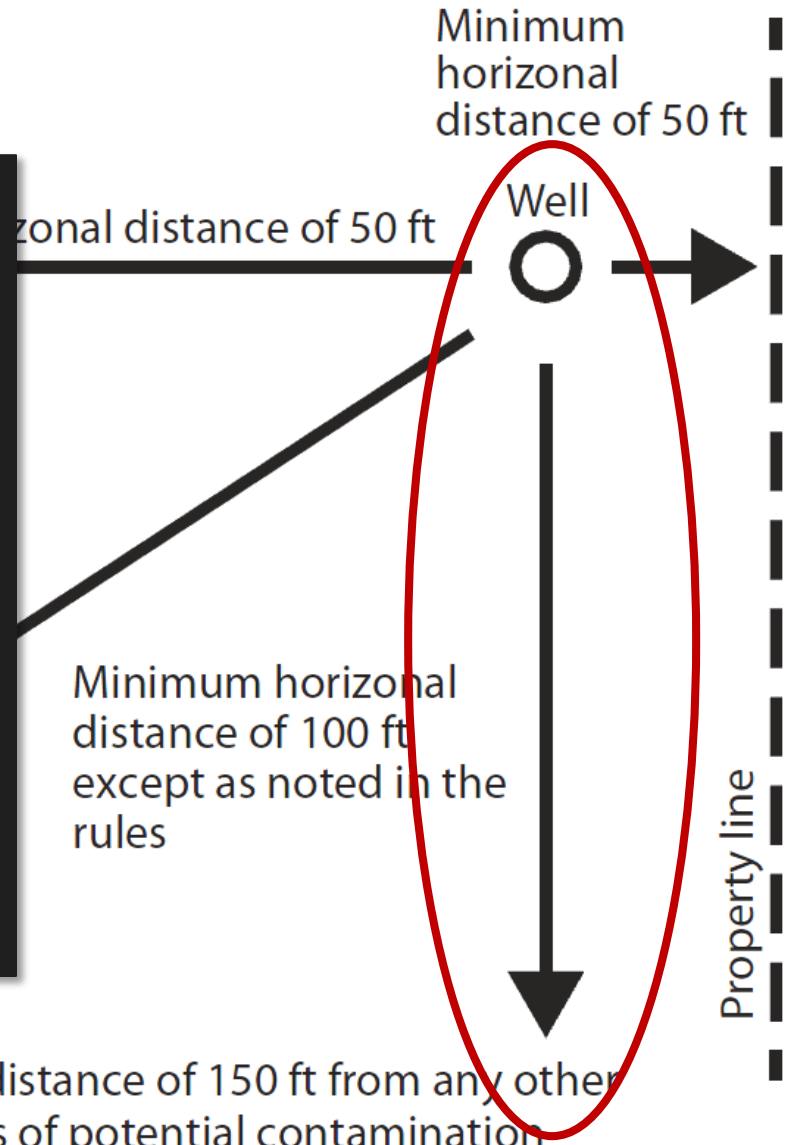


100 feet from a septic drain field or leach field

Well Siting Regulations

150 feet from:

- Pet shelter
- Livestock yard
- Feed storage facility
- Pesticide storage
- Fertilizer storage

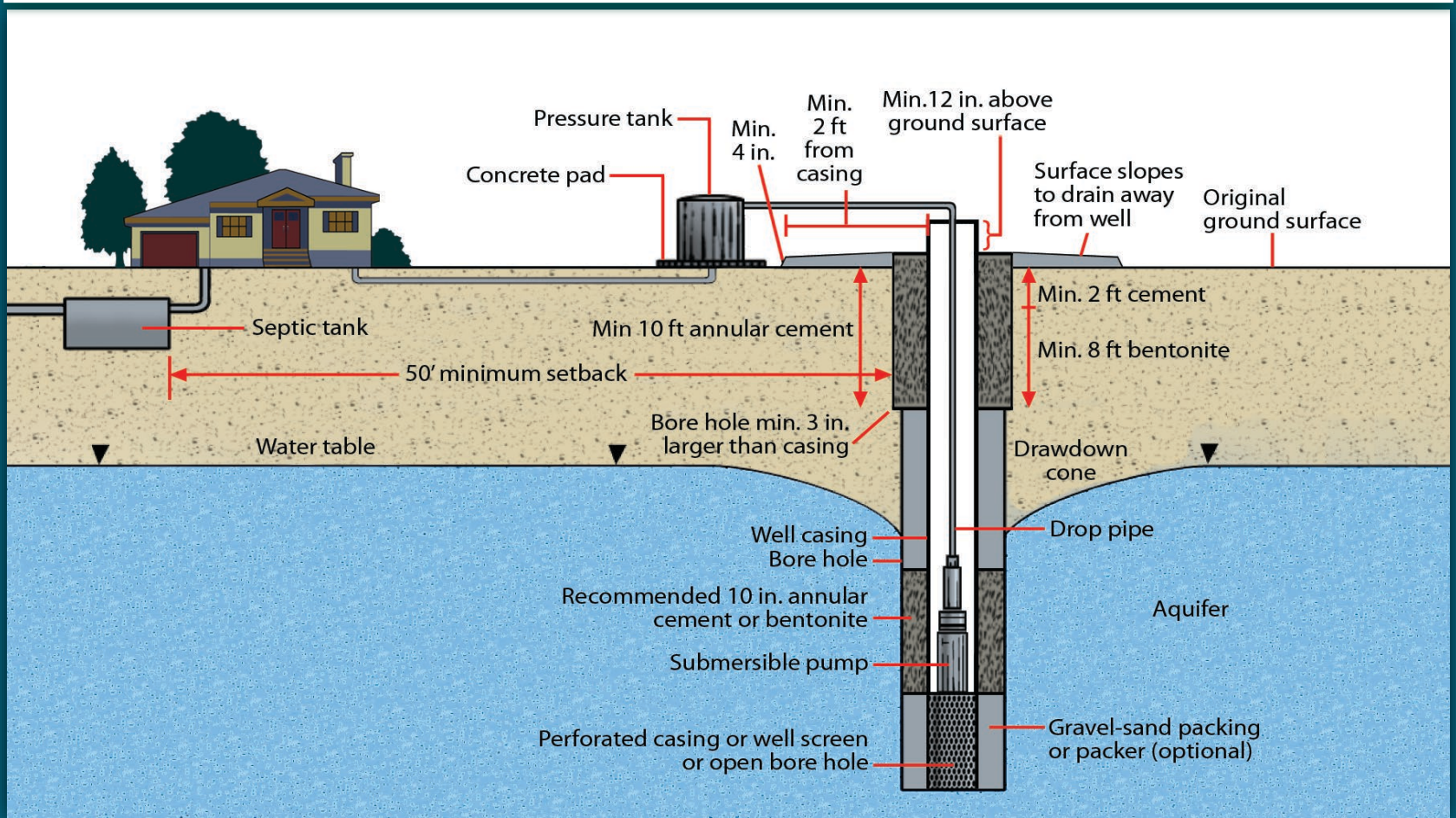


Proper Well Construction

- Contract a licensed driller
- Water Well Drillers and Pump Installers Administrative Rules
  - 76.1000. Technical Requirements. Locations and Standards for Completion for Wells (TDLR)
- Well Construction
  - Ten feet of annular cement
  - Sloping cement slab that extends 2 feet in all directions
  - Casing extending 12 inches above land surface

The Finished Product – Drilled Well

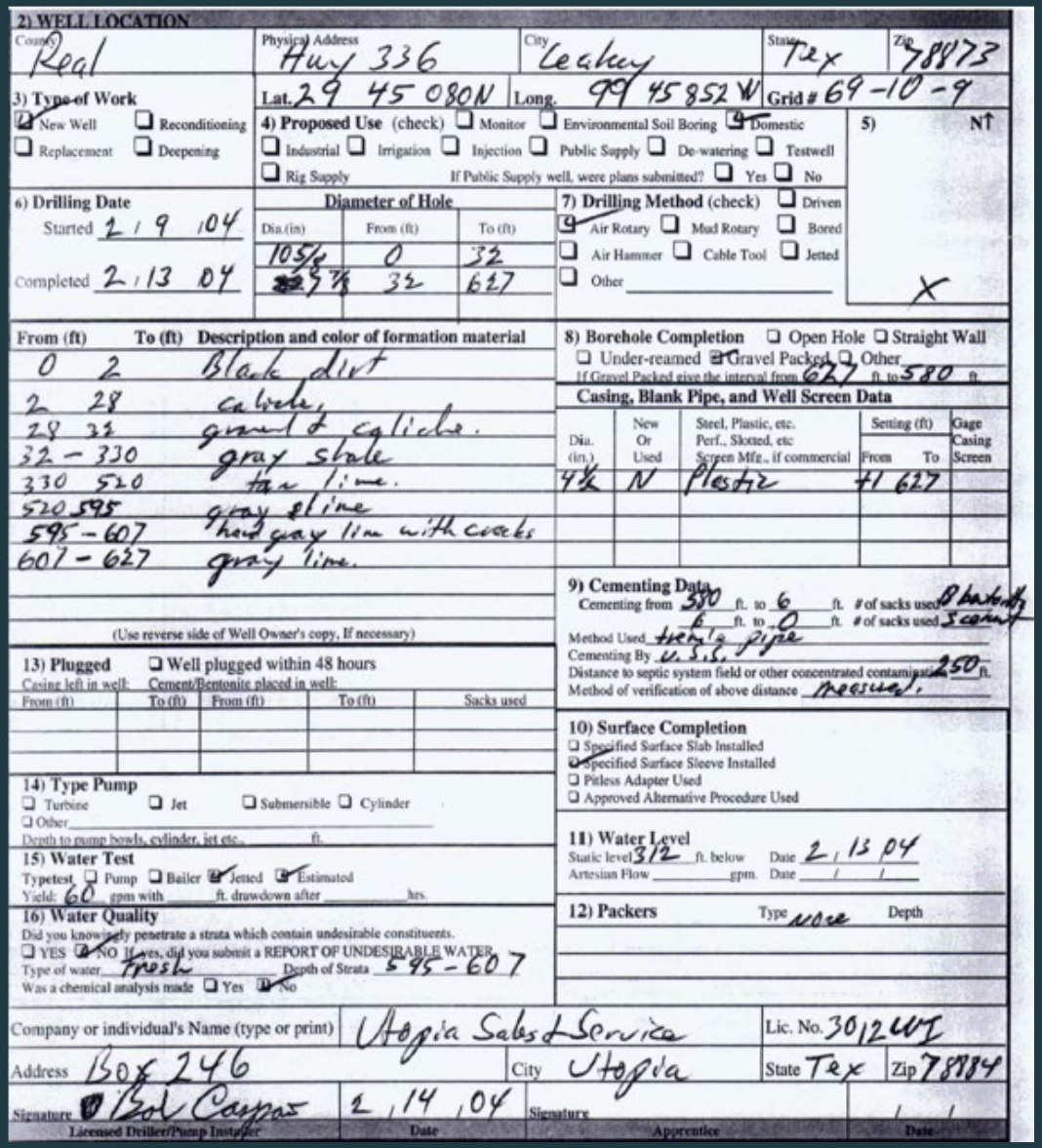
(a) Wells shall be completed in accordance with the following specifications and in compliance with the local groundwater conservation district rules or incorporated city ordinances:



Why Does Well Construction Matter?

- Poor construction can affect drinking water quality
- Poor construction can contribute to groundwater pollution
- Proper construction can prolong the life and yield of the well and protect groundwater quality

Well Logs



2) WELL LOCATION
County Real | Physical Address Hwy 336 | City Leakey | State Tex | Zip 78873
Lat. 29 45 080N | Long. 99 45 852W | Grid # 69-10-9

3) Type of Work: ☑ New Well ☐ Reconditioning ☐ Replacement ☐ Deepening
4) Proposed Use (check): ☐ Monitor ☐ Environmental Soil Boring ☑ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☐ Testwell ☐ Rig Supply
If Public Supply well, were plans submitted? ☐ Yes ☐ No
5) NT X

6) Drilling Date: Started 2/9/04 Completed 2/13/04

Diameter of Hole

Dia.(in)	From (ft)	To (ft)
10 5/8	0	32
7 7/8	32	627

7) Drilling Method (check): ☐ Driven ☑ Air Rotary ☐ Mud Rotary ☐ Bored ☐ Air Hammer ☐ Cable Tool ☐ Jetted ☐ Other

From (ft)	To (ft)	Description and color of formation material
0	2	Black dirt
2	28	caliche,
28	32	gravel & caliche.
32	330	gray shale
330	520	tan lime.
520	595	gray shale
595	607	hard gray lime with cracks
607	627	gray lime.

(Use reverse side of Well Owner's copy, If necessary)

8) Borehole Completion: ☐ Open Hole ☐ Straight Wall ☐ Under-reamed ☑ Gravel Packed ☐ Other
If Gravel Packed give the interval from 627 ft. to 580 ft.

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 Casing Screen
4½	N	Plastic	+1	627	

9) Cementing Data
Cementing from 580 ft. to 6 ft. # of sacks used 8 bentonite
6 ft. to 0 ft. # of sacks used 3 cement
Method Used tremie pipe
Cementing By U.S.S.
Distance to septic system field or other concentrated contamination 250 ft.
Method of verification of above distance measured.

13) Plugged ☐ Well plugged within 48 hours
Casing left in well: Cement/Bentonite placed in well:

From (ft)	To (ft)	From (ft)	To (ft)	Sacks used

10) Surface Completion
☐ Specified Surface Slab Installed
☑ Specified Surface Sleeve Installed
☐ Pitless Adapter Used
☐ Approved Alternative Procedure Used

14) Type Pump: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other
Depth to pump bowls, cylinder, jet etc. ft.

