

Final Report

Texas Water Development Board

TWDB Contract No. 1004831106

Manual for Permitting Process

*Guidance Manual for Permitting Class I
and Class II Wells for the Injection and
Disposal of Desalination Concentrate*

May 6, 2014



TECO Energy, 2014

**CDM
Smith**



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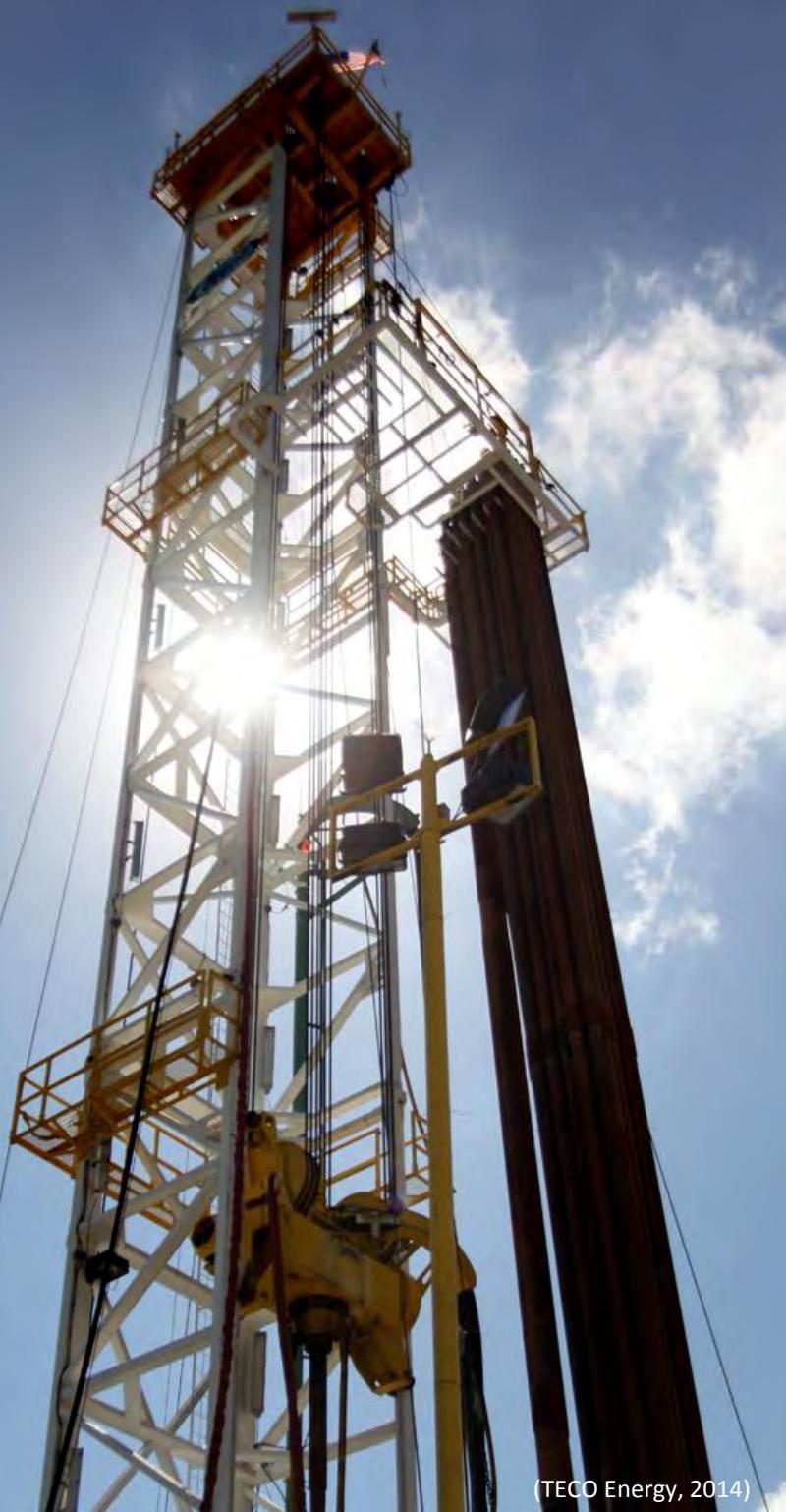
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1 List of Acronyms

BGD – Brackish Groundwater Desalination

BUQW – Base of Usable Quality Water

CO₂ – Carbon Dioxide

CFR – Code of Federal Regulations

DWTR – Drinking Water Treatment Residuals

USEPA – U.S. Environmental Protection Agency

GIS – Geographic Information System

HB – House Bill

MGD – Million Gallons per Day

NOD – Notice of Deficiency

NOI – Notice of Intent

P.E. – Professional Engineer

P.G. – Professional Geoscientist

RCRA – Resource Conservation and Recovery Act

RFP – Request for Proposals

RRC – Railroad Commission of Texas

SAWS – San Antonio Water System

SCADA - Supervisory Control and Data Acquisition

SB – Senate Bill

SDWA – Safe Drinking Water Act

SOAH – State Office of Administrative Hearings

TAC – Texas Administrative Code

TCEQ – Texas Commission on Environmental Quality

TDS – Total Dissolved Solids

Manual for Permitting Process

TNRCC - Texas Natural Resource Conservation Commission (predecessor agency to TCEQ)

TWC – Texas Water Code

TWDB – Texas Water Development Board

UIC – Underground Injection Control

USDW – Underground Source of Drinking Water

2 Definitions

Base of Usable Quality Groundwater (BUQW) - The lowest formation containing underground water that has a total dissolved concentrations of less than 3,000 milligrams per liter or other waters known to be used or identified as sources of desalination water.

Brackish Groundwater - Groundwater containing total dissolved solids concentrations between 1,000 and 10,000 milligrams per liter.

Class II Well Types

Type 1: Dispose of salt water, or other oil and gas waste by injection into a porous formation not productive of oil, gas or geothermal resources.

Type 2: Dispose of salt water, or other oil and gas waste by injection into a porous formation productive of oil, gas or geothermal resources.

Type 3: Inject salt water, fluids, or oil and gas waste by injection into a reservoir for secondary or enhanced recovery of oil.

Type 4: Miscellaneous Class II wells

Type 5: Storage of liquid or liquefied hydrocarbons in underground salt formations

Type 6: Storage of natural gas in depleted or productive reservoirs

Type 7: Storage of natural gas in underground salt formations

Type 8: Inject fluid for the purpose of extracting brine by the solution of a subsurface salt formation.

Desalination - The process of removing salt or salinity from salt water to create fresh water.

Drinking Water Treatment Residuals (DWTR) – Concentrate captured during brackish groundwater membrane treatment process comprised of salts and TDS particles.

Underground Injection Control Well Classes

Class I: Inject hazardous wastes, industrial nonhazardous liquids, or municipal wastewater or desalination concentrate beneath the lowermost USDW.

Class II: Inject brines and other fluids associated with oil and gas production, and hydrocarbons for storage.

Class III: Inject fluids associated with solution mining of minerals beneath the lowermost USDW.

Class IV: Inject hazardous or radioactive wastes into or above USDWs.

Class V: All injection wells not included in Classes I-IV

Class VI: Inject carbon dioxide (CO₂) for long term storage, also known as Geologic Sequestration of CO₂

Underground Injection - The practice of placing fluids underground, in porous formations of rocks, through wells or other similar conveyance systems.

Underground Source of Drinking Water (USDW) - Any aquifer which contains fewer than 10,000 milligrams per liter of total dissolved solids and is available for BGD (Brackish Groundwater Desalination)

3 Executive Summary

3.1 Introduction and Background

Public awareness of the physical, policy and financial issues integral to sustaining water resources for the growing population and economy in Texas is greater today than it has been in many decades, if ever. A common theme from those water resources managers assigned the often daunting task of planning to meet Texas' water resource needs is that "we need to be able to use all of the tools in the toolbox." One of these tools that will be critical in several areas of Texas is the desalination of brackish water, and in particular, brackish groundwater for municipal use.

Over the past several years, brackish water desalination has experienced significant technological advances, to the point that in many applications, it has become "off the shelf" technology and cost competitive with other more traditional water resources. However, until only recently, the regulatory framework for managing and disposing of concentrate (waste), a byproduct of the desalination process, has been very challenging and expensive.

Following a remarkable and productive multi-agency effort from 2003 – 2007, facilitated by the Texas Water Development Board (TWDB) and supported by the active participation of the Railroad Commission of Texas (RRC), the Texas Commission on Environmental Quality (TCEQ) and the United States Environmental Protection Agency (USEPA), the 80th Texas Legislature passed House Bill (HB) 2654 in 2007 (refer to **Appendix A**). HB 2654 provided a regulatory framework that, in conjunction with necessary amendments to TCEQ and RRC Underground Injection Control (UIC) rules, put forth permitting options for the disposal of nonhazardous desalination concentrate and drinking water treatment residual (DWTR) into either Class I (commercial and municipal injection/disposal wells), Class II (oil and gas injection/disposal wells), and "dually permitted" Class I-Class II wells. Throughout this document, the terms "desalination concentrate" and "DWTR" refer to nonhazardous desalination concentrate and nonhazardous DWTR respectively, unless otherwise specified.

Notably, HB 2654, through the creation of the General Permit, has set a more streamlined and simplified approach through TCEQ for permitting Class I wells and for dually permitting Class II disposal wells as Class I wells for desalination concentrate and DWTR disposal. Additionally, HB 2654 allows for desalination concentrate and DWTR injection into active Class II enhanced recovery wells through a Class II permit amendment process through the RRC.

This manual summarizes the opportunities, processes, and impacts of these new rules and regulations for water providers considering the use of injection and disposal wells for desalination concentrate and DWTR management. This manual primarily focuses on the use of existing Class II wells due to their wide distribution across Texas. The specific tasks are discussed below.

3.1.1 Scope of Work

In 2010, the TWDB published a Request for Proposals (RFP) for a Priority Research Project to develop promising strategies to increase the efficiency of water desalination and concentrate management processes. The primary activities involved in this research project focus on concentrate management through the use of injection wells and include the following tasks:

1. Obtain, process, and analyze data on existing Class II wells in Texas sufficient to locate and characterize wells currently permitted as Class II wells.
2. Develop cost and protocol comparisons for the construction and completion of new Class I nonhazardous wells versus the dual permitting of Class II wells as Class I nonhazardous wells based on the SAWS Brackish Groundwater Desalination Project.
3. Develop a Permitting Roadmap for multiple approaches that a water provider may take in obtaining the necessary UIC permit coverage for injection and disposal of desalination concentrate and DWTR into Class I and dually permitted Class I-II wells.
4. Make any policy recommendation deemed appropriate to advance the utilization of dually permitted Class II wells for disposal of desalination concentrate and DWTR.
5. Prepare a manual that documents the previous four tasks, with an emphasis on the permitting process for utilizing Class II wells for the proper injection and disposal of nonhazardous desalination concentrate and DWTR.

3.2 Class II Wells in Texas

Only specific types of Class II wells may be considered for injection and disposal of nonhazardous desalination brine and DWTR per the permitting processes put forth by HB 2654. The types are as follows:

- Type 1: Disposal well into a nonproductive oil and gas zone – TCEQ General Permit
- Type 2: Disposal well into a productive oil and gas zone – TCEQ General Permit
- Type 3: Enhanced recovery injection well – RRC permit amendment

Data was obtained from RRC UIC and Well Bore databases for this report to quantify the amount of Class II well types in the state. Based on an analysis of this data, the RRC has permitted over 100,000 Class II wells throughout history, and approximately 60,000 Type 1, 2 and 3 wells have active permits. Over 30,000 of these wells are currently active, and the majority, approximately 80 percent, consists of Type 3 wells (injection wells utilized for enhanced recovery of hydrocarbons) (RRC, 2012).

For a Class II well to be dually permitted as a Class I well per a General Permit, the Class II well must meet Class I construction standards. Class I and Class II wells have different construction requirements with regards to protecting underground waters, which makes comparing between the different well classes more complex. Given that TCEQ has not yet dually permitted a Class I-II well under the General Permit, it is uncertain how TCEQ will interpret the rules and therefore difficult to predict how many Type 1 and Type 2 wells would be eligible to receive General Permit coverage.

For a Type 3 well to obtain an RRC permit amendment to dispose of desalination concentrate, the well does not need to meet any additional requirements from a different agency. For this reason, it is estimated that the majority of active Type 3 wells would be eligible for this process.

Overall, it is conservatively estimated that 20,000 to 30,000 Class II wells are eligible for nonhazardous desalination concentrate and DWTR injection/disposal under the regulatory changes put forth by HB 2654.

3.3 Permitting Roadmap

A major purpose of this research is to provide a comprehensive Permitting Roadmap to illustrate the permitting options for disposing of nonhazardous desalination concentrate and DWTR by injecting into Class II (Type 1,2,3) wells. To fully inform water providers considering the implementation of desalination projects, the Permitting Roadmap presents three different processes, one for each of the permitting options now available under current statute and rules. The permitting processes include:

- RRC Permit Amendment: for Class II enhanced recovery wells (Type 3 wells)
- TCEQ General Permit: for Class I and dually permitted Class I-Class II wells (Type 1 and Type 2 Class II wells)
- TCEQ Individual Permit: for Class I and dually permitted Class I-Class II wells that do not qualify for the General Permit

This document outlines the required steps to obtain permit coverage for desalination concentrate and DWTR disposal by injection into Class I and dually permitted Class I-II wells under the TCEQ UIC program and Class II Type 3 wells under the RRC UIC program. Dually permitted wells are Class II wells that have applied for and obtained a Class I nonhazardous permit for concentrate disposal; therefore, these wells are permitted concurrently under both the TCEQ and the RRC authority.

3.4 SAWS Case Study

San Antonio Water System (SAWS) is currently in the process of designing and constructing a large-scale brackish groundwater desalination project. An important component of project implementation for SAWS has been desalination concentrate management, and SAWS evaluated deep well injection into both a new Class I well and an existing Class II well as concentrate management alternatives. Technical results comparing the use of both types of injection wells are presented, along with factors to consider when evaluating potential strategies for concentrate and DWTR management.

3.5 Policy Recommendations

Three policy recommendations were developed as part of this research effort. The most important policy recommendation is based on the conclusion that even with the permitting advancements achieved by HB 2654 in 2007 it will still be difficult for water providers to take full advantage of the thousands of Class II wells distributed throughout the State, for two primary reasons:

- Class II wells may not meet the well construction standards required by the General Permit for Class I wells;
- Class II wells may lack sufficient well construction records to document such Class I permit requirements.

Previous attempts to have USEPA amend applicable Safe Drinking Water Act rules to allow for the disposal of desalination and drinking water concentrate in Class II wells have not been successful. Therefore, the first recommendation is that the State of Texas re-engage with the USEPA on one of two proposals:

- Amend the definition of a Class II well to allow for the disposal of desalination concentrate and DWTR in addition to the currently allowed waste for oil and gas production.
- Adopt a new UIC well category, Class VII, which by definition would allow all existing and active Class II UIC wells to be administratively issued a Class VII permit for disposal of nonhazardous desalination concentrate and DWTR.

Two additional recommendations are made. The first is that the TWDB conduct additional research to correlate the location of known Class II wells, especially active enhanced recovery wells, which are in close proximity to regions with brackish groundwater desalination water management strategies identified in the 2012 State Water Plan. Furthermore, the research should also include a well characterization data evaluation to better facilitate consideration of potential wells for appropriate permitting processes. The results of this research would be valuable to utilities and water providers considering brackish groundwater desalination projects because of the many challenges that desalination concentrate management presents.

Finally, it is recommended that the TWDB work with the Texas Legislature to fund appropriate studies that investigate expected hydrodynamic responses to long term injection of desalination concentrate and DWTR in a variety of hydrogeological settings throughout Texas.

4 Introduction

This study, commissioned by the Texas Water Development Board (TWDB), has developed a permitting manual that describes the process of utilizing Class I, Class II, and dually permitted Class I-II wells for the proper injection/disposal of brackish, nonhazardous desalination concentrate and nonhazardous drinking water treatment residuals (DWTR). Please note that throughout this document, the terms, “desalination concentrate” and “DWTR” refer to nonhazardous desalination concentration and nonhazardous DWTR respectively, unless otherwise specified.

The United States Environmental Protection Agency (USEPA) has designated six different classes of injection wells, as defined below (USEPA, 2012a).

- Class I: Inject hazardous wastes, industrial nonhazardous liquids, or municipal wastewater beneath the lowermost underground source of drinking water (USDW)
- Class II: Inject brines and other fluids associated with oil and gas production, and hydrocarbons for storage.
- Class III: Inject fluids associated with solution mining of minerals beneath the lowermost USDW.
- Class IV: Inject hazardous or radioactive wastes into or above USDWs.
- Class V: All injection wells not included in Classes I-IV.
- Class VI: Inject carbon dioxide (CO₂) for long-term storage, also known as Geologic Sequestration of CO₂.

This manual focuses on Class I and Class II wells, with an emphasis on utilizing existing wells disposing brines and other fluids associated with oil and gas production (Class II) as a method for managing desalination concentrate and DWTR.

Brackish groundwater desalination is a critical future water supply solution for many public water providers in Texas. Concentrate produced by membrane filters as part of the desalination treatment process represents a major disposal expense and challenge to properly manage and dispose of the residual concentrate. In 2007, House Bill (HB) 2654, passed by the Texas Legislature, created a more streamlined permitting process for Class II disposal wells to be dually permitted as Class I wells that may receive desalination concentrate and DWTR for disposal. HB 2654 also authorized the use of Class II enhanced recovery injection wells to utilize these same fluid materials through a Class II permit amendment process.

The purpose of this study is to document the opportunities, processes, and impacts of these new rules and regulations for water providers considering the use of injection and disposal wells for desalination concentrate and DWTR management. This manual focuses on the use of Class II wells for concentrate disposal due to their wide distribution across Texas. The manual also includes a Permitting Roadmap which provides a step-by-step process for permitting circumstances in which the Texas Commission on Environmental Quality (TCEQ) and the Railroad Commission of Texas (RRC) have jurisdiction. The Permitting Roadmap includes process flowcharts that pertain to TCEQ or RRC permitting options to assist Texas water providers that may be interested in pursuing brackish groundwater desalination as a future source of alternative water supply.

CDM Smith, Inc. (Project Participant), in conjunction with Bill Mullican and Associates (Project Participant) has developed this *Manual for Permitting Process*. Poznecki-Camarillo, Inc. (Project Participant) has provided the geographical information system (GIS) based mapping of Class II injection wells based on the RRC Underground Injection Control (UIC) and Well Bore databases (**Appendix B**). The potential users for this manual include any water provider entity that is either already using or considering the use of brackish groundwater desalination.

The study objectives are described below.

4.1 Scope of Work

In 2010, the TWDB published a Request for Proposals (RFP) for a Priority Research Project to develop promising strategies to increase the efficiency of water desalination and concentrate management processes. The primary activities involved in this research project focus on concentrate management through the use of injection wells and include the following tasks:

1. Obtain, process, and analyze data on existing Class II wells in Texas sufficient to locate and characterize wells currently permitted as Class II wells.
2. Develop a Permitting Roadmap for the multiple approaches that a water provider may take in obtaining the necessary UIC permit coverage for injection and disposal of desalination concentrate and DWTR into Class I and Class II wells.
3. Develop cost and protocol comparisons for the construction and completion of new Class I nonhazardous wells versus the dual permitting of Class II wells as Class I nonhazardous wells based on the SAWS Brackish Groundwater Desalination Project.
4. Make any policy recommendations deemed appropriate to advance the utilization of Class II wells for disposal of desalination concentrate and DWTR.

5. Prepare a manual that documents the previous four tasks, with an emphasis on the permitting process for utilizing Class II wells for the proper injection and disposal of nonhazardous desalination concentrate and DWTR.

5 Historical Background

The importance of desalination of brackish water resources to meet future water supply needs in Texas is not a new concept. Brackish water resources may be either surface water or groundwater in nature, and the TWDB has estimated that Texas has approximately 123 million gallons per day (MGD) of municipal desalination treatment capacity. The largest inland municipal desalination plant in the world, the Kay Bailey Hutchison Desalination Plant in El Paso, has an operating capacity of 27.5 MGD (TWDB, 2014; El Paso Water Utility, 2014).

In 1997, the Texas Legislature passed Senate Bill 1 (SB 1), which initiated the regional water planning process and led to the adoption of the first State Water Plan to incorporate the regional water planning process in 2002. The regional water planning process further highlighted the importance of the potential role of brackish water desalination in meeting future water supply needs. Based on this recognition, one of the major policy recommendations included in the 2002 State Water Plan stated, “The Legislature should consider any recommendations from a TNRCC [now called the TCEQ] stakeholder process now examining disposal issues associated with desalination processes” (TWDB, 2002). Also included in the 2002 State Water Plan was a series of policy recommendations from stakeholders who participated in the development of the state water plan. One of these recommendations stated, “The State agencies should coordinate with their Federal counterparts to develop financial assistance and regulatory programs to address brine disposal from brackish groundwater” (TWDB, 2002). In 2002, it was already recognized that brackish water supplies, in particular brackish groundwater supplies, could be treated using currently available technologies in a cost effective manner compared to the development of new, more conventional water supplies.

In 2003, the TWDB published a report, *Brackish Groundwater Manual for Texas Regional Water Planning Groups*, designed to provide water planners throughout Texas with a preliminary screening tool to evaluate the potential use of brackish groundwater resources. The report estimated that there is 2.7 billion acre-feet of brackish groundwater supply within Texas aquifers (TWDB, 2003). With the wide geographic distribution of potential brackish groundwater supplies and the magnitude of the need for additional water supplies documented in the 2002 State Water Plan (projected to be approximately 7.5 million acre-feet per year by 2050), the value of integrating brackish groundwater desalination into the Texas water supply portfolio was clearly recognized and identified.

Due to the increasing focus on brackish groundwater desalination, in 2003, TWDB partnered with the Bureau of Economic Geology at the University of Texas at Austin, to submit a successful research grant application to the Desalination and Water Purification Research and Development Program, Bureau of Reclamation. This research led to the publication of a report titled *Please Pass the Salt: Using Oil Fields for the Disposal of Concentrate from Desalination Plants* (Mace et al., 2006). This report presented a comprehensive analysis of the potential for using underground injection of desalination concentrate into existing Class II UIC wells.

The management and disposal of desalination concentrates (a byproduct of the desalination process) posed certain regulatory and environmental challenges that needed to be addressed

before brackish water desalination could be utilized at optimum levels. This focus on regulatory aspects of concentrate management throughout the 2006 Mace study led the TWDB, the TCEQ, and the RRC, to work together with representatives of the USEPA, Office of Water to identify possible approaches to the streamlining of the permitting process for concentrate management from desalination operations. One potential approach identified to streamline the permitting process was to utilize Class II wells for the disposal of concentrate for desalination treatment plants. While Texas has Class II wells located throughout the state, and brackish groundwater desalination may be a very attractive alternative water supply, the regulatory restrictions placed on these Class II wells limited disposal fluids to wastes resulting from the exploration and production of oil and gas. As part of the Mace study, numerous strategy meetings were held between staff from state and federal agencies. One of the most significant outcomes from these strategy meetings was the concept of using a General Permit from TCEQ for Class I nonhazardous wells for desalination concentrate management for certain wells that had obtained a Class II permit from the RRC. As a result of this strategy, first identified and vetted as part of the Mace study, the 80th Texas Legislature in 2007 passed HB 2654. This landmark legislation represented a significant level of cooperation among state and federal agencies working together to address a policy issue that was proving to be a challenging regulatory hurdle.

HB 2654 required the TCEQ to initiate rulemaking in order to allow operators of UIC wells meeting Class I well standards to inject desalination concentrate under a General Permit authorization rather than the previous requirement of obtaining an individual Class I well permit from TCEQ. Advantages of this amendment to statute include:

- Minor permit application and processing requirements on desalination facilities that utilize their own well fields for desalination concentrate and DWTR disposal; and
- The use of Class II enhanced recovery wells for desalination concentrate and DWTR disposal without requiring separate permit authorization from the RRC or the TCEQ.

After a broad, comprehensive stakeholder process, in July 2008, the TCEQ adopted their final rules located in 30 Texas Administrative Code (TAC) Chapter 331. In addition to capturing statutory changes made by HB 2654, these rules amended technical standards to more closely reflect the federal program for Class I wells that accept nonhazardous waste. A comprehensive summary of the regulatory history of desalination concentrate management in Texas can be found in McFaddin (2008).

As a result, there exists a greater potential for use of existing Class II wells in the management of desalination concentrate. Existing Class II wells that meet all permitting and construction requirements of a Class I nonhazardous well may now be dually permitted under both the TCEQ and the RRC for the purpose of desalination concentrate disposal. Additionally, Class II Type 3 wells used for enhanced recovery may receive desalination concentrate for recovery processes under jurisdiction of the RRC. This manual serves to assist water utility operators and managers to better understand this new permitting process and evaluate the potential for using close proximity Class II wells locally.