11) Water Level
Static level 312 ft. below Date 2/13/04
Artesian Flow gpm. Date / /

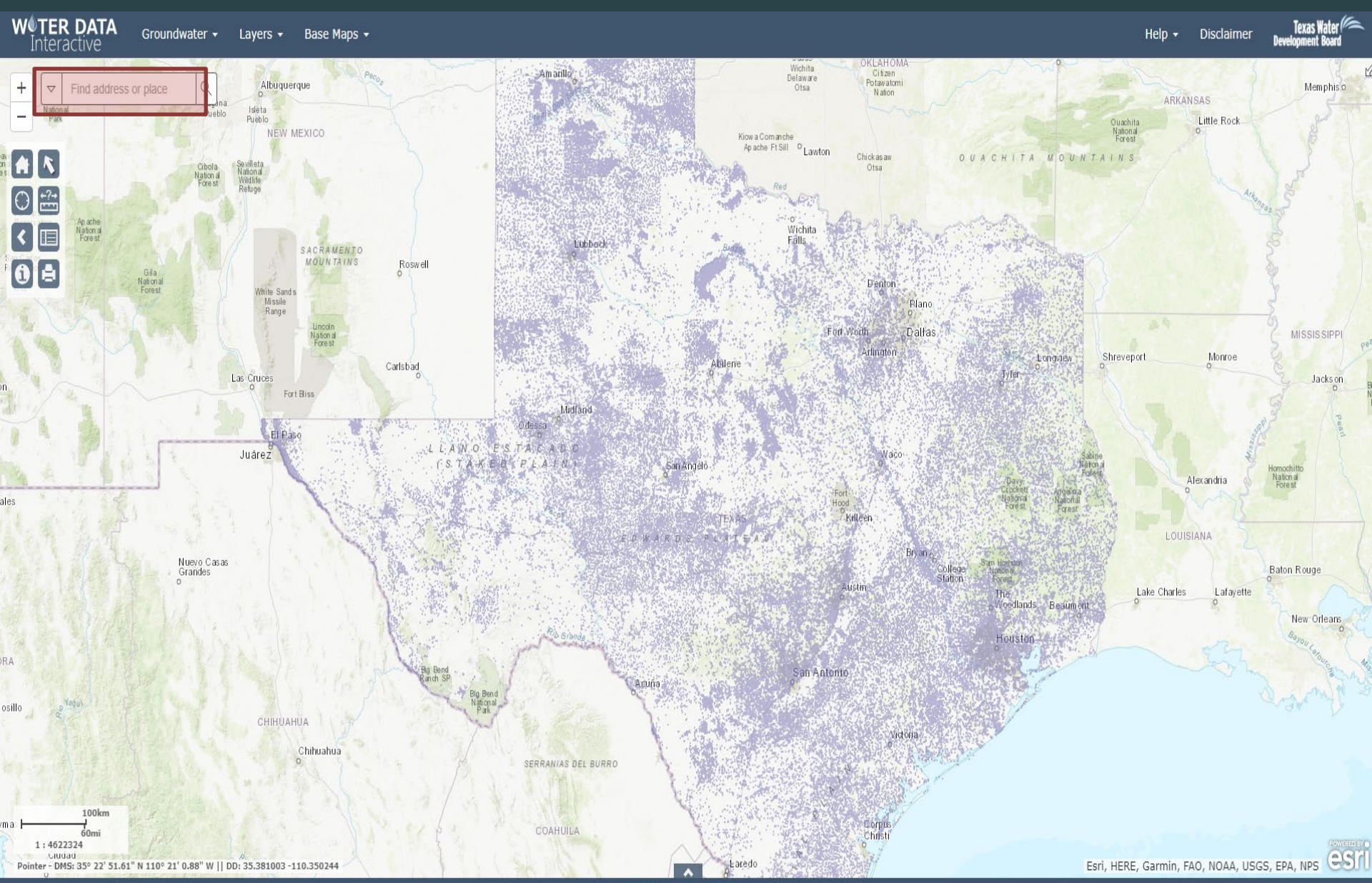
15) Water Test
Typetest ☐ Pump ☐ Bailer ☑ Jetted ☑ Estimated
Yield: 60 gpm with ft. drawdown after hrs.

12) Packers Type none Depth

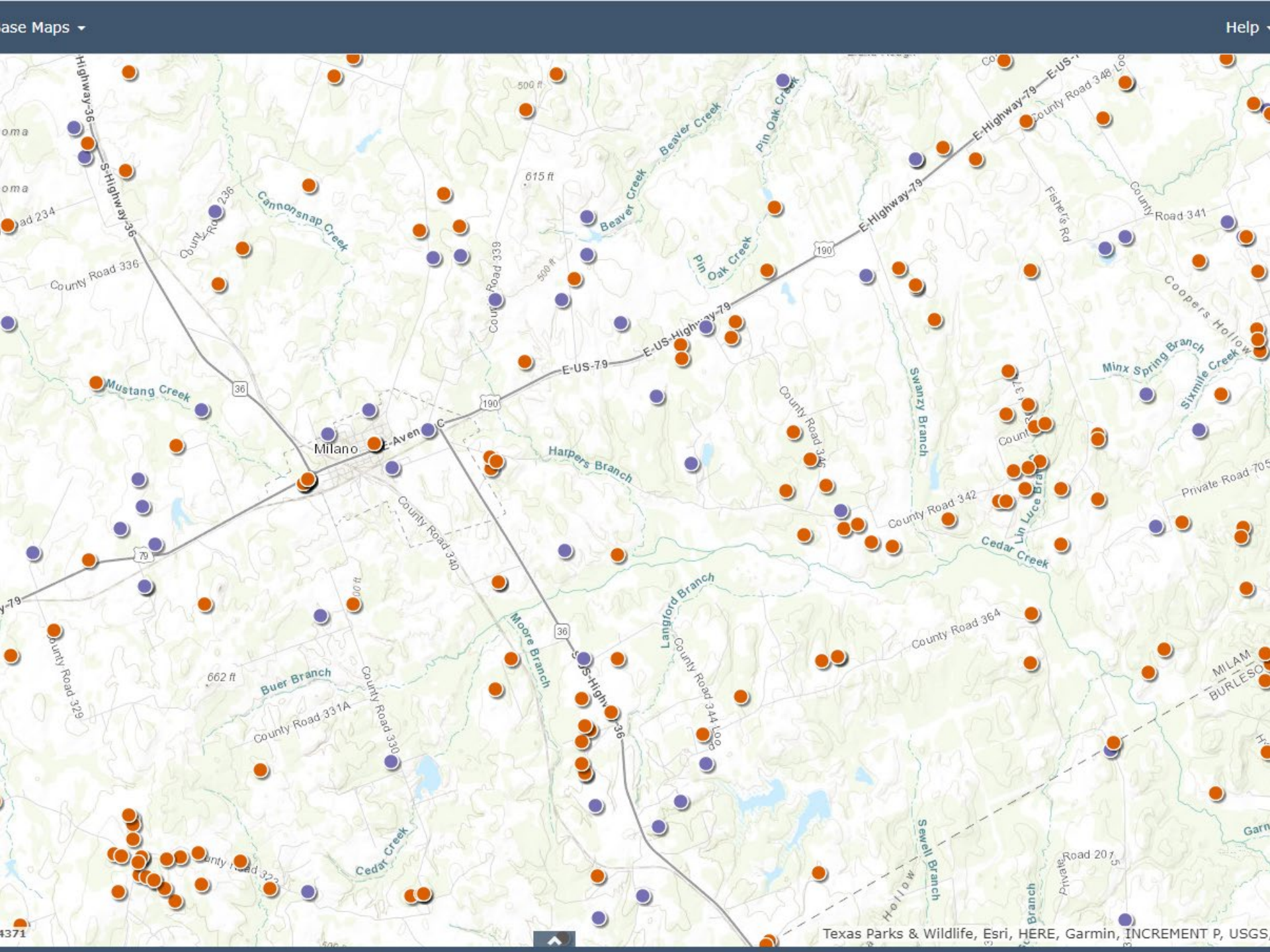
16) Water Quality
Did you knowingly penetrate a strata which contain undesirable constituents.
☐ YES ☑ NO If yes, did you submit a REPORT OF UNDESIRABLE WATER
Type of water fresh Depth of Strata 595-607
Was a chemical analysis made ☐ Yes ☑ No

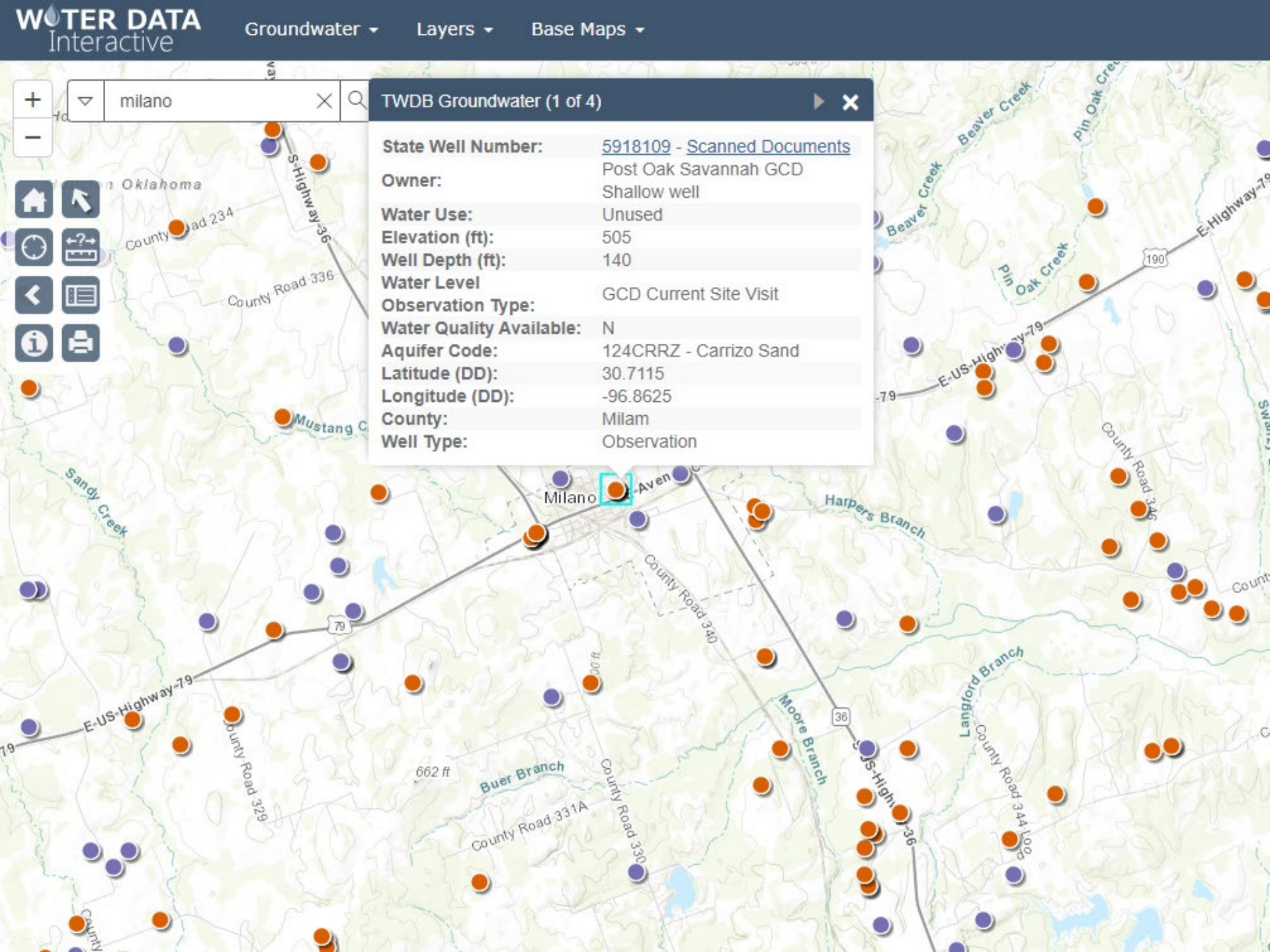
Company or individual's Name (type or print) Utopia Sales & Service Lic. No. 3012WI
Address Box 246 City Utopia State Tex Zip 78884
Signature Bob Capps 2,14,04
Licensed Driller/Pump Installer Date
Signature / /
Apprentice Date

- Well number
- Owner and location information
- Well construction and driller information
- Well testing data
- Geologic formation



https://www3.twdb.texas.gov/apps/waterdatainteractive/groundwaterdataviewer


Base Maps
Help
Milano
E-US-79
E-Highway-79
S-Highway-36
190
36
79
Mustang Creek
Cannonsnap Creek
Beaver Creek
Pin Oak Creek
Harpers Branch
Swanzy Branch
Cedar Creek
Langford Branch
Moore Branch
Buer Branch
Sewell Branch
Sixmile Creek
Minx Spring Branch
Coopers Hollow
County Road 336
County Road 339
County Road 340
County Road 341
County Road 342
County Road 345
County Road 348
County Road 364
County Road 329
County Road 330
County Road 331A
County Road 344
Fisher's Rd
Private Road 705
615 ft
662 ft
500 ft
Texas Parks & Wildlife, Esri, HERE, Garmin, INCREMENT P, USGS


WATER DATA Interactive
Groundwater
Layers
Base Maps
milano
TWDB Groundwater (1 of 4)
State Well Number: 5918109 - Scanned Documents
Owner: Post Oak Savannah GCD Shallow well
Water Use: Unused
Elevation (ft): 505
Well Depth (ft): 140
Water Level Observation Type: GCD Current Site Visit
Water Quality Available: N
Aquifer Code: 124CRRZ - Carrizo Sand
Latitude (DD): 30.7115
Longitude (DD): -96.8625
County: Milam
Well Type: Observation
Milano
Sandy Creek
Harpers Branch
Beaver Creek
Pin Oak Creek
Buer Branch
Moore Branch
Langford Branch
Mustang C
E-US-Highway-79
S-Highway-36
County Road 234
County Road 336
County Road 340
County Road 329
County Road 331A
County Road 330
County Road 344
662 ft
79
36
190

STATE OF TEXAS WELL REPORT for Tracking #282920

Owner:	**Post Oak Savanah GCD**	Owner Well #:	**No Data**
Address:	**310 East Ave. C Milano, TX 76556**	Grid #:	**59-18-1**
		Latitude:	**30° 42' 41" N**
Well Location:	**310 E. Ave. C Milano, TX 76556**	Longitude:	**096° 51' 45" W**
Well County:	**Milam**	Elevation:	**604 ft. above sea level**
Type of Work:	**New Well**	Proposed Use:	**Monitor**

Drilling Start Date: **2/28/2012** Drilling End Date: **3/30/2012**

	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
Borehole:	8.75	0	1240

Drilling Method: **Mud (Hydraulic) Rotary**

Borehole Completion: **Filter Packed**

	Top Depth (ft.)	Bottom Depth (ft.)	Filter Material	Size
Filter Pack Intervals:	834	1220	Gravel	12 - 20

	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
Annular Seal Data:	0	10	12 Sakrete
	674	834	46 Portland

Seal Method: **triemie and grout**

Sealed By: **Driller**

Distance to Property Line (ft.): **50+**

Distance to Septic Field or other concentrated contamination (ft.): **100+**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed**

Water Level: **259 ft.** below land surface on **2012-03-22** Measurement Method: **Unknown**

Packers: **No Data**

Type of Pump: **NO PUMP**

Well Tests: **Pump** **Yield: 45 GPM with 5 ft. drawdown after 24 hours**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Brien Water Wells**
5214 South Highway 6
Hearne, TX 77859

Driller Name: **Pete Brien** License Number: **1750**

Apprentice Name: **Frank Mendoza** Apprentice Number: **56871**

Comments: **Assigned SWN 59-18-108 by TWDB on 3/18/2013.**

Lithology: DESCRIPTION & COLOR OF FORMATION MATERIAL

From (ft)	To (ft)	Description
0	64	Sand
64	78	Sandy Clay
78	123	Sand and Sandy Clay
123	164	Sandy and Sand
164	264	Sandy Shale and Shale
264	278	Sand (B) and Sandy Shale
278	279	Rock
279	300	Sand and Sandy Shale
300	306	Rock
306	342	Sand (B)
342	348	Snad and Rocks
348	450	Sand(B)
450	475	Sandy Shale and Shale
475	508	Sahle and Coal Streals
508	517	Coal
517	645	Sandy Shale and Shale
645	702	Sandy Shale and Shale
702	725	Sand (B)
725	761	Sandy SHale and Coal Streaks
761	774	Shale
774	793	Sandy Shale and Coal Streaks
793	798	Shale (Tight)
798	834	Snady Shale and Coal Streaks
834	872	Sand (B)
872	880	Sand (B) Coal Streaks
880	938	Sand Coarse
938	938.5	Rock
938.5	1071	Sand Coarse
1071	1156	Sand and Small Rocks
1156	1168	Shale and Sandy Shale
1168	1190	Sand (B)
1190	1240	Sand

Casing: BLANK PIPE & WELL SCREEN DATA

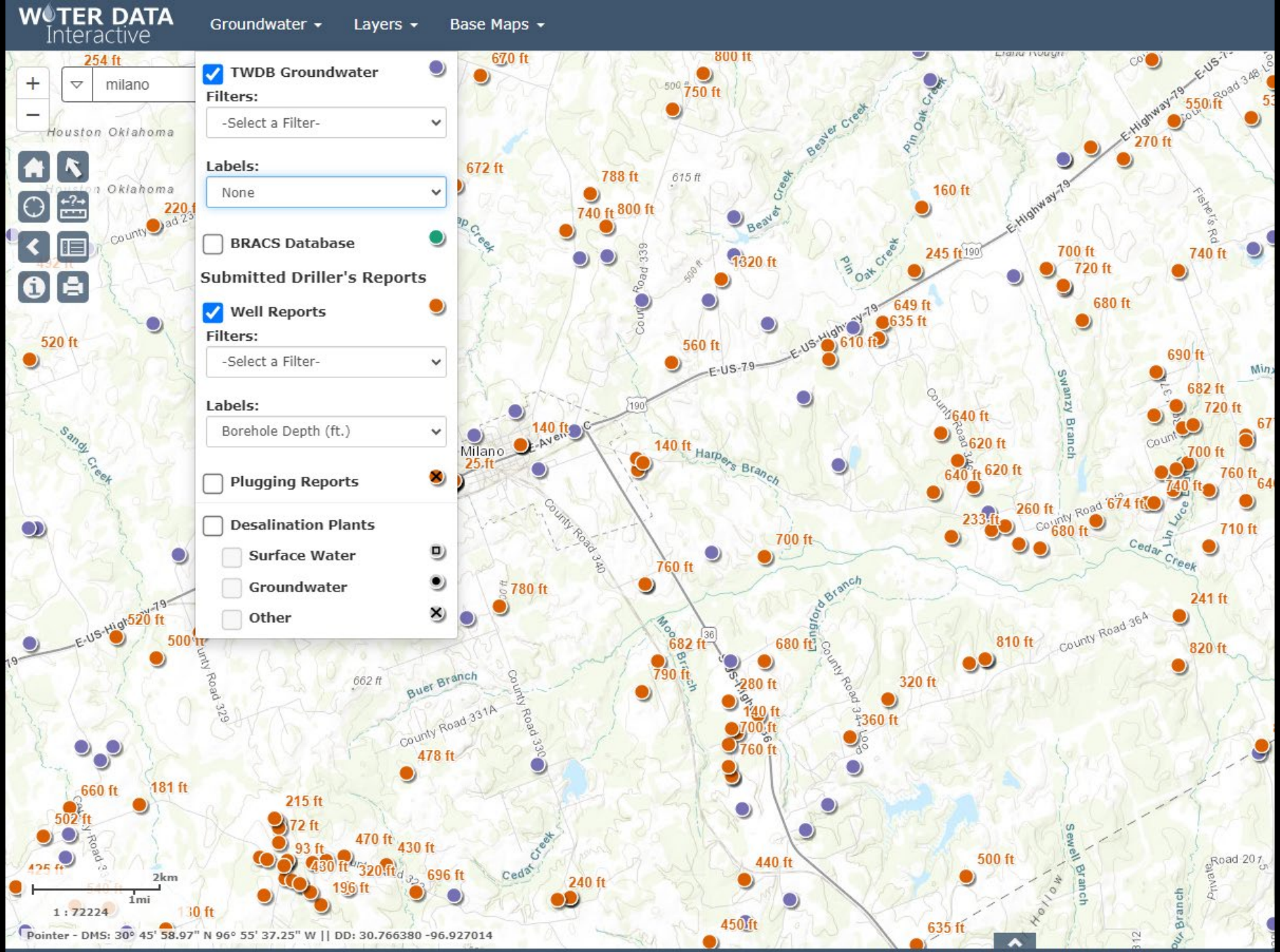
Dia. (in.)	New/Used	Type	Setting From/To (ft.)
4"	New	Black Steel Pipe	+1 - 1178
4"	New	Pipe Based Stainless Screen	1178 - 1220 .026

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

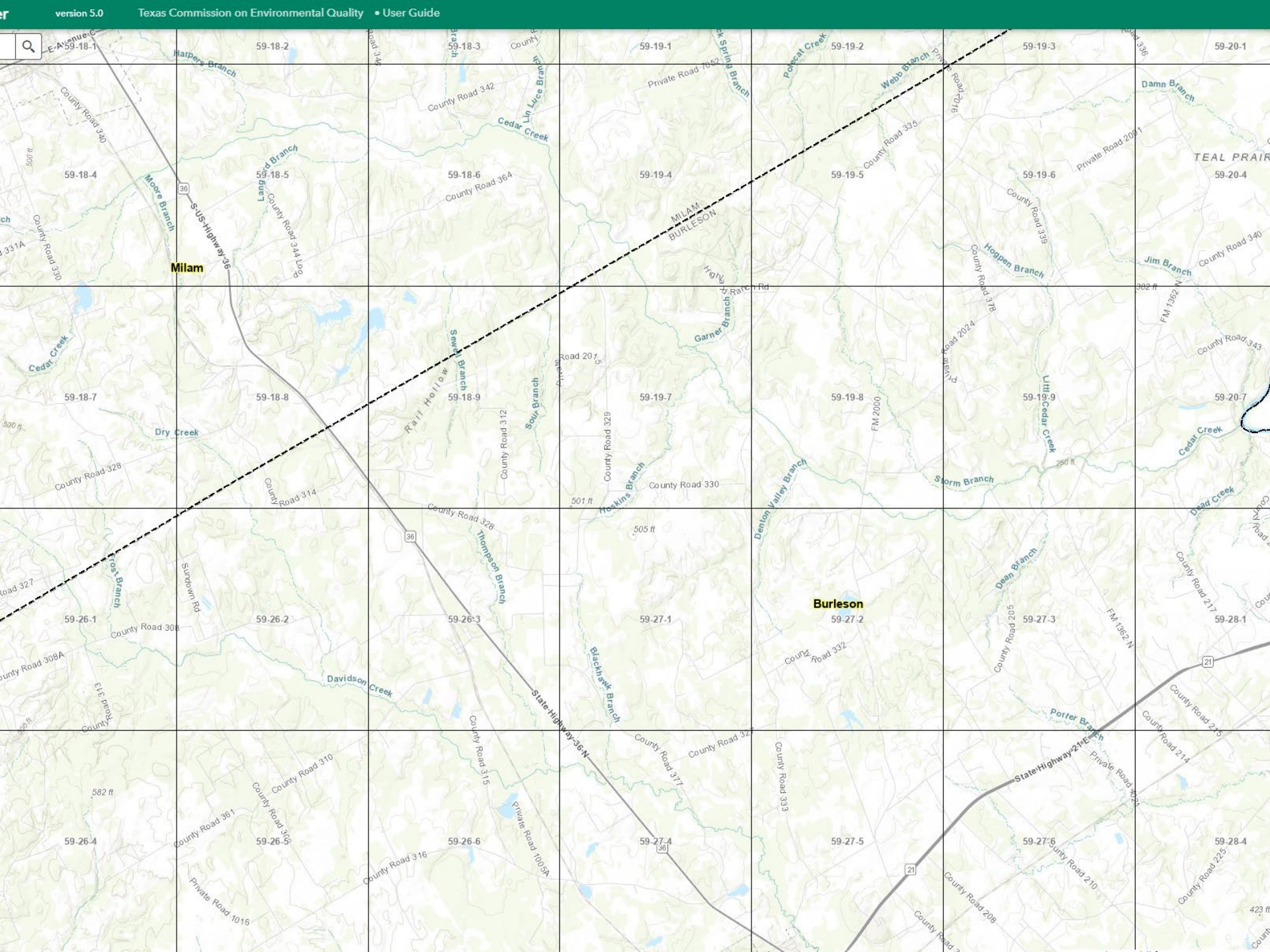
TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540


WATER DATA Interactive
Groundwater
Layers
Base Maps
milano
TWDB Groundwater
Filters:
-Select a Filter-
Labels:
None
BRACS Database
Submitted Driller's Reports
Well Reports
Filters:
-Select a Filter-
Labels:
Borehole Depth (ft.)
Plugging Reports
Desalination Plants
Surface Water
Groundwater
Other
Milano
Houston Oklahoma
E-US-Highway-79
Harpers Branch
Buer Branch
Cedar Creek
Beaver Creek
Pin Oak Creek
Swanzy Branch
Sandy Creek
Moore Branch
Sewell Branch
County Road 340
County Road 329
County Road 331A
County Road 330
County Road 364
2km
1mi
1 : 72224
Pointer - DMS: 30° 45' 58.97" N 96° 55' 37.25" W || DD: 30.766380 -96.927014
TEXAS WATER DEVELOPMENT BOARD

https://www.tceq.texas.gov/gis/waterwellview.html


Milam
Burleson
MILAM
BURLESON
TEAL PRAIR
S US Highway 36
State Highway 36 N
State Highway 21 E
59-18-1
59-18-2
59-18-3
59-19-1
59-19-2
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59-20-1
59-18-4
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Harpers Branch
Cedar Creek
Moore Branch
Langford Branch
Webb Branch
Polecat Creek
Damn Branch
Hogpen Branch
Jim Branch
Garner Branch
Sewell Branch
Rail Hollow Branch
Sour Branch
Little Cedar Creek
Dry Creek
Hopkins Branch
Storm Branch
Denton Valley Branch
Dead Creek
Dean Branch
Thompson Branch
Frost Branch
Davidson Creek
Blackhawk Branch
Porter Branch
County Road 340
County Road 342
County Road 364
County Road 335
County Road 339
County Road 378
County Road 343
County Road 330
County Road 328
County Road 314
County Road 312
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County Road 332
County Road 333
County Road 377
County Road 361
County Road 366
County Road 205
County Road 217
County Road 214
County Road 215
County Road 210
County Road 208
County Road 225
Private Road 7662
Private Road 2016
Private Road 2091
Private Road 1005A
Private Road 1016
Private Road 4029
FM 1362 N
FM 2000
Ranch Rd
Road 2024
Road 313
Sundown Rd
582 ft
501 ft
505 ft
423 ft