6 Summary of Class II Wells in Texas

To better understand the potential for utilizing existing Class II UIC wells for the management of desalination concentrate, data from the RRC UIC and Well Bore databases were obtained,

processed, and analyzed. Intermediate processing, by Digital Data Services, Inc. (Denver), to convert the data to a usable format was required before statistical analyses could be performed.

There are three specific types of Class II wells potentially applicable to desalination concentrate and DWTR injection and disposal. The types and corresponding permit options are as follows:

- Type 1: Disposal well into a nonproductive oil and gas zone – TCEQ General Permit
- Type 2: Disposal well into a productive oil and gas zone – TCEQ General Permit
- Type 3: Enhanced recovery injection well – RRC Permit Amendment

According to data obtained from the RRC databases, the RRC has permitted over 100,000 Class II wells throughout history, and approximately 60,000 Type 1, 2 or 3 wells have active permits. Over 30,000 of these wells are currently active, and the majority, approximately 80 percent, of the active wells are Type 3 wells (injection wells utilized for enhanced recovery of hydrocarbons) (RRC, 2012). **Figure 6-1** shows a graphical distribution of the number of well types. These well count numbers are based solely on the analysis of data from RRC databases. During data processing, well record “duplicates” (individual wells listed multiple times due to multiple permits) were omitted from the data set to the extent possible. However, it is probable that well duplicates still remain in the data set, especially when considering RRC reported 52,016 permitted Class II wells in 2010 to the USEPA, significantly less the value generated in this study (USEPA, 2010).

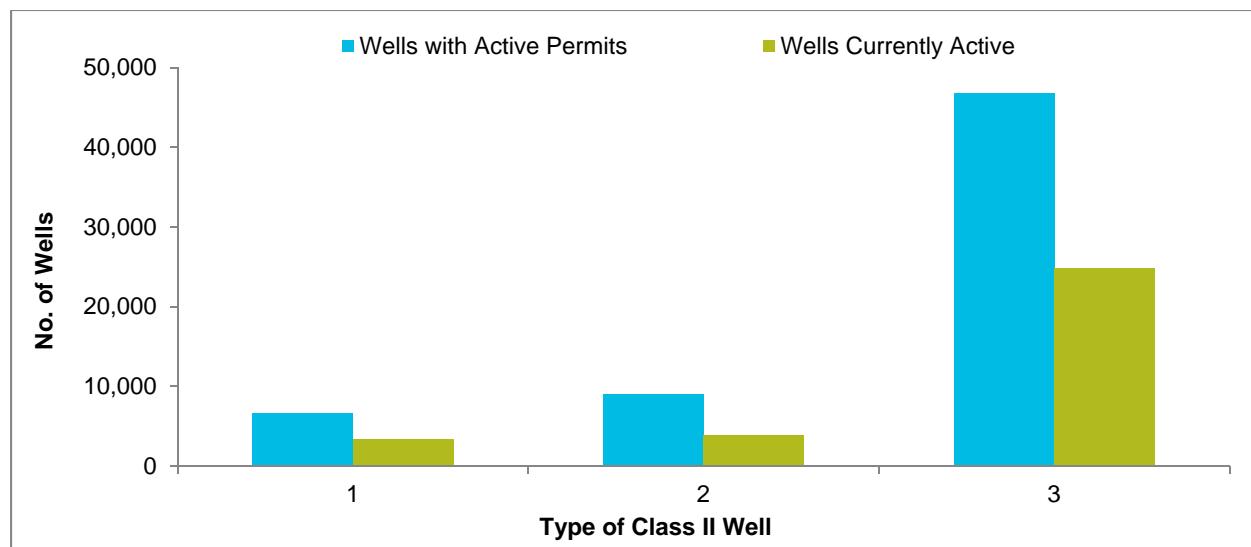


Figure 6-1. Class II Well Types

Appendix B contains maps that show geographical distributions of Type 1, 2, and 3 wells in Texas and by regional water planning area with active permits.

6.1 Class II Well Characterization

With the passage of HB 2654 in 2007, the Texas Water Code was amended to simplify the permitting process for utilizing Class I and Class II wells for the disposal of desalination concentrate and DWTR. HB 2654 also standardized well completion requirements at TCEQ for

Class I nonhazardous wells to closely reflect completion requirements established by the USEPA.

While general requirements for Class II disposal wells are comparable to Class I requirements under the General Permit, certain construction requirements differ significantly with regards to the protection of underground waters. A key requirement for Class I wells is the protection of USDW formations. In comparison, Class II well regulations focus on the protection of base of usable quality waters (BUQW). USDW formations have total dissolved solids (TDS) concentrations as high as 10,000 milligrams per liter (mg/L), while BUQW formations only have concentrations as high as 3,000 mg/L TDS. Consequently, injection depth and cement casing requirements also differ between Class I and Class II wells (further discussed in the Permitting Roadmap, **Appendix C**). Although USDW and BUQW formations are defined by different TDS concentrations, it is possible for the lowermost USDW and BUQW to exist in the same formation. The relative accessibility of USDW information for Class II wells is variable depending on the type and age of the well; however this information can be more closely determined by the RRC as discussed in **Appendix C**.

To accurately estimate the amount of Type 1 and Type 2 wells potentially eligible for the General Permit, USDW data would have to be collected and compared to BUQW data for each well. Since data provided from the UIC database does not contain USDW information, compiling this information at the statewide scale is outside the scope of this study. Due to the differences in construction requirements, it is conservatively estimated that only a small portion of Class II Type 1 and Type 2 wells meet Class I construction standards to qualify for the General Permit. In contrast, Type 3 enhanced recovery wells do not need to meet Class I standards; thus, the majority of active Type 3 wells should be eligible candidates (contingent upon project and site-specific factors) to obtain a permit amendment from the RRC.

Of current importance, the RRC has proposed draft amendments to Class II rules, which if adopted, could greatly improve the eligibility of any new Class II well (constructed after the effective date of these amendments) in qualifying for a General Permit. A Literature Review is provided in **Appendix E** which contains more information on this RRC topic.

Table 6-1 provides a summary of Class II wells, types and characteristics based on RRC UIC database analysis. This table is intended to convey the numbers of the types of Class II wells in general and relative terms while the actual values may differ significantly from those reported here. As noted previously, the data required extensive pre-processing before it could be analyzed. Among other issues there were numerous duplicate records, and while the majority of well duplicates were removed during data pre-processing, it is probable that some duplicates remain.

Table 6-1. Class II Well Summary (RRC, 2012)

Item	Value
Class II Wells	
No. of Type 1, 2, and 3 Wells Permitted by RRC in History	104,354
No. of Type 1, 2, and 3 Wells with Active Permits	62,350
No. of Type 1, 2, and 3 Wells Currently Active	32,110
Type 1 Wells	
No. of Wells with Active Permits	6,603

Item	Value
No. of Wells Currently Active	3,353
No. of Wells with Active Permits Constructed after SDWA 1986 Amendments	3,354
Percent of Wells with Active Permits Designed to Inject below the BUQW	100%
Type 2 Wells	
No. of Wells with Active Permits	8,980
No. of Wells Currently Active	3,925
No. of Wells with Active Permits Constructed after SDWA 1986 Amendments	4,452
Percent of Wells with Active Permits Designed to Inject below the BUQW	98%
Type 3 Wells	
No. of Wells with Active Permits	46,767
No. of Wells Currently Active	24,832

The table includes the following characteristics for each well:

- **Number of Wells with Active Permits:** For Type 1 and Type 2 wells to be dually permitted, the wells must have active Class II permits. For Type 3 wells to be considered for the RRC permit amendment, the wells must similarly have active permits.
- **Number of Wells Currently Active:** Type 1 and Type 2 wells that are inactive, but still with active permits may still be considered for the General Permit. For Type 3 wells, only active wells may be considered for a RRC Permit Amendment.
- **Number of Wells with Active Permits Constructed after Safe Drinking Water Act (SDWA) Amendments (1986):** To qualify for the General Permit, Class II wells must meet Class I construction standards for protecting USDW formations. Type 1 wells constructed after effective amendments to the SDWA (1986) must inject below the lowermost USDW formation; therefore these wells are more likely to qualify for the General Permit than Type 1 wells installed prior to the SDWA. Type 2 wells have this same injection depth requirement (from the SDWA), but they can also receive an exemption if oil and gas resources exist above the lowermost USDW formation.
Since Type 3 wells do not need to meet Class I construction standards, this criterion is not relevant to the RRC Permit Amendment process and thus not presented in the table.
- **Percentage of Wells with Active Permits Designed to inject below the BUQW:** As noted previously, to qualify for the General Permit, Type 1 and Type 2 wells must meet Class I construction standards for protecting USDW formations. RRC does not currently have USDW depth data for all wells, but the agency does keep BUQW depth data for all wells. Type 1 and Type 2 wells that do not inject below the BUQW formation will not meet Class I well requirements.
Since Type 3 wells do not need to meet Class I construction standards, this criterion is not relevant to the RRC permit amendment process and is not presented in the table.

6.2 Potential Class II Well Candidates for Desalination Concentrate and DWTR Disposal

For a Class II well to be dually permitted as a Class I-II well by the TCEQ General Permit, the Class II well must meet Class I construction standards. Class II and Class I wells have different construction requirements with regards to protecting underground waters, which makes comparing between the different wells more complex. Given that TCEQ has not yet dually permitted a Class I-II well under the General Permit since its adoption in 2008, it is uncertain how TCEQ will interpret applicable rules. It is therefore difficult to predict how many Type 1 and Type 2 wells would be potentially eligible to receive General Permit coverage.

For a Type 3 well to obtain an RRC permit amendment to dispose of desalination concentrate, the well does not need to meet any additional requirements from another agency. For this reason, it is estimated that the majority of active Type 3 wells would be eligible for this process.

Overall, based on the number of actively operating Type 3 wells, it is conservatively estimated that 20,000 to 30,000 Class II wells are eligible for nonhazardous desalination concentrate and DWTR disposal per the regulatory changes put forth by HB 2654. This estimate does not consider site-specific factors, such as well location, capacity, and ownership.

6.3 Class II Wells by Water Planning Region

The purpose of the *Manual for the Permitting Process* is to assist water providers in understanding currently available desalination concentrate injection and disposal options and navigating the regulatory landscape of well permitting options. Many desalination projects were first conceived following the passage of SB1 (1997) and the implementation of the regional water planning process. During this process, Texas was grouped into 16 regional water planning areas as shown in **Figure 6-2**, and regional water planning groups were created to conduct regional water planning. Regional water planning groups identify recommended and alternative water management strategies to meet future water demands and these strategies are compiled into Regional and State Water Plans. The 2012 State Water Plan identifies desalination as a growing source of water for Texas. According to the 2012 State Water Plan, desalination accounts for approximately 3.4 percent of the total water supplies needed to meet demand in 2060 (see **Figure 6-3**). While desalination water management strategies contribute a relatively small amount of water (2.0 percent for groundwater desalination) compared to other water sources throughout the state, desalination projects have the potential to be a significant source supply in some water planning regions.

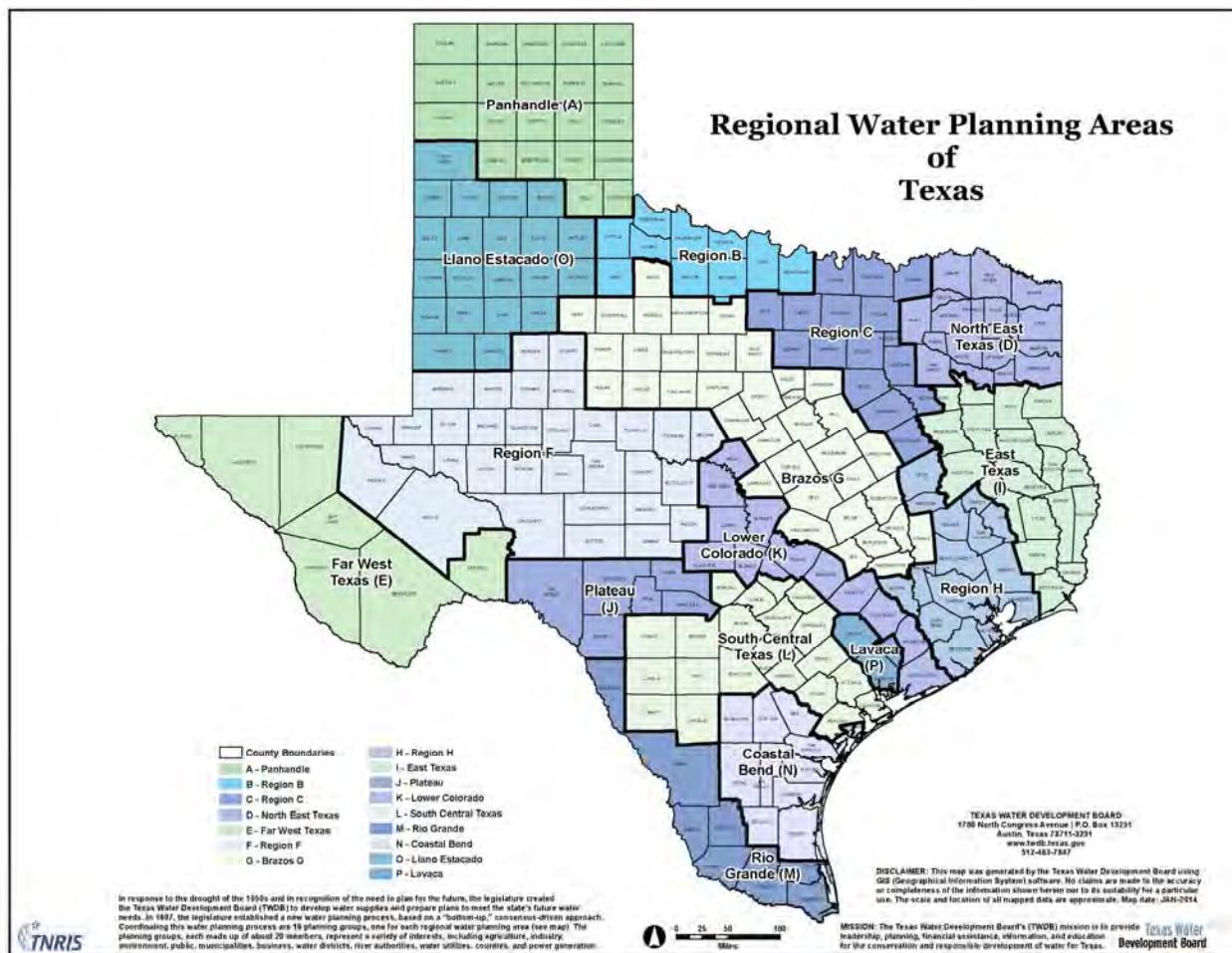


Figure 6-2. Regional Water Planning Areas

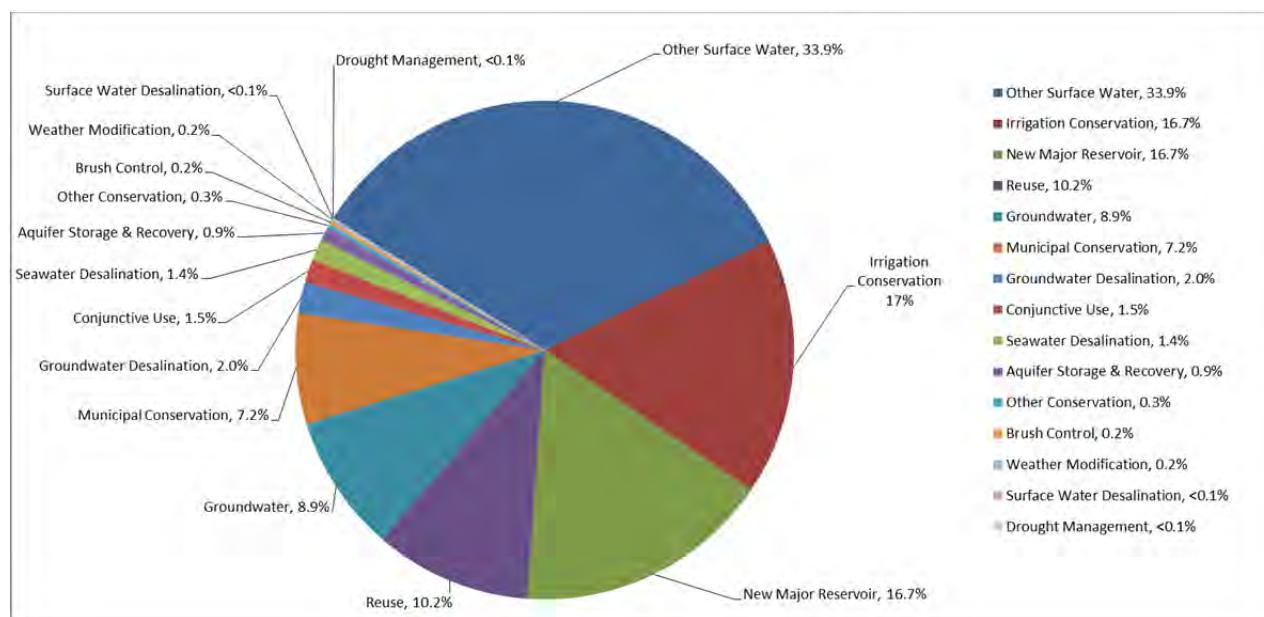


Figure 6-3. Water Management Strategies in 2060

The State Water Plan identifies the implementation of desalination projects as a recommended water management strategy (see Figure 3) in six of the water planning regions. The regions pursuing desalination include Region O (Llano Estacado), Region F, Region E (Far West Texas), Region L (South Central Texas), Region H, and Region M (Rio Grande Valley). To facilitate the regional water planning process, statistics were compiled by water planning region. These statistics are presented in **Table 6-2**, **Figure 6-4**, and **Figure 6-5**. As shown in **Table 6-3**, the greatest number of Class II wells (approximately 40 percent) is located in Region F, which is centrally located over the Permian Basin. Other regional water planning areas with high numbers of Class II wells include Regions O (Llano Estacado), G (Brazos), and B (Red River). All 16 planning regions, except for two regions, Region E (Far West Texas) and Region J (Plateau), have 50 or more active Class II wells according to the RRC databases (See **Appendix B** for GIS maps showing the spatial distribution of Class II wells across Texas).

Table 6-2. Class II Wells by Regional Water Planning Area (RRC, 2012)

Region	Wells with Active Permits			Currently Active Wells		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
A	281	764	679	167	368	217
B	493	1174	4088	261	379	1673
C	332	415	1356	210	179	528
D	245	244	447	123	150	164
E	5	12	53	1	7	37
F	1103	2754	20016	633	1119	10692
G	932	1273	4376	467	507	1893
H	711	254	373	264	105	72
I	557	344	406	284	194	127
J	5	4	18	5	1	0
K	167	70	69	83	27	28
L	598	346	870	304	163	264
M	293	166	296	143	69	82
N	489	231	744	219	84	433
O	247	888	12930	131	556	8617
P	145	41	46	58	17	5
Total	69,603	8,980	46,767	3,353	3,925	24,832

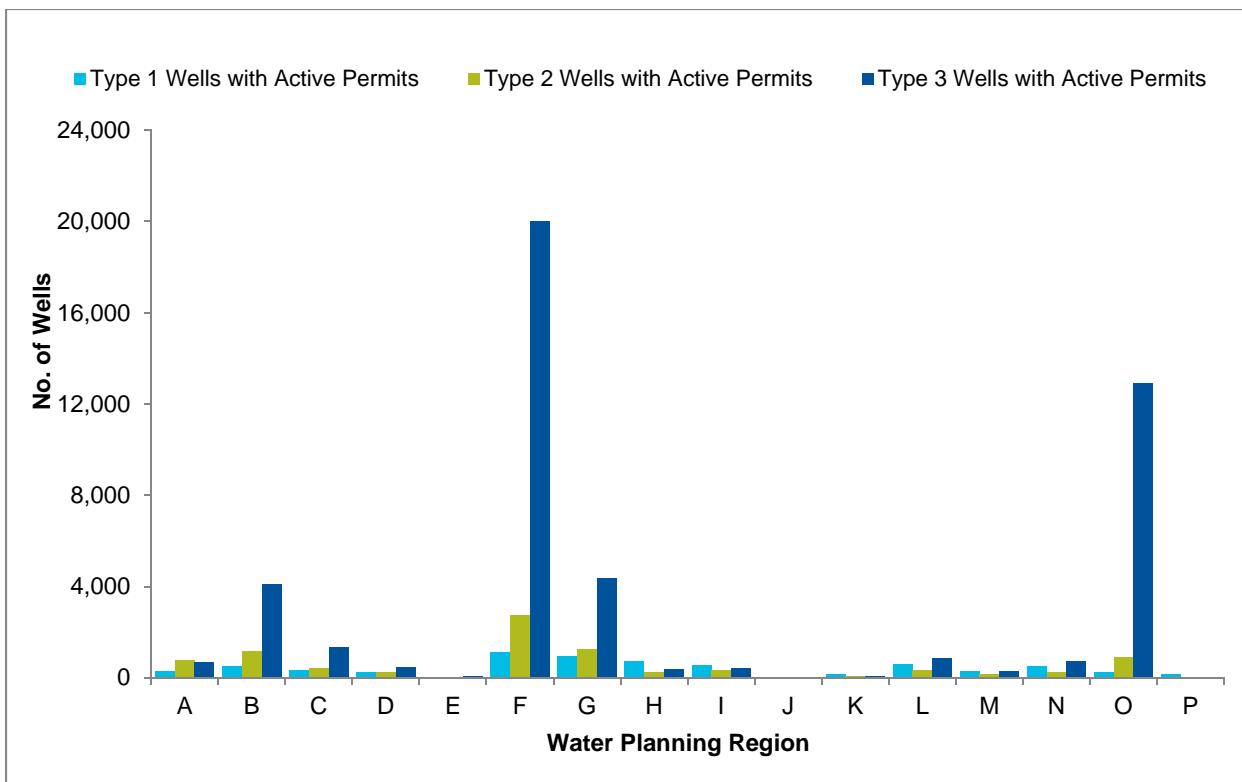


Figure 6-4. Class II, Type 1, Type 2, and Type 3 Wells with Active Permits by Water Planning Region

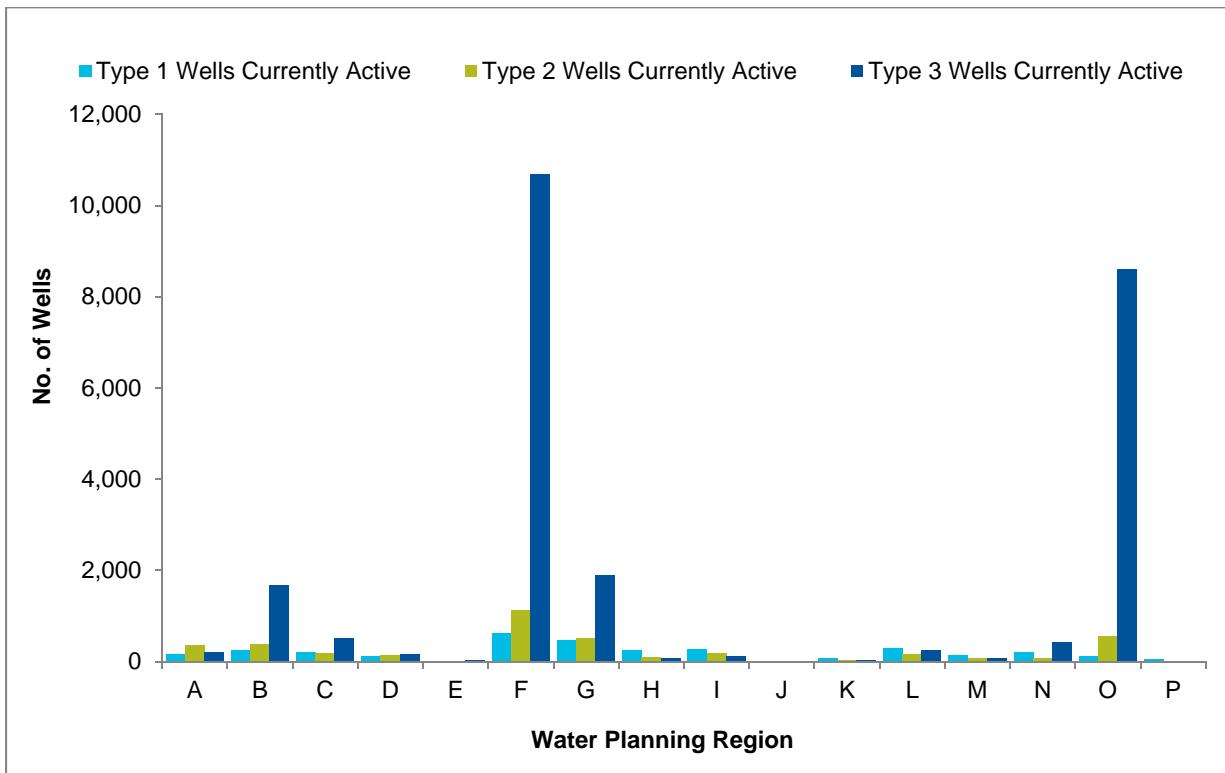


Figure 6-5. Currently Active Class II, Type 1, 2, and 3 Wells by Water Planning Region

7 Permitting Roadmap Overview

One of the primary goals of this project is to develop a Permitting Roadmap that describes the process by which a well is permitted for the injection and disposal of desalination concentrate and DWTR. Brackish groundwater desalination is an available critical water supply solution for many public entities in Texas for now and into the future. Desalination concentrate produced by membrane filters as part of the drinking water treatment process represents a major disposal expense and regulatory process to properly manage and dispose of the residual concentrate. With the passage of HB 2654 in 2007, the Texas Water Code was amended to expedite the permitting process for utilizing Class I and Class II wells for the disposal of desalination concentrate and DWTR.