Plotted Water Wells

Total record count: 250

No	Grid Num	County	WWD ID	Report Box Type
1	33-46-7	BURLESON	734185	Reports and Standard Size Maps
2	39-27-8	BURLESON	1283566	Reports and Standard Size Maps
3	39-44-6	BURLESON	734188	Reports and Standard Size Maps
4	59-18-8	BURLESON	734750	Reports and Standard Size Maps
5	59-18-9	BURLESON	734751	Reports and Standard Size Maps
6	59-19-3	BURLESON	734752	Reports and Standard Size Maps
7	59-19-4	BURLESON	734754	Reports and Standard Size Maps
8	59-19-4	BURLESON	734754	Oversize Maps
9	59-19-4	BURLESON	734754	Oversize Maps
10	59-19-4	BURLESON	734754	Oversize Maps
11	59-19-5	BURLESON	734755	Reports and Standard Size Maps
12	59-19-6	BURLESON	734757	Reports and Standard Size Maps
13	59-19-6	BURLESON	734757	Oversize Maps
14	59-19-6	BURLESON	734757	Oversize Maps
15	59-19-6	BURLESON	734757	Oversize Maps
16	59-19-7	BURLESON	734758	Reports and Standard Size Maps
17	59-19-8	BURLESON	734759	Reports and Standard Size Maps
18	59-19-8	BURLESON	734759	Oversize Maps
19	59-19-8	BURLESON	734759	Oversize Maps
20	59-19-8	BURLESON	734759	Oversize Maps
21	59-19-8	BURLESON	734759	Oversize Maps
22	59-19-8	BURLESON	734759	Oversize Maps
23	59-19-8	BURLESON	734759	Oversize Maps
24	59-19-8	BURLESON	734759	Oversize Maps
25	59-19-8	BURLESON	734759	Oversize Maps
26	59-19-9	BURLESON	734760	Reports and Standard Size Maps
27	59-19-9	BURLESON	734760	Oversize Maps
28	59-19-9	BURLESON	734760	Oversize Maps
29	59-20-1	BURLESON	734779	Reports and Standard Size Maps
30	59-20-4	BURLESON	734788	Reports and Standard Size Maps
31	59-20-4	BURLESON	734788	Oversize Maps
32	59-20-5	BURLESON	734792	Reports and Standard Size Maps
33	59-20-7	BURLESON	734776	Reports and Standard Size Maps
34	59-20-8	BURLESON	734793	Reports and Standard Size Maps
35	59-25-3	BURLESON	734796	Reports and Standard Size Maps
36	59-25-5	BURLESON	734838	Reports and Standard Size Maps
37	59-25-6	BURLESON	734820	Reports and Standard Size Maps
38	59-25-9	BURLESON	734822	Reports and Standard Size Maps
39	59-26-1	BURLESON	734823	Reports and Standard Size Maps
40	59-26-2	BURLESON	734824	Reports and Standard Size Maps
41	59-26-3	BURLESON	734825	Reports and Standard Size Maps
42	59-26-3	BURLESON	734825	Oversize Maps
43	59-26-4	BURLESON	734826	Reports and Standard Size Maps
44	59-26-5	BURLESON	734831	Reports and Standard Size Maps
45	59-26-5	BURLESON	734831	Oversize Maps

Send original copy by certified mail to the Texas Water Development Board P. O. Box 12386 Austin, Texas 78711

State of Texas

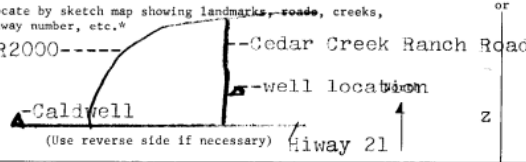
WATER WELL REPORT

For TWDB use only
Well No.
Located on map
Received:

1) OWNER:
Person having well drilled J. J. Parsley (Name) Address 2660 Campbell Rd Houston Tex (Street or RFD) (City) (State)
Landowner (Name) Address (Street or RFD) (City) (State)

2) LOCATION OF WELL:
County Burleson, 10 miles in NE (N.E., S.W., etc.) direction from Caldwell (Town)

Locate by sketch map showing landmarks, ~~roads~~, creeks, hiway number, etc.*



(Use reverse side if necessary)

or Give legal location with distances and directions from adjacent sections or survey lines.
Labor League
Block Survey
Abstract No.
(NW¼ NE¼ SW¼ SE¼) of Section

3) TYPE OF WORK (Check): X New Well, Deepening, Reconditioning, Plugging
4) PROPOSED USE (Check): X Domestic, Industrial, Municipal, Irrigation, Test Well, Other
5) TYPE OF WELL (Check): X Rotary, Driven, Dug, Cable, Jetted, Bored

6) WELL LOG:
Diameter of hole 6¼ in. Depth drilled 220 ft. Depth of completed well 220 ft. Date drilled 12/70
All measurements made from ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
1	20	Sand
20	60	Hard ~~shale~~ sand & shale
60	160	Hard shale and rock
160	200	Sand & shale stringers
200	220	Shale

(Use reverse side if necessary)

9) Casing:
Type: Old XX New X Steel Plastic Other
Cemented from ft. to ft.

Diameter (inches)	Setting From (ft.)	To (ft.)	Gage
4	1	168	Schedule 40
2	147	178	Schedule 40

10) SCREEN:
Type galv. casing
Perforated X Slotted

Diameter (inches)	Setting From (ft.)	To (ft.)	Slot Size
2	178	220	.020

7) COMPLETION (Check): Straight wall, Gravel packed, Other telscope, Under reamed, Open Hole

8) WATER LEVEL:
Static level 80 ft. below land surface Date 12/70
Artesian pressure lbs. per square inch Date
Depth to pump bowls, cylinder, jet, etc., 126 ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes No X If yes, by whom?
Yield: gpm with ft. drawdown after hrs.
Bailer test gpm with ft. drawdown after hrs.
Artesian flow gpm
Temperature of water

12) WATER QUALITY:
Was a chemical analysis made? Yes No
Did any strata contain undesirable water? Yes No
Type of water? depth of strata

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.

NAME Charlie J. Loehr (Type or Print) Water Well Drillers Registration No. 143
ADDRESS Rt. 3, Box 148, Caldwell, Texas 77836 (Street or RFD) (City) (State)
(Signed) Charlie J. Loehr (Water Well Driller) Charlie J. Loehr (Company Name)

TEXAS DEPARTMENT OF LICENSING & REGULATION

TDLR License Data Search (Active Licenses only)

Search Help | Download License files | Download Other | Questions/Comments

Inquire by License Type

Water Well Drillers, Pump Installers

Inquire by License #

(Numeric only)

Inquire by Expiration Date

(mmddyyyy)

Inquire by Endorsement

All

Inquire by Name (Last, First) or by Business Name

Inquire by Location (City)

Choose One (Optional) Type the first letter to scroll down.

Inquire by County

Burleson Type the first letter to scroll down.

Inquire by Zip Code

Search Reset

If license not found, please contact Customer Service at 800-803-9202

Data last updated: 8/9/2023 06:01

Bookmark This Page

https://www.tdlr.texas.gov/LicenseSearch/

TDLR
TEXAS DEPARTMENT OF LICENSING & REGULATION

TEXAS DEPARTMENT OF LICENSING & REGULATION

License Data Search Results. Search Again | Back

Water Well Drillers, Pump Installers 2 Records Found

License#	Exp Date	Name	City	Zip	County	Phone
WWD - 1831	08/19/2024	VOLLENTINE, GUY JOSEPH	CALDWELL TX	77836	BURLESON	(409) 272-8665
WWD - 4182	08/19/2024	LOEHR, CHARLIE JOHN	CALDWELL TX	77836	BURLESON	(409) 272-8665

If license not found, please contact Customer Service at 800-803-9202

Search Again | Back

TDLR
TEXAS DEPARTMENT OF LICENSING & REGULATION

TEXAS DEPARTMENT OF LICENSING & REGULATION

License Data Search Results. Search Again | Back

No Records Found
You searched on:
License Type = Water Well Drillers, Pump Installers
County = Milam

License#	Exp Date	Name	City	Zip	County	Phone

If license not found, please contact Customer Service at 800-803-9202

Search Again | Back

TEXAS DEPARTMENT OF LICENSING & REGULATION

Texas Department of Licensing and Regulation

Result Listing

Name and Location	Other Information
VOLLENTINE, GUY JOSEPH 6374 COUNTY ROAD 225 CALDWELL TX 77836-5804 County: BURLESON	**Water Well Driller and Pump Installer** License #: 1831 Expiration Date: 08/19/2024 Type: CIMW License Status: Active Phone: (409) 272-8665 Continuing Education Status: Required

Driller Designations:

(W) - water well;

(M) - monitoring well;

(C) - closed loop geothermal well;

(N) - injection well;

(D) - dewatering well;

(A) - master well driller which includes all designations previously listed.

Pump Installer Designations:

(L) - windmills, hand pumps, and pump jacks;

(P) - single phase pumps;

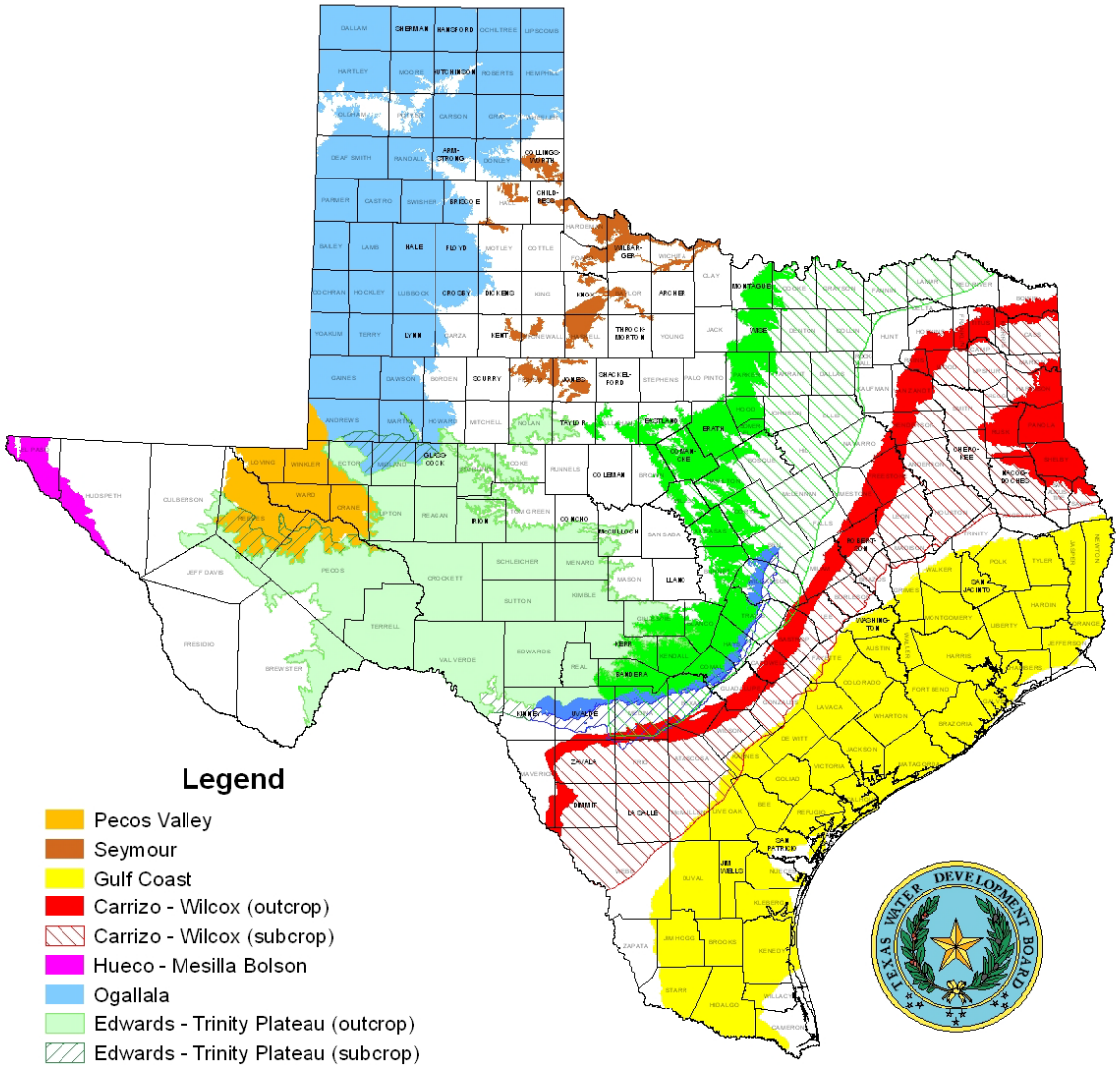
(K) - three phase pumps;

(T) - line-shaft turbine pumps;

(I) - master water well pump installer which includes all designations previously listed.