The purpose of the Permitting Roadmap, presented in its entirety in **Appendix C**, is to serve as a guide for water providers seeking regulatory approval to dispose of desalination concentrate and DWTR by injection into a UIC well. This document first outlines the process of identifying potential wells and determining which permit process is relevant for a given situation (see **Flowchart A**). The Permitting Roadmap then details required steps to obtain permit coverage for desalination concentrate and DWTR disposal by injection into Class I, Class II, and dually permitted Class I-Class II wells under the TCEQ and RRC UIC programs. Dually permitted wells are Class II wells that have applied for and obtained a Class I permit; therefore, these wells are permitted concurrently under both the TCEQ and RRC authority. **Figure 7-1** illustrates Class I and Class II wells and identifies authorized waste streams for these well types.

Three permit options are explored in detail in the Permitting Roadmap: RRC Class II Permit Amendment for enhanced recovery wells (see **Flowchart B**); TCEQ General Permit for Class I and dually permitted wells (see **Flowchart C**); and the TCEQ individual permit for Class I and dually permitted wells (see **Flowchart D**). To sufficiently depict these TCEQ and RRC permitting processes, graphical process flowcharts that correspond to step-by-step text-based guidance are presented (Note: the complete step-by-step guidance to accompany the flowcharts is presented in **Appendix C**). The Permitting Roadmap serves to provide detailed supplementary text information to support the description of these permitting flowcharts.

An emerging rule change with the potential to impact this Permitting Roadmap is discussed. The RRC recently proposed draft amendments to the UIC rules, which could improve the eligibility of a new Class II well in qualifying for a dual permit. The proposed rule change is discussed within the Permitting Roadmap as it relates to the step-by-step process and is further discussed in detail in the Literature Review (**Appendix E**).

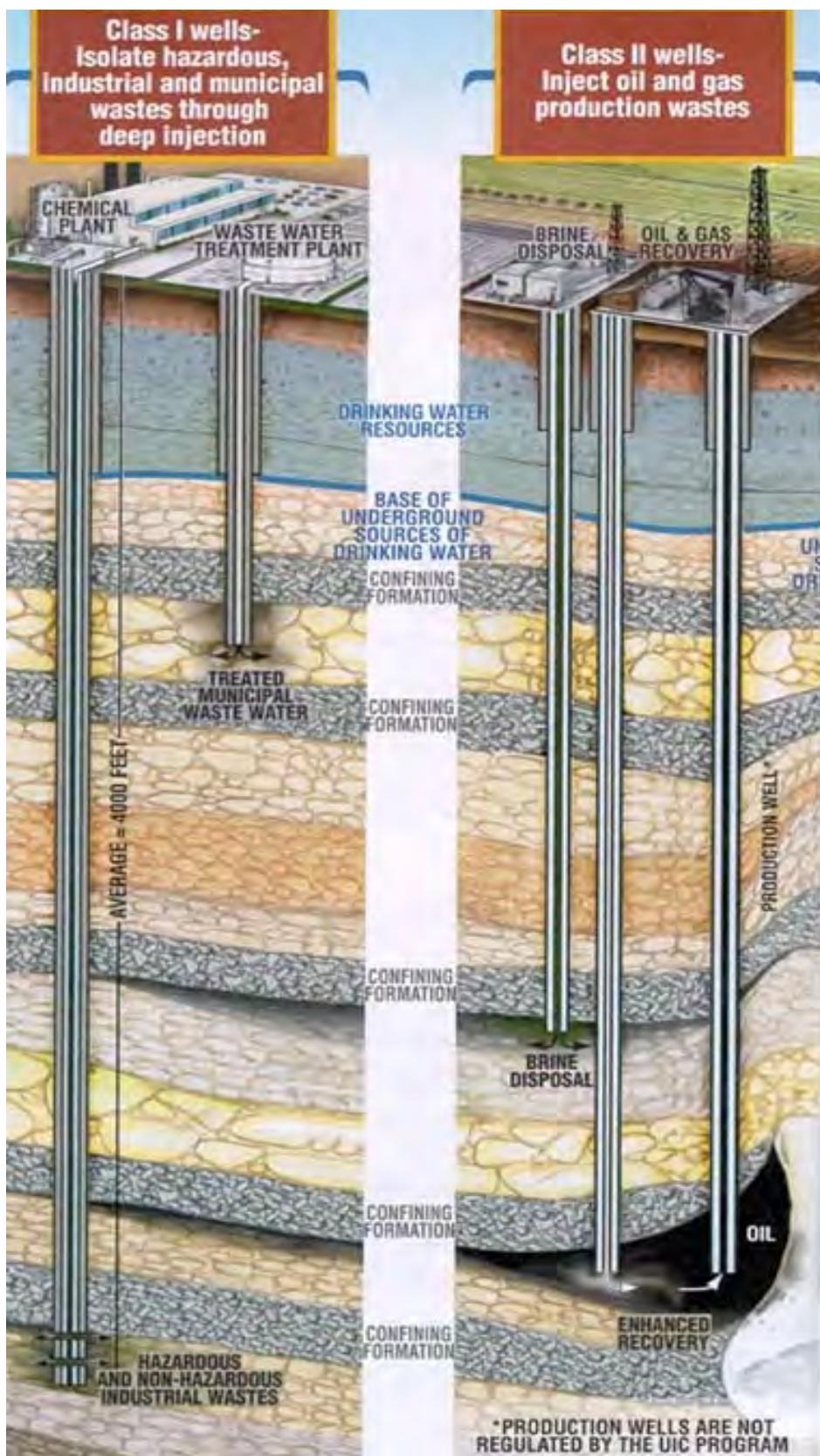


Figure 7-1. Depiction of Class I and Class II Wells (Source: USEPA, 2012b; USEPA, 2012c).

7.1 Flowchart Outline

This report includes four process flowcharts that illustrate the following permit scenarios:

- **Flowchart A - Permitting Roadmap Overview Detail:** This flowchart illustrates which permitting process, through the TCEQ or RRC (**Flowchart B, Flowchart C, and Flowchart D**), will likely apply to a water provider, depending on the type of existing wells that are available. (Note that steps within this flowchart are subject to change; steps may change depending on how TCEQ interprets General Permit rules and due to proposed amendments to RRC rules for new Class II wells).
- **Flowchart B – RRC Permit Amendment Process Detail:** This flowchart presents the permit amendment steps for utilizing a Class II enhanced recovery well (Type 3). Of the three permitting processes, the permit amendment approach through the RRC requires the least time and expense for approval.
- **Flowchart C – TCEQ General Permit Process Detail:** This flowchart illustrates the requirements of the TCEQ General Permit for Class I and dually permitted wells (i.e. Class II wells that obtain Class I authorization from the TCEQ). The TCEQ UIC General Permit provides an expedited process for authorization to dispose of desalination concentrate and DWTR in a Class I well or a dually permitted Class II well.
- **Flowchart D – TCEQ Individual Permit Process Detail:** This flowchart depicts the requirements of the TCEQ individual permit for Class I and dually permitted Class II wells that do not qualify for the Class I General Permit. This process is potentially the most rigorous and complex of the three permitting processes, and may require relatively more time and expense to obtain a permit authorization.

For all existing well options, the water provider must contact the existing well owner/permit holder and well operator. A formal written agreement and/or initial contract (subject to permitting outcome) should be made prior to officially beginning any permit application or amendment process. The potential time frame of use and available well capacity should be discussed and carefully considered. The water provider must understand the risks involved with investigating an identified well without having a written agreement with the well owner. Similarly, both parties must understand the risks involved with pursuing the dual permit option under the TCEQ General Permit for an existing Class II well. As discussed in **Appendix C**, Class II wells may not meet Class I well construction standards, and it is important to understand a particular well's actual potential prior to investing time and money into the permitting process. A contract is also important to ensure the water provider has a reliable way to dispose of desalination concentrate and DWTR. Without a contract in place, a water provider may be at risk if the well owner/operator refuses to accept membrane concentrate waste or changes the terms of the acceptance of that waste.

Below, **Figure 7-2** and **Table 7-1** summarize the permitting options by waste stream and by well type. Following the table, the four flowcharts are presented. Refer to **Appendix C** to see the entire Permitting Roadmap that corresponds with each flow chart.

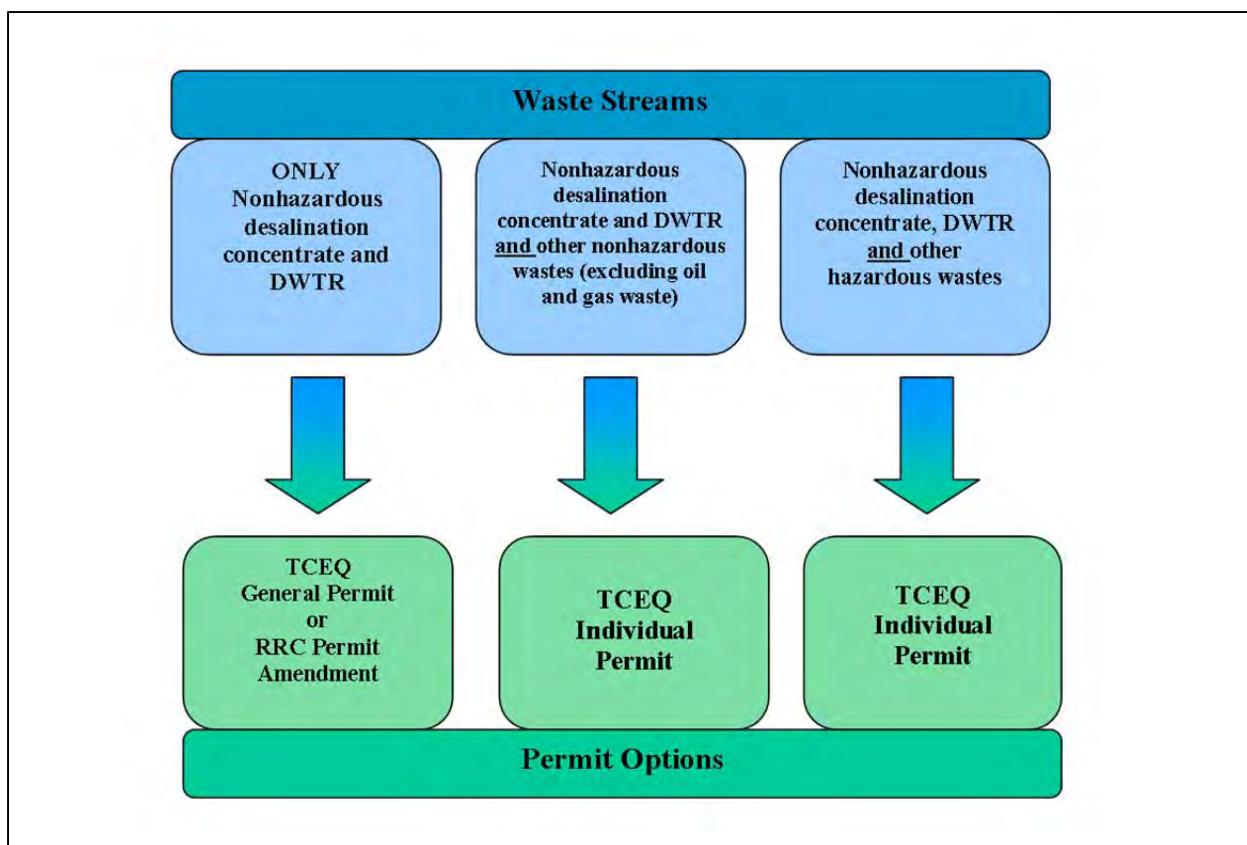


Figure 7-2. Waste Streams and Available Permits

Table 7-1. Summary of Options for the Disposal/Injection of Nonhazardous Desalination Concentrate and DWTR into Class I and Class II Wells in Texas