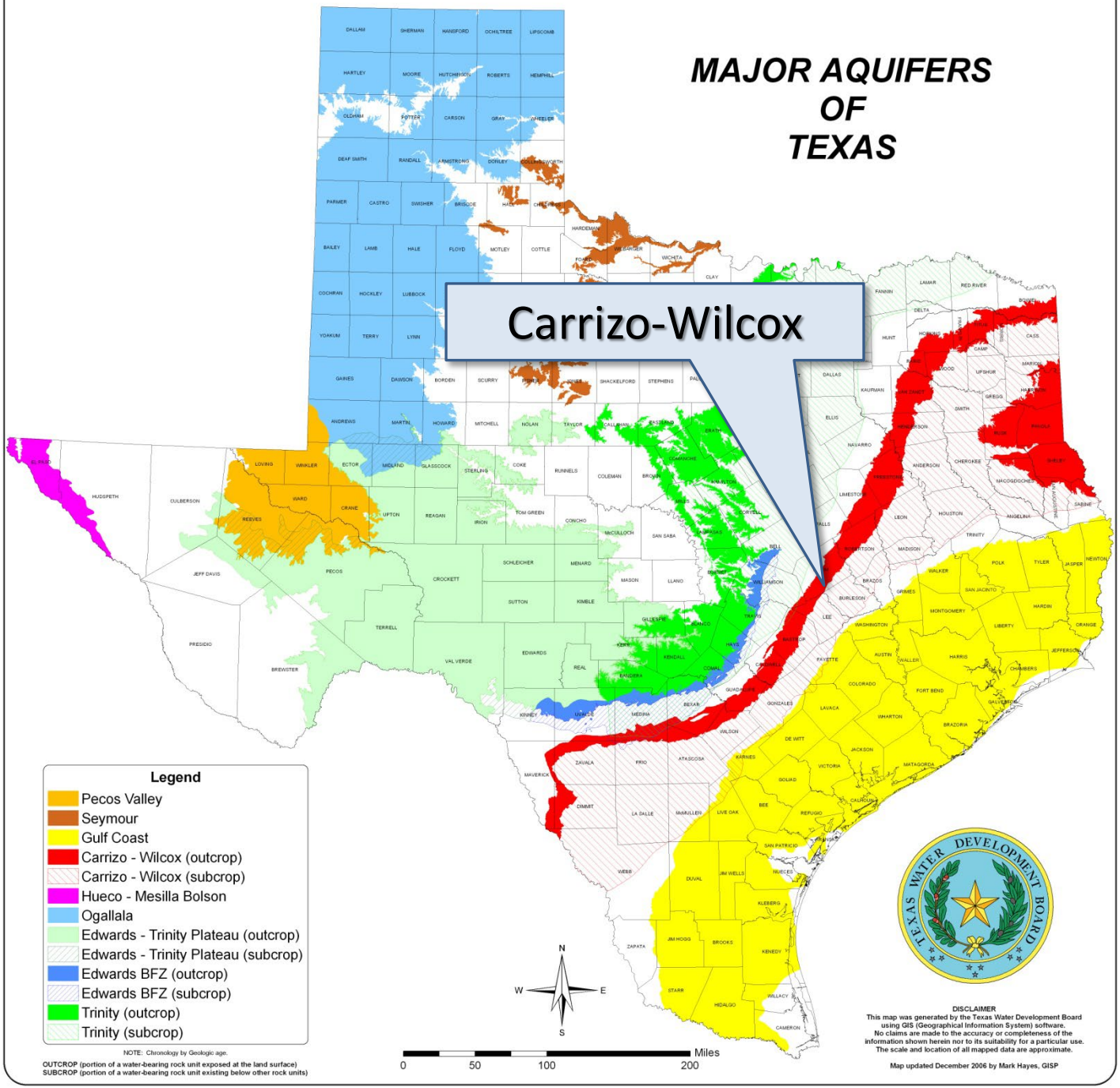
Search Again | Back

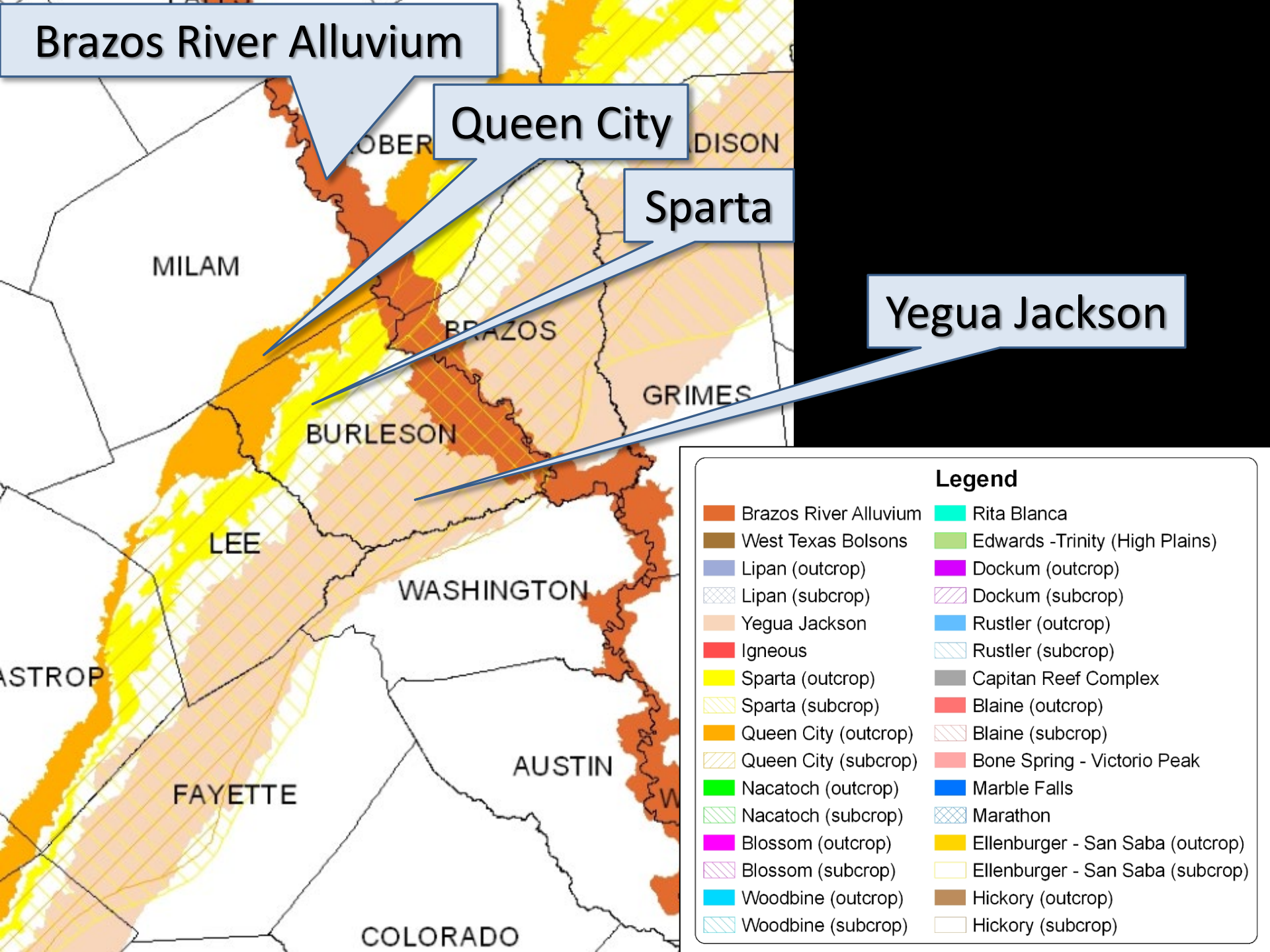
Major Aquifers of Texas



GROUNDWATER

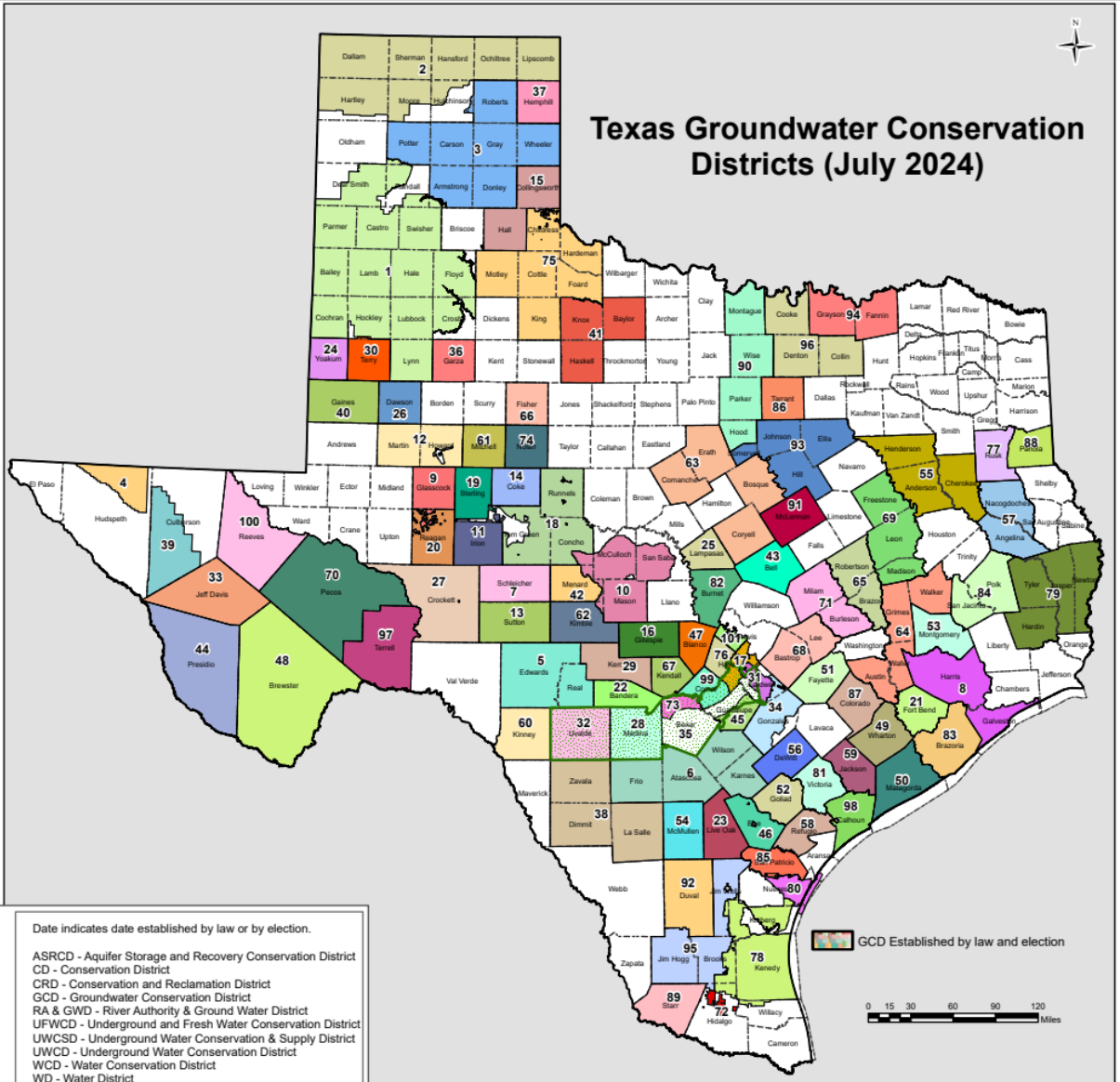
- 9 major, 21 minor aquifers
- **3-4 billion** acre-feet
- 250 times as much groundwater as we have surface water


MAJOR AQUIFERS
OF
TEXAS
Carrizo-Wilcox
Legend
Pecos Valley
Seymour
Gulf Coast
Carrizo - Wilcox (outcrop)
Carrizo - Wilcox (subcrop)
Hueco - Mesilla Bolson
Ogallala
Edwards - Trinity Plateau (outcrop)
Edwards - Trinity Plateau (subcrop)
Edwards BFZ (outcrop)
Edwards BFZ (subcrop)
Trinity (outcrop)
Trinity (subcrop)
NOTE: Chronology by Geologic age.
OUTCROP (portion of a water-bearing rock unit exposed at the land surface)
SUBCROP (portion of a water-bearing rock unit existing below other rock units)
N
W
E
S
0
50
100
200
Miles
TEXAS WATER DEVELOPMENT BOARD
DISCLAIMER
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 nor to its suitability for a particular use.
The scale and location of all mapped data are approximate.
Map updated December 2006 by Mark Hayes, GISP


Brazos River Alluvium
Queen City
Sparta
Yegua Jackson
MILAM
BRAZOS
GRIMES
BURLESON
LEE
WASHINGTON
AUSTIN
FAYETTE
COLORADO
Legend
Brazos River Alluvium
West Texas Bolsons
Lipan (outcrop)
Lipan (subcrop)
Yegua Jackson
Igneous
Sparta (outcrop)
Sparta (subcrop)
Queen City (outcrop)
Queen City (subcrop)
Nacatoch (outcrop)
Nacatoch (subcrop)
Blossom (outcrop)
Blossom (subcrop)
Woodbine (outcrop)
Woodbine (subcrop)
Rita Blanca
Edwards -Trinity (High Plains)
Dockum (outcrop)
Dockum (subcrop)
Rustler (outcrop)
Rustler (subcrop)
Capitan Reef Complex
Blaine (outcrop)
Blaine (subcrop)
Bone Spring - Victorio Peak
Marble Falls
Marathon
Ellenburger - San Saba (outcrop)
Ellenburger - San Saba (subcrop)
Hickory (outcrop)
Hickory (subcrop)

Groundwater Conservation Districts

1 High Plains UWCD No.1 - 9/29/1951
2 North Plains GCD - 1/2/1955
3 Panhandle GCD - 1/21/1956
4 Hudspeth County UWCD No. 1 - 10/5/1957
5 Real-Edwards C and R District - 5/30/1959
6 Evergreen UWCD -8/30/1965
7 Plateau UWC and Supply District - 3/4/1974
8 Harris-Galveston Subsidence District- 4/23/1975
9 Glasscock GCD - 8/22/1981
10 Hickory UWCD No. 1 - 8/14/1982
11 Irion County WCD - 8/2/1985
12 Permian Basin UWCD - 9/21/1985
13 Sutton County UWCD - 4/5/1986
14 Coke County UWCD - 11/4/1986
15 Mesquite GCD - 11/4/1986
16 Hill Country UWCD - 8/8/1987
17 Barton Springs/Edwards Aquifer CD - 8/13/1987
18 Lipan-Kickapoo WCD - 11/3/1987
19 Sterling County UWCD - 11/3/1987
20 Santa Rita UWCD - 8/19/1989
21 Fort Bend Subsidence District - 8/28/1989
22 Bandera County RA & GWD - 11/7/1989
23 Live Oak UWCD - 11/7/1989
24 Sandy Land UWCD - 11/7/1989
25 Saratoga UWCD - 11/7/1989
26 Mesa UWCD - 1/20/1990
27 Crockett County GCD - 1/26/1991
28 Medina County GCD - 8/26/1991
29 Headwaters UWCD - 11/5/1991
30 South Plains UWCD - 2/8/1992
31 Plum Creek CD - 5/1/1993
32 Uvalde County UWCD - 9/1/1993
33 Jeff Davis County UWCD - 11/2/1993
34 Gonzales County UWCD - 11/2/1994
35 Edwards Aquifer Authority - 7/28/1996
36 Garza County UWCD - 11/5/1996
37 Hemphill County UWCD - 11/4/1997
38 Wintergarden GCD - 1/17/1998
39 Culberson County GCD - 5/2/1998
40 Llano Estacado UWCD - 11/3/1998
41 Rolling Plains GCD - 1/26/1999
42 Menard County UWCD - 8/14/1999
43 Clearwater UWCD - 8/21/1999
44 Presidio County UWCD - 8/31/1999
45 Guadalupe County GCD - 11/14/1999
46 Bee GCD - 1/20/2001
47 Blanco-Pedernales GCD - 1/23/2001
48 Brewster County GCD - 11/6/2001
49 Coastal Bend GCD - 11/6/2001
50 Coastal Plains GCD - 11/6/2001
51 Fayette County GCD - 11/6/2001
52 Goliad County GCD - 11/6/2001
53 Lone Star GCD - 11/6/2001
54 McMullen GCD - 11/6/2001
55 Neches & Trinity Valleys GCD -11/6/2001
56 Pecan Valley GCD - 11/6/2001
57 Pineywoods GCD - 11/6/2001
58 Refugio GCD - 11/6/2001
59 Texana GCD - 11/6/2001
60 Kinney County GCD - 1/12/2002
61 Lone Wolf GCD - 2/2/2002
62 Kimble County GCD - 5/3/2002
63 Middle Trinity GCD - 5/4/2002
64 Bluebonnet GCD - 11/5/2002
65 Brazos Valley GCD - 11/5/2002
66 Clear Fork GCD - 11/5/2002
67 Cow Creek GCD - 11/5/2002
68 Lost Pines GCD - 11/5/2002
69 Mid-East Texas GCD - 11/5/2002
70 Middle Pecos GCD - 11/5/2002
71 Post Oak Savannah GCD - 11/5/2002
72 Red Sands GCD - 11/5/2002
73 Trinity Glen Rose GCD - 11/5/2002
74 Wes-Tex GCD - 11/5/2002
75 Gateway GCD - 5/3/2003
76 Hays Trinity GCD - 5/3/2003
77 Rusk County GCD - 6/5/2004
78 Kenedy County GCD - 11/2/2004
79 Southeast Texas GCD - 11/2/2004
80 Corpus Christi ASRCD - 6/17/2005
81 Victoria County GCD - 8/5/2005
82 Central Texas GCD - 9/24/2005
83 Brazoria County GCD - 11/8/2005
84 Lower Trinity GCD - 11/7/2006
85 San Patricio County GCD - 5/12/2007
86 Northern Trinity GCD - 5/15/2007
87 Colorado County GCD - 11/6/2007
88 Panola County GCD - 11/6/2007
89 Starr County GCD - 11/6/2007
90 Upper Trinity GCD - 11/6/2007
91 Southern Trinity GCD - 6/19/2009
92 Duval County GCD - 7/25/2009
93 Prairielands GCD - 9/1/2009
94 Red River GCD - 9/1/2009
95 Brush Country GCD - 11/3/2009
96 North Texas GCD - 12/1/2009
97 Terrell County GCD - 11/6/2012
98 Calhoun County GCD - 11/4/2014
99 Comal Trinity GCD - 6/17/2015
100 Reeves County GCD - 11/3/2015
101 Southwestern Travis County GCD -11/6/2019