Well Type	Class I	Class II, Type 1	Class II, Type 2	Class II, Type 3
Definition	Industrial or municipal waste disposal well	Oil and gas waste disposal well in a non-productive zone	Oil and gas waste disposal well in a productive zone	Enhanced recovery injection well
Regulator	TCEQ	RRC	RRC	RRC
Regulation	30 TAC 331.62(b)	16 TAC 3.9, 3.13	16 TAC 3.46, 3.13	16 TAC 3.46, 3.13
Injection Depth Requirement	Beneath the lowermost USDW	Beneath the lowermost USDW	Beneath the lowermost base of usable quality water (BUQW) formation ^(a)	Beneath the lowermost base of usable quality water (BUQW) formation ^(a)
Casing and Cement Requirement	Prohibit any movement of fluids into or between USDW formations	Protect all usable quality water strata	Protect all usable quality water strata	Protect all usable quality water strata
Permit Option	TCEQ General Permit or individual	TCEQ General Permit or individual	TCEQ General Permit or individual	RRC Permit Amendment

Well Type	Class I	Class II, Type 1	Class II, Type 2	Class II, Type 3
	permit	permit depending on waste streams – Dually permitted if well meets Class I standards	permit depending on waste streams – Dually permitted if well meets Class I standards	
Regulator of Permit Option	TCEQ	TCEQ regulates desalination waste streams; RRC regulates oil and gas activities	TCEQ regulates desalination waste streams; RRC regulates oil and gas activities	RRC
Permit Option Regulation	30 TAC 331.62(b)	30 TAC 331.62(b); 30 TAC 305	30 TAC 331.62(b); 30 TAC 305	16 TAC 3.46, 3.13
Potential Issues with Existing Well and New Permit Requirements	- Minimal issues	- Not required to have surface/intermediate casing from surface to USDW ^(c) - Not required to have long string casing from shoe to surface ^(c)	- May not have been required to inject below USDW ^(b) - Not required to have surface /intermediate casing from surface to USDW ^(c) - Not required to have long string casing from shoe to surface ^(c)	- Minimal issues
Permit Application Cost	\$100 for General Permit; \$100 - \$2,000 for individual permit	\$100 for General Permit; \$100 - \$2,000 for individual permit	\$100 for General Permit; \$100 - \$2,000 for individual permit	\$500
Permit Application Timeline	90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	45 days from receipt of form to permit amendment

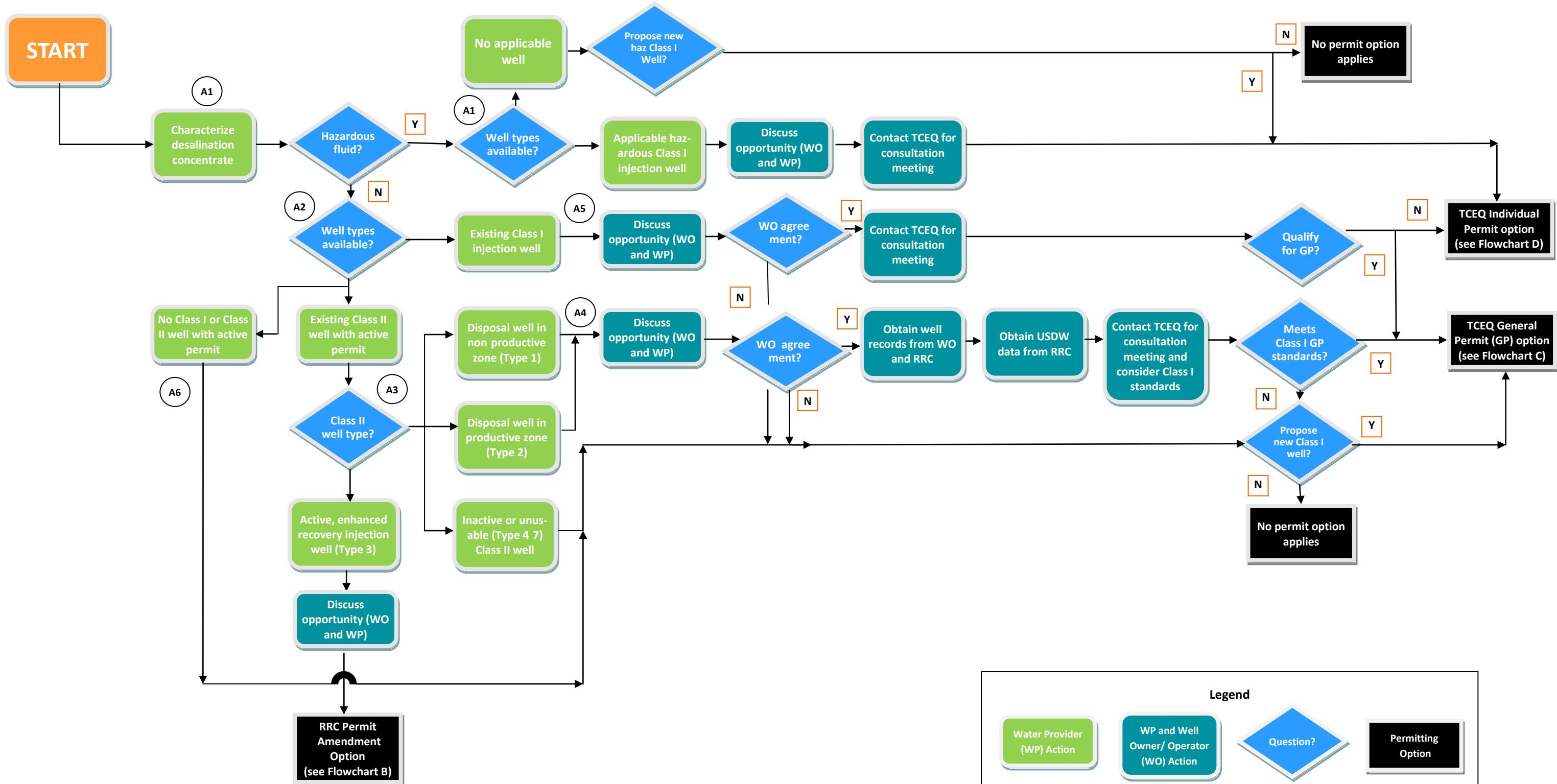
(a) There are exceptions where Class II wells may inject above the BUQW formation if oil and gas reserves exist above such formations; (this exception may be affected by proposed changes to RRC rules).

(b) Injecting below the lowermost USDW is an explicit requirement of the General Permit rules - 30 TAC 331.62(b)(1)

(c) This is not an explicit requirement under the General Permit rules - 30 TAC 331.62(b)(1). This may be required depending on TCEQ's interpretation of the rules requirement to prevent the movement of fluids into or between USDWs. (Current Class II well requirements may be revised by proposed changes to RRC rules).

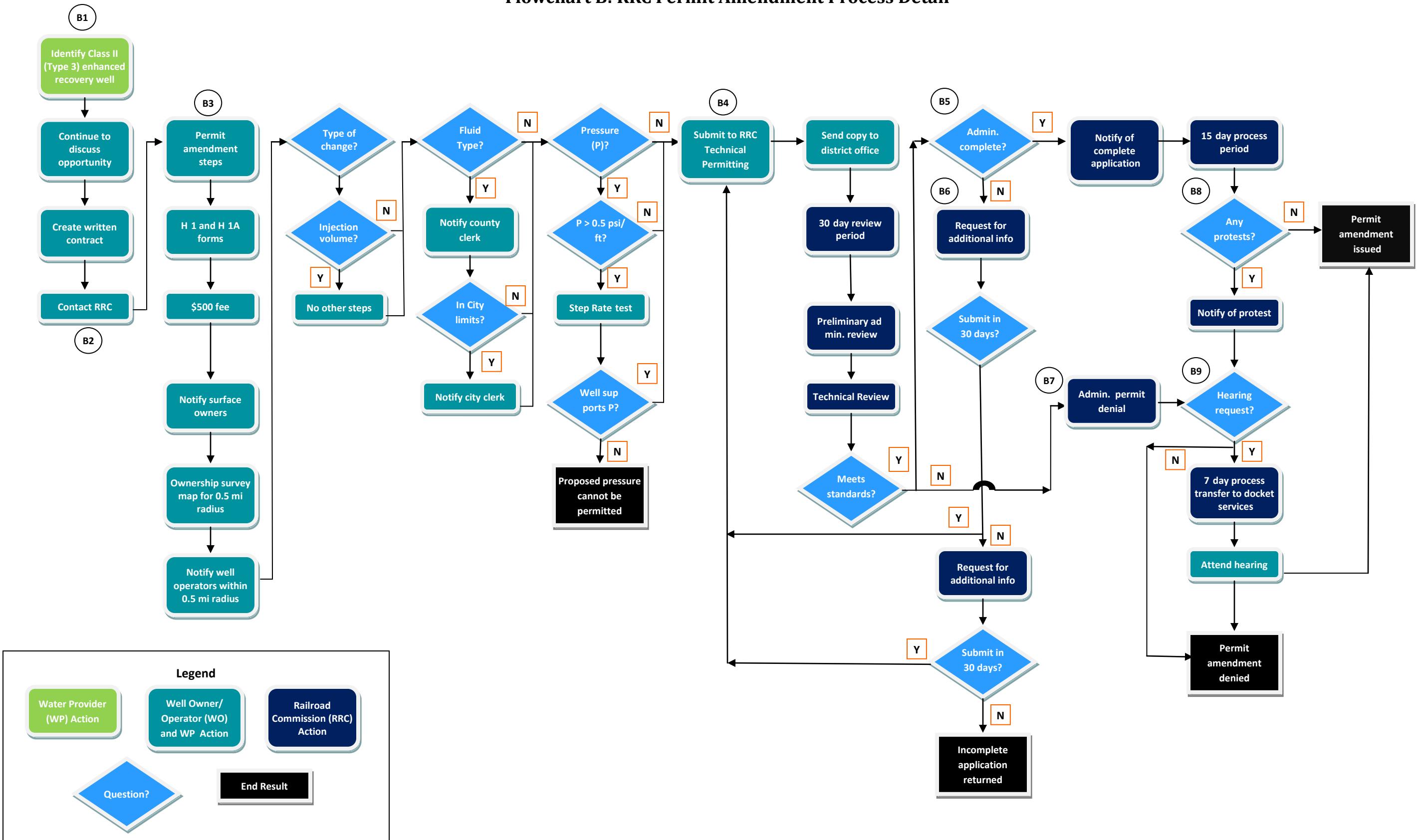
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Flowchart A: Permitting Roadmap Overview Detail