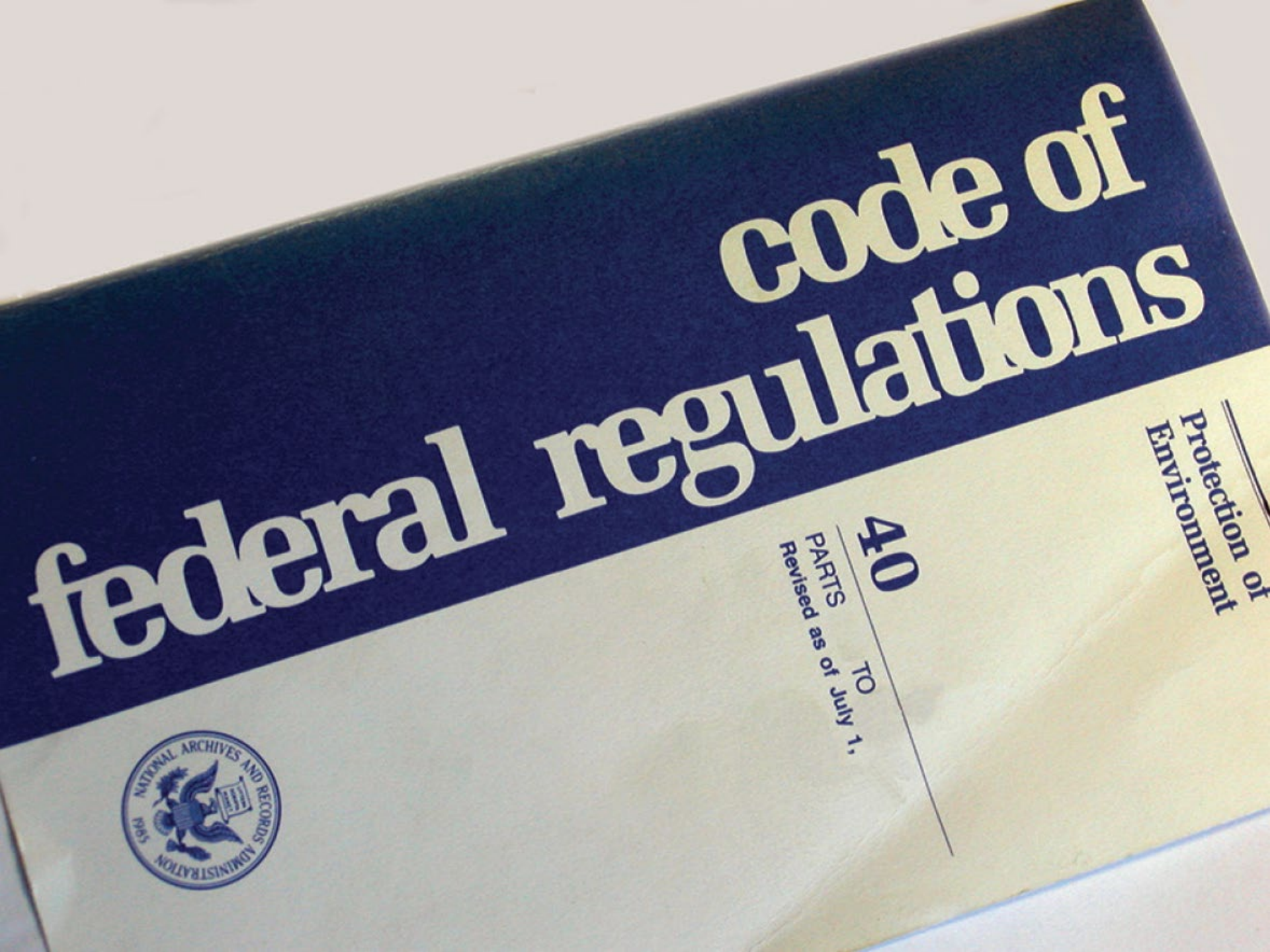
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

This map was generated by the Water Availability Division of the Texas Commission on Environmental Quality. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Water Availability Division at (512) 239-4600.

Map printed July 1, 2024.

Date indicates date established by law or by election.

ASRCD - Aquifer Storage and Recovery Conservation District
CD - Conservation District
CRD - Conservation and Reclamation District
GCD - Groundwater Conservation District
RA & GWD - River Authority & Ground Water District
UFWCD - Underground and Fresh Water Conservation District
UWCSD - Underground Water Conservation & Supply District
UWCD - Underground Water Conservation District
WCD - Water Conservation District
WD - Water District


code of
federal regulations
40
PARTS TO
Revised as of July 1,
Protection of
Environment
NATIONAL ARCHIVES AND RECORDS ADMINISTRATION
1985

Water Supply Regulations

EPA – National Drinking Water Standards

- Public water systems
- Primary Standards – Health
- Secondary Standards – Nuisance
- **Can be used as a guide for your private well**

Texas Private Well Regulations

- Well location requirements
- Well construction
- **No requirements** for water testing or maintenance after construction

Private Wells: Drinking, Irrigation, Livestock

1. Over 1,000,000 private water wells in Texas.
2. About 10% of private wells contain fecal coliform bacteria. MCL = 0.
3. Two to 50% exceed nitrate MCL depending on region (TWDB 2003-2008 data for 3,861 wells).
4. Iron and H_2S are not harmful, but can be significant nuisances.
5. Disappointment: water too salty for irrigation and livestock uses

Keeping a Safe Distance

Protecting the well

- Pump house should not be used as a storage shed for
  - Pesticides
  - Chemicals
  - Feed sacks
- Don't winterize the well with fertilizer bags

Thirsty?

Summary Results

Number of samples screened: **52**

Positives for *E. coli*: **1 (2%)**

Positive for coliform bacteria: **19 (37%)**

Nitrate average: **0.06 ppm** Range: **0.01 – 0.93 ppm**

Average salinity (TDS): **586 ppm** Range: **44 – 2,351 ppm**

pH Range: 5.1 – 8.1

Summary Results

Boron Average: **0.43 ppm** Range: **0.01 – 5.92 ppm**

Sodium Average: **123 ppm** Range: **1 – 681 ppm**

SAR Average: **9.1** Range: **0.2 – 43.9**

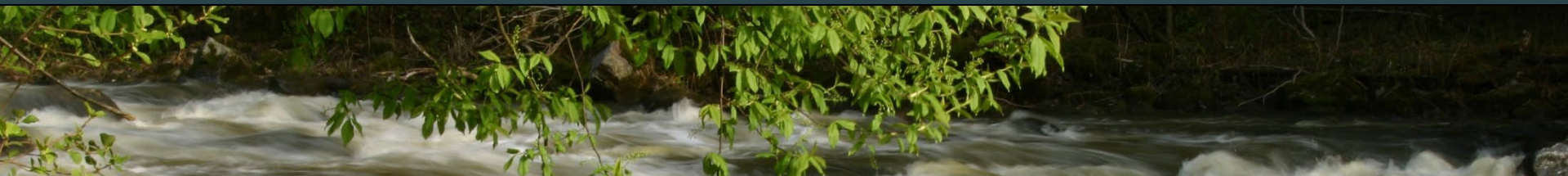
Sulfate Average: **86** ppm Range: **1 - 777 ppm**

Chloride Average: **83 ppm** Range: **3 – 871 ppm**

Iron Average: **0.2 ppm** Range: **0.01 – 5.57 ppm**

Manganese Average: **0.06 ppm** Range: **0.01 – 0.51 ppm**

Conductivity Average: **789** Range: **87 – 4,390**



Water Source =Well

Water Use =Domestic

Parameter analyzed		Results	Units	Method	V. Limiting	Limiting	Acceptable
Calcium (Ca)		95	ppm	ICP			*****
Magnesium (Mg)		48	ppm	ICP			*****
Sodium (Na)		37	ppm	ICP		*****	
Potassium (K)	<	1	ppm	ICP			*****
Boron (B)	<	0.01	ppm	ICP			*****
Carbonate (CO_3)		0	ppm	Titr.			*****
Bicarbonate (HCO_3)		410	ppm	Titr.		*****	
Sulfate (SO_4 -calculated from total S)		35	ppm	ICP			*****
Chloride (Cl^-)		27	ppm	Titr.			*****
Nitrate-N (NO_3-N)		14.66	ppm	Cd-red.		*****	
Phosphorus (P)	<	0.01	ppm	ICP			*****
pH		7.36		ISE			*****
Conductivity		769	umhos/cm	Cond.		*****	
Hardness		25	grains CaCO3/gallon	Calc.		*****	
Hardness		433	ppm CaC03	Calc.		*****	
Alkalinity		336	ppm CaC03	Calc.		*****	
Total Dissolved Salts (TDS)		667	ppm	Calc.		*****	
SAR		0.8		Calc.	N/A		
Iron (Fe)	<	0.01	ppm	ICP			*****
Zinc (Zn)	<	0.01	ppm	ICP			*****
Copper (Cu)	<	0.01	ppm	ICP			*****
Manganese (Mn)	<	0.01	ppm	ICP			*****
Arsenic (As)							
Barium (Ba)							
Nickel (Ni)							
Cadmium (Cd)							

Water Well Testing FAQs

How often should the well be tested?

- Annually for bacteria.
- Every few years for general chemistry such as nitrates and salts.
- As frequently as needed for other contaminants of concern (http://water.epa.gov/drink/contaminants/index.cfm)

How much will it cost?

- Varies depending on analyses selected.
- Basic *E. coli* test should be less than $50.

How do I find a lab?

- County Health Departments and River Authorities
- NELAC-certified labs on TCEQ website

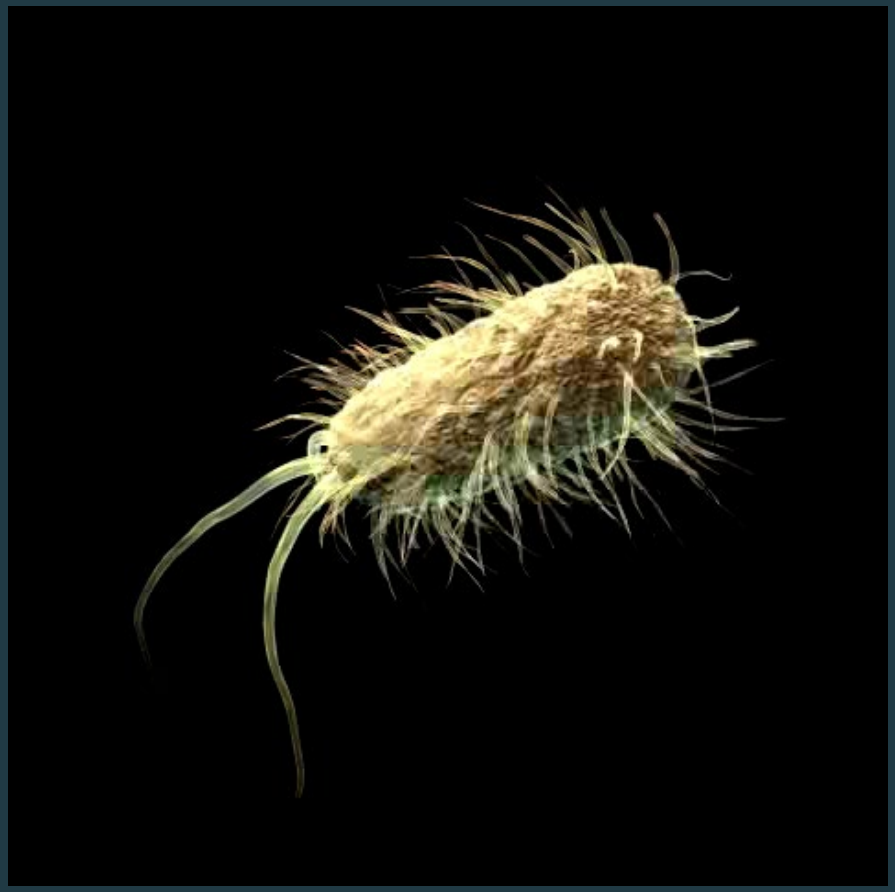
Private Well Testing

Irrigation and Livestock:

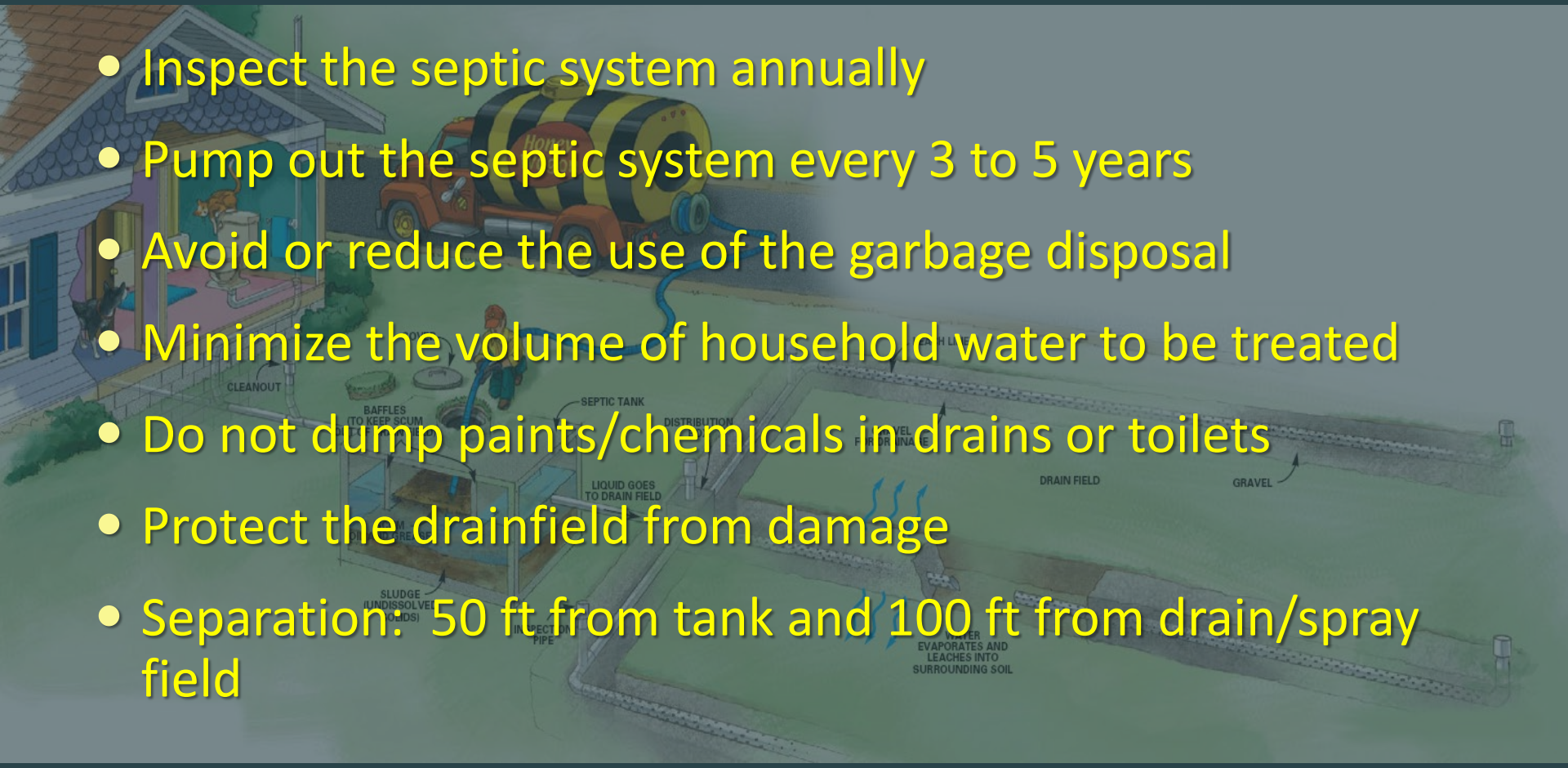
Texas AgriLife Extension Service Soil, Water and Forage Testing Laboratory at TAMU (http://soiltesting.tamu.edu/)

Fecal Bacteria

- Microscopic organisms found in feces of humans and other warm-blooded animals
- Not all are harmful by themselves
- *Indicator* organisms: indicate presence of *pathogenic* bacteria, viruses, parasites
- Fecal coliform and *E. coli* are most commonly tested



Septic Systems



- Inspect the septic system annually
- Pump out the septic system every 3 to 5 years
- Avoid or reduce the use of the garbage disposal
- Minimize the volume of household water to be treated
- Do not dump paints/chemicals in drains or toilets
- Protect the drainfield from damage
- Separation: 50 ft from tank and 100 ft from drain/spray field

Sources of Bacteria

HUMANS

50 Ft. Minimum Separation

100 Ft. Minimum Separation drain/Spray Field

Sources of Bacteria

LIVESTOCK

- 150 Ft. Minimum Separation
- Down slope from Well

Sources of Bacteria

DOMESTIC ANIMALS

150 Ft. Minimum Separation From pens, yards and runs

Why be Concerned with Nitrates?

- Methemoglobinemia (Blue baby syndrome)
- Pregnant/Nursing women
- Infants
- Elderly/Suppressed immune systems
- Symptoms: blueness, breathing difficulty, and vomiting

Sources of Nitrates

HUMANS

50 Ft. Minimum Separation

100 Ft. Minimum Separation drain/Spray Field

Sources of Nitrates

FERTILIZER

STORAGE: 150 FT. MINIMUM SEPARATION

Sources of Nitrates

ANIMAL WASTE

- 150 Ft. Separation for Pets and Livestock
- Wildlife: No Guidelines

Total Dissolved Solids (TDS)

- Level of dissolved minerals, including salts
- More than 500 mg/L tastes salty
- Sodium is often referred to as a measure of salinity, most common cause of high TDS in Texas

Salinity Tolerance - Animals

PPM	
0 - 3,000	O.K. for all livestock
3,000 – 4,999	Satisfactory, may result in temporary refusal/diarrhea; poor quality for poultry
4,999 - 6,999	Reasonably safe, not for pregnant/ lactating animals
6,999 - 10,000	Risky to young, pregnant/lactating animals or animals under heat stress
>10,000	Unsuitable for all livestock

Salinity Tolerance - Plants

PPM	
0 - 175	Excellent, no risk to plants
175 – 525	Good, not for sensitive plants
525 – 1,400	Permissible, not for low salt tolerant plants
1,400 – 2,100	Doubtful, damage to high salt tolerant plants
>2,100	Unsuitable

Other Water Quality Concerns: Boron

Boron can become toxic to some plants when the soil-water concentration exceeds optimum plant growth levels

PPM	Plants
<1	Toxicity to many sensitive plants may occur at 1 ppm.
2-10	Most perennial grasses relatively tolerant at 2-10. (2 samples in this range)

Highest in Summary set: 5.92

Sodium (Na) Hazard

- Sodic Soil Condition
  - Na accumulates on soil.
  - Loss of structure, hard, compacted.
  - Infiltration, aeration, root growth greatly reduced.

SAR – Soil Sodium Absorption Ratio

Sodium concentration in relation to calcium and magnesium concentrations

- Na can replace Calcium and Magnesium adsorbed on soil clays
- Causes dispersion of soil particles
- Soil becomes hard and compact, and water infiltration is affected
- Soil structure can be damaged

SAR – Soil Sodium Absorption Ratio

Sodium relative to calcium and magnesium concentrations

SAR Value	Sodium Hazard and Comments
<10	No sodium hazard. May be used on all sensitive crops.
10-18	Medium sodium hazard. Gypsum and leaching needed. (5 samples)
19-26	High sodium hazard. Generally unsuitable for continued use. (1 sample)
>26	Very high sodium hazard. Generally unsuitable for use. (7 samples)

Other Water Quality Concerns: Sulfate

Target Concentrations

Domestic water: **> 250 ppm can cause diarrhea (Secondary Drinking Water Standard)**

(4 samples)

Irrigation water: **Moderate concentration can reduce growth or cause specific injury**
Adds to salinity

Livestock water: **> 2000 ppm can cause diarrhea in most livestock**

Other Water Quality Concerns: Chloride

Target Concentrations

Domestic water: **> 250 ppm may cause salty taste (Secondary Drinking Water Standard)**

(5 samples)

Irrigation water: **>900 ppm is considered non-suitable for all agronomic crops**

Livestock water: **Limit not currently established**

Adds to salinity

Managing Marginal Quality Irrigation Water

- Crop Management
  - Select more tolerant plant species.
- Water Management
  - Water "deeply" to leach salts (leaching fraction). Typically 5-75% extra water.
- Soil Management
  - Mulch to reduce evaporation and improve leaching.
  - Deep tillage to improve drainage.
  - Chemical amendments – gypsum to remove sodium.
  - Routine soil testing to monitor.

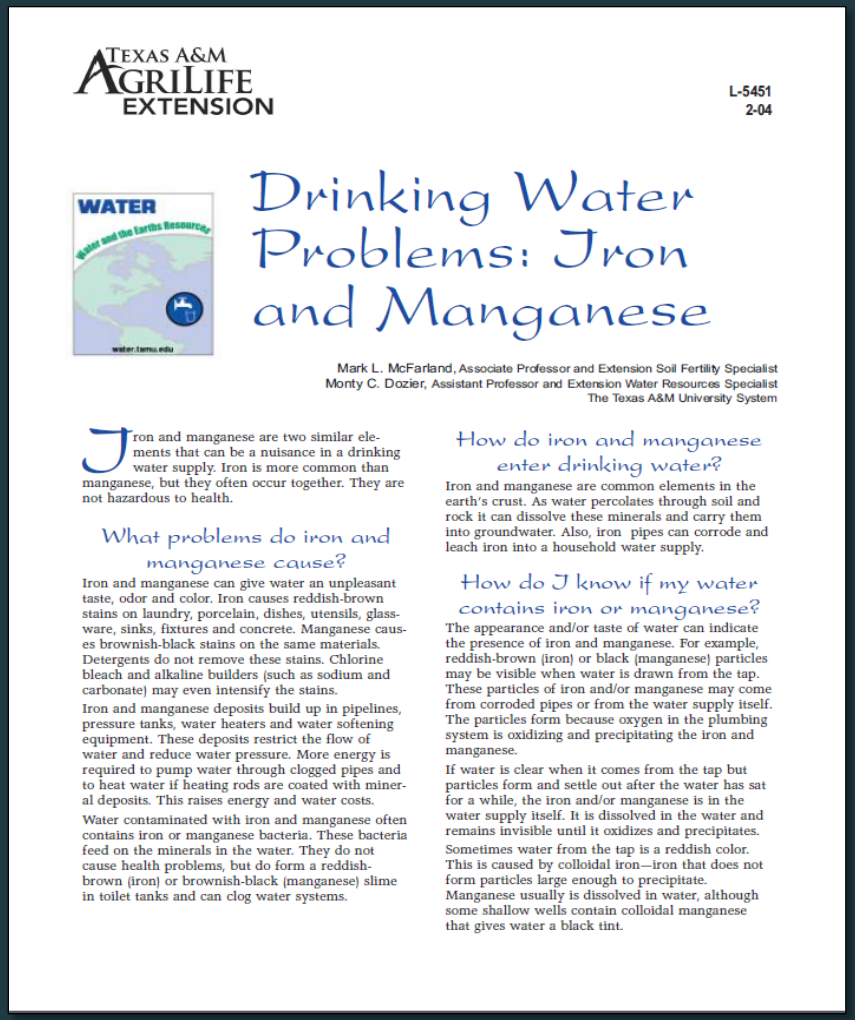
Iron and Manganese

- Nuisance –unpleasant taste, odor, and color
- Secondary MCL:
  - Iron = 0.3 mg/L (5)
  - Manganese =.05 mg/L (9)
- Stains- Iron (reddish brown) Manganese (brownish black) on concrete, laundry, and plumbing fixtures

Iron and Manganese Treatment

Treatment depends on type and concentration

- Initially clear, but particles form and settle out
- Water from tap has solid particles or has a tint
- Iron/manganese bacteria- reddish or black slime in toilet or faucets.



TEXAS A&M AGRILIFE EXTENSION

L-5451
2-04

Drinking Water Problems: Iron and Manganese

Mark L. McFarland, Associate Professor and Extension Soil Fertility Specialist
Monty C. Dozier, Assistant Professor and Extension Water Resources Specialist
The Texas A&M University System

Iron and manganese are two similar elements that can be a nuisance in a drinking water supply. Iron is more common than manganese, but they often occur together. They are not hazardous to health.

What problems do iron and manganese cause?

Iron and manganese can give water an unpleasant taste, odor and color. Iron causes reddish-brown stains on laundry, porcelain, dishes, utensils, glassware, sinks, fixtures and concrete. Manganese causes brownish-black stains on the same materials. Detergents do not remove these stains. Chlorine bleach and alkaline builders (such as sodium and carbonate) may even intensify the stains.

Iron and manganese deposits build up in pipelines, pressure tanks, water heaters and water softening equipment. These deposits restrict the flow of water and reduce water pressure. More energy is required to pump water through clogged pipes and to heat water if heating rods are coated with mineral deposits. This raises energy and water costs.

Water contaminated with iron and manganese often contains iron or manganese bacteria. These bacteria feed on the minerals in the water. They do not cause health problems, but do form a reddish-brown (iron) or brownish-black (manganese) slime in toilet tanks and can clog water systems.

How do iron and manganese enter drinking water?

Iron and manganese are common elements in the earth's crust. As water percolates through soil and rock it can dissolve these minerals and carry them into groundwater. Also, iron pipes can corrode and leach iron into a household water supply.

How do I know if my water contains iron or manganese?

The appearance and/or taste of water can indicate the presence of iron and manganese. For example, reddish-brown (iron) or black (manganese) particles may be visible when water is drawn from the tap. These particles of iron and/or manganese may come from corroded pipes or from the water supply itself. The particles form because oxygen in the plumbing system is oxidizing and precipitating the iron and manganese.

If water is clear when it comes from the tap but particles form and settle out after the water has sat for a while, the iron and/or manganese is in the water supply itself. It is dissolved in the water and remains invisible until it oxidizes and precipitates.

Sometimes water from the tap is a reddish color. This is caused by colloidal iron—iron that does not form particles large enough to precipitate. Manganese usually is dissolved in water, although some shallow wells contain colloidal manganese that gives water a black tint.

Treatment: Phosphate injection, water softener, oxidizing filter, aeration/filtration, shock treatment and filtration

Hydrogen Sulfide

- Colorless gas with a “rotten egg” odor
- Formed by sulfur- and sulfate-reducing bacteria that can occur naturally in groundwater
- Shallow or poorly constructed wells
- Wells drilled in shale, sandstone, near coal or oil fields

Hydrogen Sulfide (H_2S) Treatment

- If the smell is only from the hot water faucet, problem likely is in the water heater
  - Ensure the water heater is set according to manufacturer's recommendation – often 140^{o} will help. Careful of scalding.
  - Problem might be caused by a chemical reaction with the magnesium control rod (anode)
    - Can be removed or replaced with an aluminum or zinc rod.
  - Consider a tankless heater.
- If the smell is coming from both hot and cold faucets, but only from water treated by a water softener and not in the untreated water, problem likely is sulfur bacteria in the water softener.
  - Hire a water treatment specialist to clean the water softener.

Hydrogen Sulfide (H_2S) Treatment

- If the smell is strong when the water in both the hot and cold faucets is first turned on, and ***becomes weaker or goes away*** after the water has run for a while, or if the smell varies over time, the problem is likely sulfur bacteria in the well or plumbing system.
  - If from sulfur-reducing bacteria, shock chlorination may treat; could follow with a UV filter OR manganese greensand filter (up to 10 ppm) or continuous chlorination system (6 to 75 ppm)
- If the smell is strong when you first turn on the water in both the hot and cold faucets and is ***more or less constant and persists with use***, the problem likely is H_2S in the groundwater that supplies the well.
  - A whole house carbon filter may remove enough (GAC up to 1 ppm and Catalytic C “more” depending on DO).
  - Aeration tank, early-style pressure tank bladder (up to 2 ppm)

Hydrogen Sulfide (H_2S) Treatment

AgriLIFE EXTENSION
Texas A&M System

L-5312
6-99

HYDROGEN SULFIDE IN DRINKING WATER

Causes and Treatment Alternatives

Mark L. McFarland and T. L. Provin*

Drinking water with a nuisance "rotten egg" odor contains hydrogen sulfide (H_2S), a gas that dissolves readily in water. This sulfide-rich water commonly is referred to as sulfur water.

Although typical concentrations in household water are not a health risk, high concentrations do affect the taste of water. A concentration as low as 0.1 milligram hydrogen sulfide per liter of water (mg/l) is detectable by smell by most people. As a point of reference, 1 teaspoon of salt dissolved in 1,000 gallons of water produces a concentration equal to about 1 mg/l. A characteristic hydrogen sulfide taste can be detected in water with a concentration as low as 0.05 mg/l. Some people become accustomed to the odor and taste and tolerate hydrogen sulfide levels as high as 5 to 6 mg/l. Most people, unaccustomed to sulfur water, find it highly unpleasant.

Hydrogen sulfide also can corrode plumbing metals (iron, steel, copper, brass) and exposed metal parts in washing machines and other water-using appliances. Corrosion of iron and steel by hydrogen sulfide forms a black precipitate (ferrous sulfide) that can stain laundry and bathroom fixtures, darken silverware and discolor copper and brass utensils.

Sources of hydrogen sulfide

Hydrogen sulfide is formed by sulfur- and sulfate-reducing bacteria that can occur naturally in water. These anaerobic bacteria use sulfates and sulfur compounds found in decaying plant material, rocks or soil to convert organic compounds into energy. Under these anaerobic (without oxygen) conditions, hydrogen sulfide forms as a by-product. Hydrogen sulfide can occur in deep or shallow wells and also can enter surface water through springs.

Shallow, poorly constructed wells or those located close to sewer lines or septic systems and surface water can become contaminated with sewage and develop problems with hydrogen sulfide. Wells drilled in shale or sandstone or near coal or oil fields often will have hydrogen sulfide present in the water.

Odors from hot water only

In the home, the foul odor caused by hydrogen sulfide sometimes is detected only on the hot water side of taps. If the water heater is electric, the problem might be caused by a chemical reaction with the sacrificial metal rod (anode). Electric water heaters often contain a magnesium rod that functions to retard corrosion of the tank. As the rod releases small amounts of magnesium, some hydrogen also is released. The hydrogen can then combine with sulfur in the water to form hydrogen sulfide. To correct the problem, the magnesium rod can be removed or replaced by an aluminum or zinc rod. However, such action could void the manufacturer's warranty on the water heater. Chemical feeder systems using polyphosphate also can retard corrosion, but generally are more costly.

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Abandoned Wells

- Have you seen an abandoned well?
  - Was it covered?
  - Would it have been easy to fall in to?

Should the well be plugged or capped?

- A well that has not been used in six months should be plugged.
- However, if the well is not deteriorated and has good casing, pump and pump column, the landowner may instead cap the well.

Who Should Plug the Well?

A landowner may plug wells with less than 100 feet of standing water in the well.

But, a contractor may have **better equipment** and **understanding** of the **geological conditions** that affect how the well should be plugged.

Capping Abandoned Wells

- Under Texas law, the landowner is responsible for plugging abandoned water wells and is liable for any water contamination or injury that results
- Another alternative is to cap the well
  - If the well is “non-deteriorated” and in good condition

Capping a Well

Three criteria for capping a well

- A cap must fit tightly and be properly sealed to prevent surface pollutants from entering well
- The cap should support 400 pounds to minimize the risk of a person falling into the well
- To protect children and animals, the cap should not be easily removed by hand and not easy to lift.

Key Points to Remember

- As the private well owner you are the operator of your water system: drilling, maintenance, regulating, testing
- Protect your well and your water supply with easy preventive steps
- It is cheaper to prevent issues than to repair them
- **TEST** your water well every year!

Resources on water quality issues available at: **https://twon.tamu.edu**

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Water Well Basics

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Texas A&M Depa

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Capping of Water Wells for Future Use

Bruce Lesikar and Justin Mechell*

Water is one of our state's most precious resources. Much of our groundwater comes from aquifers, which are underground layers of porous rock or sand containing water. Wells can be drilled into the aquifers to produce drinking water, irrigation water, and water for industry. Because groundwater supplies more than half of the water used in the state, all Texans must help protect the quality of this vital resource.

Groundwater has been pumped from water wells for many years. Over time, many wells around homes, farms, industrial sites and urban areas may no longer be needed. Wells that are no longer being used but might be needed in the future can be sealed with a cap that covers the top of the well casing pipe to prevent unauthorized access and contamination of the well. A cap is a temporary groundwater protection solution that allows a well to be used at a later time.

Can my well be capped?

A well can be capped only if it is in good condition and is in use. The Texas Department of Licensing and Regulation (TDLR) defines this as a "non-deteriorated well." A non-deteriorated well is one with a casing and pump in good condition. If your well is not in good condition it should be properly abandoned according to instructions in the Landowners Guide to Plugging Abandoned Water Wells (*http://www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/rg/rg-347.html*).

You can inspect the condition of a well casing at the surface by searching for holes or cracks. Use a light to check the inside of the casing. If you can move the casing around by pushing against it, the casing is probably deteriorating. If you need assis-

Figure 1. The slab around this capped well must be repaired to keep water from entering the well bore hole.

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Drinking Water Problems: Nitrates

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Nitrogen is present in the environment in many forms. The earth's atmosphere consists of 70 percent nitrogen.
When nitrogen interacts with another element in the environment, it changes form and becomes a com-
pound. Two kinds of nitrogen com
nature are nitrates [NO_3] and nitri
and nitrites are chemicals that are
gen and oxygen and that combine
organic (related to or derived from
and inorganic compounds. Once
nitrates are converted into nitrites
Nitrates occur naturally in drinkin
if there are high levels of nitrates
probably caused by human activi
overuse of chemical fertilizers and
of human and animal wastes. The
wastes contain nitrogen compoun
ed to nitrates in the soil.
Nitrates dissolve easily in water a
ly through soil into the drinking w
nitrate accumulates in water, high
up over time. For most adults, nitr
to be harmful, even at elevated le
too much nitrate can be harmful f
infants and susceptible adults.

Who regula
drinking water

In 1974, the United States Congre
Drinking Water Act. This law req
Environmental Protection Agency

the safe levels of chemicals for U.S. drinking water. The EPA conducts research to determine the level of a contaminant in drinking water that is safe for a person to consume over a lifetime and that water systems can reasonably be required to remove from

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Drinking Water Problems: Iron and Manganese

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Iron and manganese are two similar elements that can be a nuisance in a drinking water supply. Iron is more common than manganese, but they often occur together. They are not hazardous to health.

How do iron and manganese enter drinking water?

Iron and manganese are common elements in the earth's crust. As water percolates through soil and rock it can dissolve these minerals and carry them
s, iron pipes can corrode and
ehold water supply.

know if my water
n or manganese?

r taste of water can indicate
and manganese. For example,
or black (manganese) particles
water is drawn from the tap.
n and/or manganese may come
r from the water supply itself.
ense oxygen in the plumbing
d precipitating the iron and

t it comes from the tap but
tle out after the water has sat
nd/or manganese is in the
is dissolved in the water and
l it oxidizes and precipitates.
n the tap is a reddish color.
oidal iron—iron that does not
nough to precipitate.
dissolved in water, although
emain colloidal manganese
ck tint.

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Protect Your Water Well During Drought

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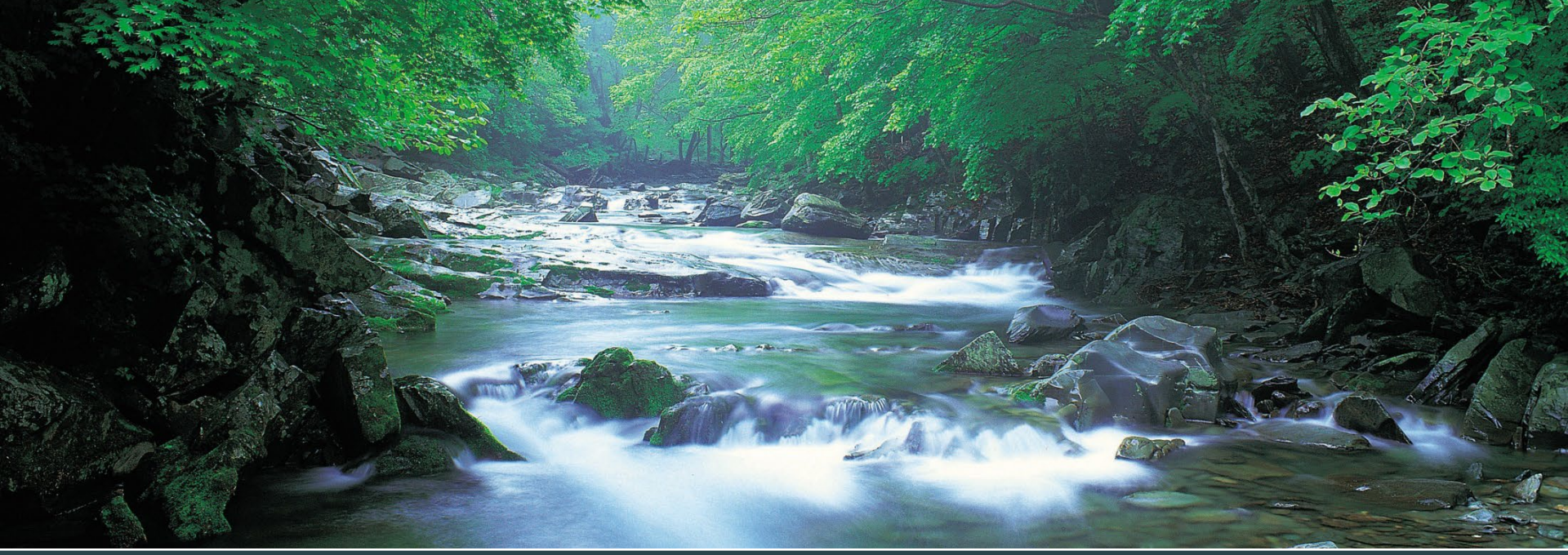
During severe droughts, people rely heavily on groundwater—the water held underground in aquifers. An aquifer can become depleted when more water is pumped out of it than is replenished by rainfall or other water sources. If the water level drops below the point of your pump intake, the pump could be damaged.

To protect your well equipment and water supply when the water level is low, follow these practices:

- Monitor your pump. Water levels that are low or recover slowly will make your pump cycle on and off rapidly and burn out the motor. Low water levels can also cause submersible pumps to overheat and damage PVC drop-pipes. If your pump is rapidly cycling on and off, turn it off. You may need to reduce your future pumping rate or lower the pump if the water level does not rise.
- If your pump sounds like it is sucking air, let it rest. When the water level drops, your well may begin to produce sand and air bubbles. Indications that the well may go dry include sand in the toilet tank and milky-looking tap water that clears after a short time.
- Depending on the depth of the well, This procedure will require help from a licensed pump installer. The Texas Department of Licensing and Regulation maintains a list of licensed well drillers and pump installers at http://www.license.state.tx.us/LicenseSearch/.
- Have the well water tested regularly during and after a drought. As the water level falls, air will enter the aquifer and change its chemistry. Oxygen in the aquifer will increase concentrations of naturally occurring contaminants such as arsenic. If your well normally contains low concentrations of arsenic, expect it to increase during a drought. The concentrations of other contaminants, such as total dissolved solids or salinity, may also change.
- Add a pumped-water storage tank if you have a low-yielding well. Adding a storage tank will help meet peak demand when your water needs exceed the pump's capacity.
- Work with your neighbors to schedule heavy water use. If everyone does laundry on Saturday, all the wells may go dry on Sunday. Distribute heavy water use over the week to help individual wells recover and to maintain the water supply in your area.
- Conserve water to preserve your well's



Questions?

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TEXAS STATE Soil & Water CONSERVATION BOARD