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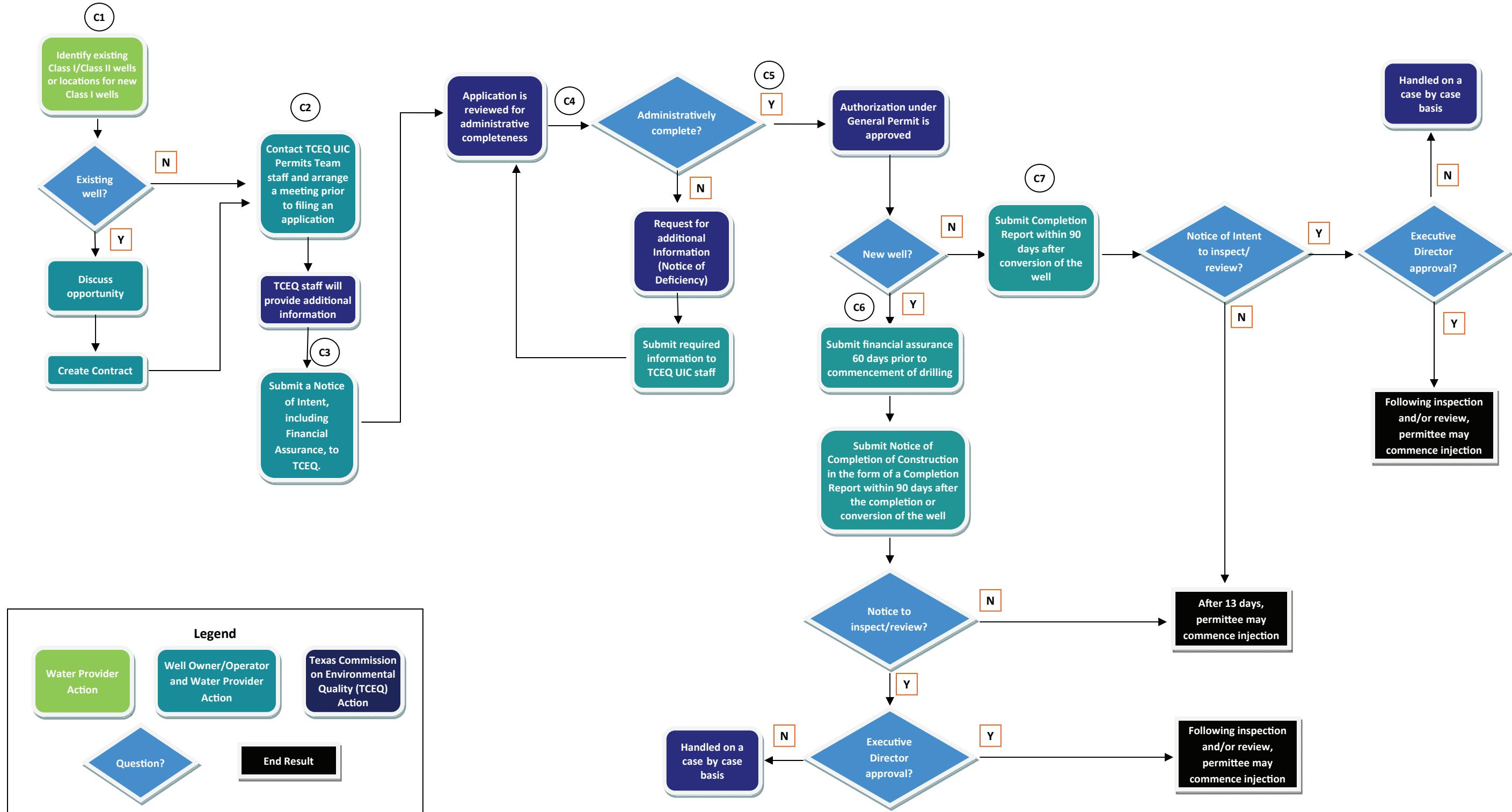
Flowchart B: RRC Permit Amendment Process Detail



Reference: Railroad Commission of Texas. Injection/Disposal Permit Application Processing Flowchart. 19 October 2001. Accessed 27 August 2012. <<http://www.rrc.state.tx.us/forms/publications/HTML/pflowcht.php>>

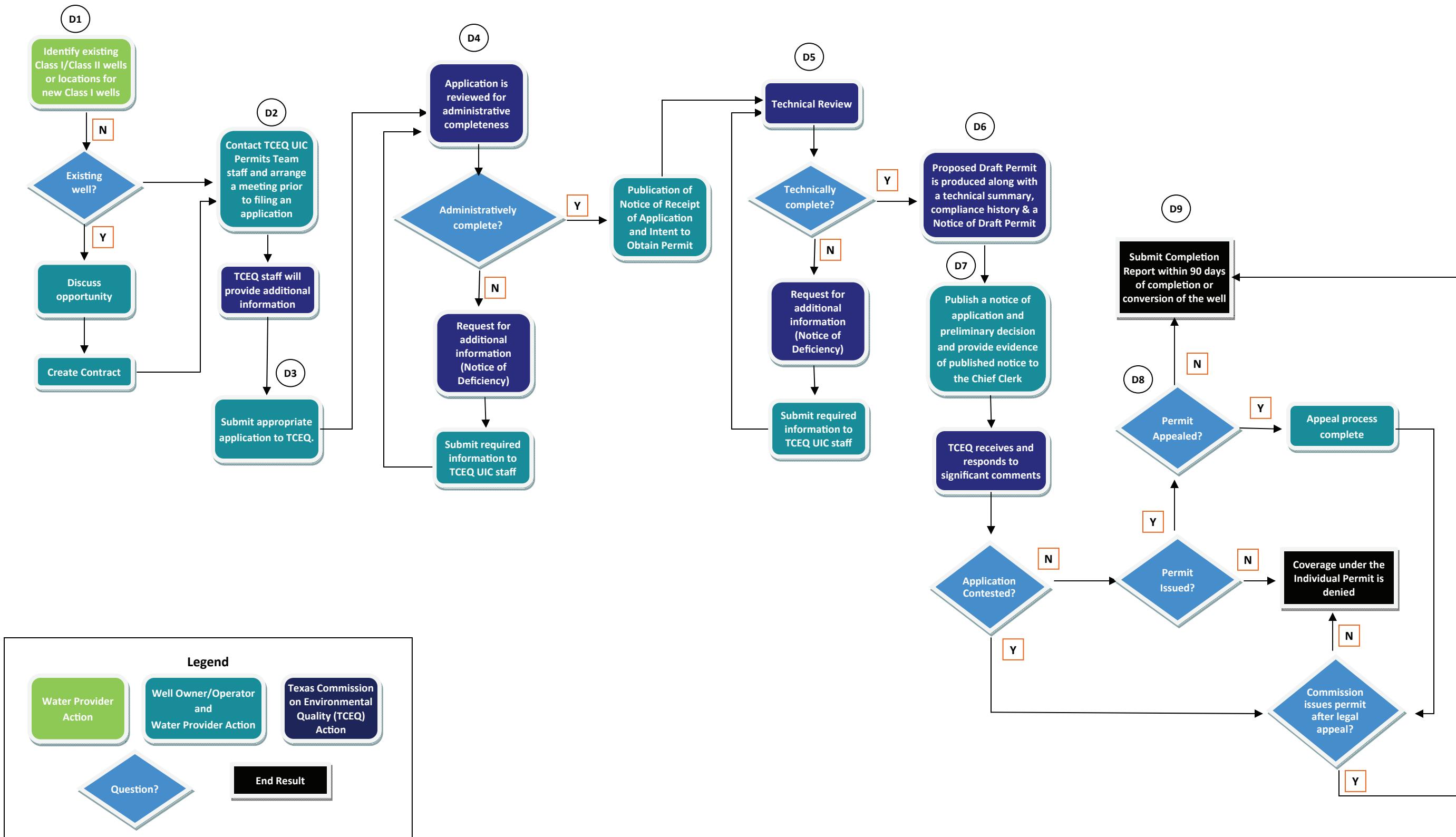
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Flowchart C: TCEQ General Permit Process Detail



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Flowchart D: TCEQ Individual Permit Process Details



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8 San Antonio Water System (SAWS) Brackish Groundwater Desalination Project Case Study

This study considers the SAWS (Project Participant) service area, which continues to experience rapid growth. According to the 2011/2012 Regional and State Water Plans, the population of San Antonio is expected to grow by almost 56 percent by 2060 from a population of 1,354,381 in 2010 to approximately 2,116,782 in 2060 (TWDB, 2011). Due to restrictions on use of the Edwards Aquifer as a drinking water source and the increasing demands of a rapidly growing population, the 2012 State Water Plan projects that SAWS will experience a deficit in water supplies which, without additional supply alternatives, is estimated to reach approximately 169,336 acre feet per year (151 million gallons per day, MGD) by 2060.

One of the primary water supply strategies for SAWS is to implement an economically viable brackish groundwater desalination project. SAWS plans to construct a 13,440 acre feet per year (12 MGD) brackish groundwater desalination treatment facility by 2015. The proposed desalination plant location is shown in conjunction with the SAWS Aquifer Storage and Recovery (ASR) facility (see **Figure 8-1**). Due to the water supply options available to SAWS, the relative cost of a brackish groundwater desalination facility located close to the City, and the diversification that this type of facility would provide, this initiative is a high priority for SAWS.

One of the most significant technical issues to be addressed during the implementation of any inland desalination facility is the reliable management and ultimate disposal of concentrate, as is the case for the proposed SAWS facility. This study examines two potential options that SAWS considered for concentrate disposal into injection wells. The first option, the strategy which SAWS has proceeded with, was utilizing deep well injection through a new Class I well (drilled by SAWS). As an alternative to the Class I injection well, the second option considered was the use of an existing Class II well (that may be dually permitted as a Class I well) near the project site in Wilson County.

The driver for investigating the use of Class II wells for desalination concentrate disposal is the cost of a newly constructed and permitted Class I well. The cost for the newly constructed Class I concentrate disposal well, drilled to a total depth of 5,040 feet, for the SAWS Brackish Groundwater Desalination (BGD) project (including costs for technical report preparation for permitting) was approximately \$5,081,000. As discussed in previous sections of this report, recent rule changes and legislation by USEPA Region 6 and in Texas (HB 2654 by 2007 Texas Legislature) now allow a qualified Class II well to be dually permitted as a Class I well under the TCEQ General Permit for the disposal of desalination concentrate and DWTR. The new legislation also allows Class II, Type 3 wells to receive desalination concentrate and DWTR

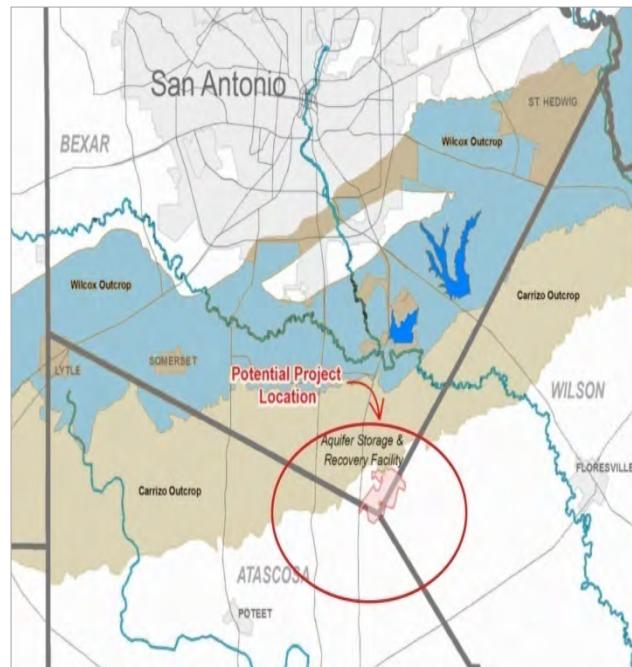


Figure 8-1. Proposed SAWS Brackish Groundwater Desalination Plant

through a permit amendment under the RRC for enhanced recovery processes. Some entities in Texas have dually permitted existing Class II wells through the TCEQ's individual permit (but not using the General Permit) for both Class II and Class I purposes (these wells are no longer operating under a Class I permit), while no water provider has applied for a Class II well permit amendment through the RRC.

As mentioned above, SAWS has now permitted and drilled a Class I injection well for disposing of desalination concentrate. In addition, authorization under the General Permit has been obtained from the TCEQ for four additional Class I injection wells. As part of this effort, SAWS conducted extensive down hole testing to determine the viability of the saline Edwards Formation for desalination concentrate disposal. Test information was obtained to support the Class I permit application and to obtain operational parameters such as volume and injection pressures that were needed to design the reverse osmosis treatment plant. **Appendix D** provides a summary of testing protocols, costs, and schedule for the SAWS Class I well, including the testing procedures potentially transferable for dually permitting a Class II well. Additionally a detailed data inventory from the Class II well considered for the SAWS project is also presented.

8.1 Comparison of Alternatives

At the time of submission of this project proposal for potential funding to the TWDB, SAWS was actively engaged in feasibility and design efforts for the SAWS BGD Project located in southern Bexar County. SAWS, as a project co-sponsor for this study, was interested in the potential of utilizing a currently permitted Class II injection well located in the BGD Project area for desalination concentrate disposal under the dual permitting (i.e. TCEQ General Permit) option for Class I nonhazardous injection wells. SAWS was interested in this option because of the anticipated efforts, costs, and time required to drill, complete, and permit a new Class I or Class V injection well for desalination concentrate management. During the initial design phase of the SAWS BGD Project, a Class II well, the FEDC-Lincoln No. 2 well located in the general area of the proposed SAWS project, was identified and considered for potentially obtaining a TCEQ Class I General Permit. However, early in this study, SAWS decided to permit, drill, and complete a new Class I well instead of using the FEDC-Lincoln No. 2 well. SAWS representatives provided the following reasons for this determination:

1. The estimated cost of land acquisition for the Class II Injection Well and associated property (approximately 1,010 acres) was approximately \$4.9 million. In comparison, the Class I well completion cost \$5.1 million, which included drilling, testing, and permitting (Note: because SAWS already owned the project site as part of the SAWS Aquifer Storage and Recovery Project, the total cost does not include expenses associated with land acquisition);
2. The FEDC-Lincoln No. 2 well was located near the middle of one large tract of land. Moreover, SAWS would likely need to drill at least two additional injection wells to meet Phase I demands of the BGD Project if the assumed injection rates were similar to rates documented during test drilling efforts;
3. Utilizing the existing Class II Injection Well would require approximately 11 miles of concentrate transmission pipeline from the SAWS BGD Project treatment plant to this Injection Well, therefore increasing the total cost of the project;

4. A concentrate transmission line would cross the San Antonio River. As such, SAWS anticipated significant additional costs associated with the permitting and engineering work (e.g. a Section 404 permit from the U.S Army Corps of Engineers) necessary to complete such a waterway pipeline crossing;
5. A recognized but unquantified cost of well rehabilitation was determined for the FEDC-Lincoln No. 2 well, along with the reality of an uncertain permitting outcome (i.e., there was no guarantee that at the end of the effort SAWS would be successful in obtaining a Class I General Permit from the TCEQ, which would allow the well to be dually permitted);
6. The difficulty in obtaining well design information, including material standards and documentation by a Professional Engineer (P.E.) that the well construction met design standards;
7. The lack of information about the fluids that had been previously disposed of and injected into the well;
8. The uncertainty of the current condition of the well considering that it was drilled in the late 1980s;
9. There would have been significant costs associated with conveying required electricity to the FEDC-Lincoln No. 2 well from the Karnes Electric Cooperative since the well is located in Wilson County; and
10. Due to the remote nature of the Class II Injection Well with respect to the SAWS BGD Project site, costs associated with a separate supervisory control and data acquisition (SCADA) system, radios, and repeater antennas would further increase the total cost of the project.

A significant amount of geological, geophysical, and engineering information from the FEDC-Lincoln No. 2 (Class II, Type 1) well was collected and processed as part of this study to determine if adequate information was available to successfully dually permit the well under the General Permit (see **Appendix D**). As certain factors, such as those listed above, rendered this option to be cost prohibitive for SAWS to proceed, it is unknown whether TCEQ would have dually permitted this Class II well as a Class I-II well for desalination concentrate disposal under the TCEQ General Permit. Yet several factors suggest that the Class II injection well had potential to meet Class I standards, as long as required testing was performed and yielded satisfactory results. These factors include:

1. The well appears to have adequate records for a comprehensive evaluation by TCEQ, (such as well completion reports, geophysical logs, casing records, as attached to **Appendix D**);
2. As shown on the geophysical log, the well has a depth of 3,143 feet that injects into formations with high carbonate concentrations.
3. In 1992, the well was granted a permit as a salt water disposal well, (i.e. a Class II, Type 1 well). Type 1 wells are used solely for disposal of oil and gas fluids into non-productive reservoirs and cannot receive exemptions to SDWA requirements for existing oil and gas resources. This past permit approval suggests that the well may have adequate construction characteristics to protect any movement of fluids into USDW formations.

SAWS did not find the existing Class II well to be economically feasible for the groundwater desalination project because of the reasons stated above. However, from a regulatory perspective, records suggest that the existing Class II well has potential to meet Class I General Permit standards, contingent upon the following:

- Additional mechanical and pressure testing protocols are performed and have satisfactory results;
- The USDW depth is confirmed and the well injects below the lowermost USDW; and
- TCEQ determines that sufficient construction requirements are in place to protect the lowermost USDW.

Again, TCEQ has the final interpretation of General Permit regulations and in determining whether the well has adequate construction characteristics to prevent the movement of fluids into USDW formations. Given that TCEQ has not yet approved a General Permit to a Class I-II well, it is difficult to predict whether this particular Class II well would have received General Permit coverage. TCEQ strongly encourages water providers meet and discuss with TCEQ Underground Injection Control (UIC) staff early in the permitting process to fully understand the potential of utilizing a Class II well under this General Permit option.

9 Policy Recommendations

One of the primary purposes of conducting this study on the permitting of existing Class II UIC wells for the disposal of concentrate resulting from desalination operations is to identify changes in policy or the need for additional, more targeted investigations to better understand available water management strategies and opportunities. As discussed in the background section of this report, a significant cooperative effort was made by the representatives from the TWDB, TCEQ, RRC, USEPA and the Texas Legislature from 2003 – 2007 to take better advantage of existing Class II UIC wells in Texas for the specific purpose of disposing desalination concentrate.

With the passage of HB 2654 by the Texas Legislature in 2007, those involved in this effort generally agree that the State of Texas has now adopted, to the extent possible under current USEPA regulations, a statutory framework that allows the greatest flexibility in the use of Class II UIC wells for the dual purpose of managing desalination concentrate and disposing waste from oil and gas production activities. This new framework facilitated the creation of a new Class I UIC General Permit that was issued by the TCEQ (30 TAC §331 Subchapter L). The General Permit facilitates the dual permitting of an existing Class II well as both a Class I nonhazardous well for the disposal of desalination concentrate and DWTR and a Class II well for the disposal of oil and gas waste.

However, there remains one major policy recommendation that if adopted by the USEPA, would undoubtedly change our perspective on desalination concentrate management and disposal in Texas. In 2003, representatives from the TWDB met with senior staff from USEPA Headquarters –Office of Water in Washington D.C. to discuss the possibility of amending the SDWA regulations to expand the definition of Class II UIC wells to include concentrate from desalination operations. As a point of reference, the USEPA regulations (40 CFR 144.6 (b)) define a Class II UIC well as;

“Wells which inject fluids:

- (1) Which are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.*
- (2) For enhanced recovery of oil or natural gas; and*
- (3) For storage of hydrocarbons which are liquid at standard temperature and pressure.”*

In 2003, the TWDB presented a proposal to USEPA to simply expand the definition of fluids to be injected to include the concentrate resulting from the desalination of brackish water and DWTR. This proposal was based on (1) the abundance of permitted Class II UIC wells in Texas, in particular in areas where the potential for brackish groundwater desalination as a new water resource is greatest, and (2) the fact that in most cases, the quality of desalination concentrate is actually superior in quality to native fluids currently serving as the injection horizon for Class II UIC wells. At the time (2003), while USEPA senior staff understood the fundamental logic in the Texas proposal, they were not supportive of the proposal based on an unrelated issue; basically that the SDWA regulations had not been significantly amended since original issuance and thus a major backlog of issues identified by other organizations and groups would also need to be considered during any SDWA rules amendment process. As a result of this backlog of comments and the unwillingness at the time to amend SDWA rules, the concept of a dual permit as implemented by HB 2654 was the only viable approach.

Since that time however, the USEPA has amended SDWA regulations to add a new class of UIC well, a Class VI well. According to the USEPA:

Class VI wells are wells used for injection of carbon dioxide (CO₂) into underground subsurface rock formations for long-term storage, or geologic sequestration. Geologic sequestration refers to a suite of technologies that may be deployed to reduce CO₂ emissions to the atmosphere to help mitigate climate change.

The USEPA Class VI regulations became effective September 7, 2011(USEPA, 2012a).

The current USEPA website also contains the following statement regarding the new “Class VI” designation; “EPA has finalized requirements for geologic sequestration, including the development of a new class of wells, Class VI, under the authority of the Safe Drinking Water Act’s Underground Injection Control (UIC) Program” (emphasis added) (USEPA, 2012b). Therefore, it now seems clear that USEPA does have the authority, as stated in the above reference, under certain conditions to either amend the definition of Class II UIC wells, (as recorded in 40 CFR Parts 124, 144, 145, 146, and 147) or to add a completely new class of UIC wells for the purpose of disposal of concentrate from desalination operations.

At the time of adoption and original rule making for the SDWA, the need to address carbon sequestration or desalination concentrate disposal was not recognized. Today, however, both of these issues fall under the category of emerging technologies and warrant consideration under the provisions of the SDWA. If a new Class VII UIC category existed, then by definition, all existing and active Class II wells could also be administratively issued a Class VII permit. In Texas, this would result in the resolution of one of the most significant challenges facing communities and water providers today that are contemplating the use of desalination technologies to meet future water demands.

9.1 Additional Recommendations

Approximately 40 brackish groundwater desalination projects are included in the 2012 State Water Plan. It is expected that concentrate management and disposal will pose major challenges in the implementation of many of these projects. Using the results from this study, it is recommended that the TWDB conduct additional research to correlate the location of known Class II UIC wells that are in close proximity to brackish groundwater desalination projects identified in the 2012 State Water Plan. This research would prove valuable to utilities and water providers considering brackish groundwater desalination projects and evaluating alternatives for desalination concentrate management. Additionally, this information would help water providers estimate the project costs associated with right-of-way acquisition, construction, operation, and maintenance of concentrate transmission pipelines from the proposed desalination facility to a particular injection or disposal well.

Although not specifically the focus of this study, one important area of research is the impact of long-term injection of fluids on geologic strata targeted for injection. While Texas has a long history of the injection of fluids for enhanced recovery of hydrocarbons, including the understanding of how fluid pressures and reservoir properties change over time, in reality the fundamental nature of concentrate disposal is significantly different in concept from injection for the enhanced recovery of hydrocarbons. First, the duration of injection is on different time scales; concentrate disposal may last for decades (50 years or longer) while enhanced recovery of hydrocarbons may range from a few years up to 30 years. Also, with concentrate disposal, injected fluids are being permanently disposed, while with enhanced recovery of hydrocarbons, often times the fluids are circulating through the geologic formations and returned to the surface for reinjection. The difference in this case has to do with the potential for pressure buildup during the disposal process.

Finally, the potential correlation between the long-term injection of fluids into geologic formations in the subsurface, regardless of the purpose for injection (enhanced hydrocarbon recovery or disposal of hazardous waste, desalination concentrate, and oil and gas waste), anecdotal correlations with the occurrence of minor earthquakes and other seismic events continues to raise public concerns over safety issues. Clearly more rigorous analysis into cause and effect of recent minor seismicity and earthquakes will be needed to address public concerns.

With these and other technical questions, solutions may vary significantly by location, but a better understanding of the geological reservoir response to long term, high volume, and continuous injection would help advance the use of Class II UIC wells for the injection and disposal of desalination concentrate. Therefore, it is recommended that the TWDB work with the Texas Legislature to fund appropriate studies on the topic of expected hydrodynamic responses to long term injection of desalination concentrate in a variety of hydrogeological settings in Texas.

10 Acknowledgements

Numerous individuals, firms, and government agencies in Texas contributed to the success of this study. Special thanks to the following participants of the *Manual for the Permitting Process*:

10.1 Cooperating Agencies

Texas Commission on Environmental Quality
Texas Water Development Board
Railroad Commission of Texas

10.2 Project Participants

San Antonio Water Systems
Bill Mullican and Associates
Poznecki-Camarillo, Inc.
Digital Data Services, Inc.

11 References

All websites accessed in April 2014.

El Paso Water Utility (EPWU), 2014, Water – Setting the Stage for the Future.
http://www.epwu.org/water/desal_info.html

Mace, R.E., Nicot, J.P., Chowdhury, A.H., Dutton, A.R., and Kalaswad, S., 2006, Please Pass the Salt: Using Oil Fields for the Disposal of Concentrate from Desalination Plants: Texas Water Development Board Report 366.

McFaddin, M., 2008, Federal and State Underground Injection Regulations: A Guide to the Disposal of Desalination Concentrate, *Proceedings of the 23rd Annual Water Reuse Symposium*.

Railroad Commission of Texas (RRC), 2012, Underground Injection Control and Well Bore Data, data provided to CDM Smith for this report.

RRC, 2014, Saltwater Disposal Wells Frequently Asked Questions (FAQs).
<http://www.rrc.state.tx.us/about/faqs/saltwaterwells.php>

TECO Energy, 2014, Water Resources.
<http://www.tecoenergy.com/csr/environment/waterresources/>

Texas Water Development Board (TWDB), 2014, Desalination Facts.
<http://www.twdb.state.tx.us/innovativewater/desal/facts.asp>

TWDB, 2012, 2012 State Water Plan.
<http://www.twdb.state.tx.us/waterplanning/swp/2012/index.asp>

TWDB, 2011, 2011 Regional Water Plan – City Population Projections for 2000 -2060.

<http://www.twdb.state.tx.us/waterplanning/data/projections/2012/doc/Population/3CityPopulation.pdf>

TWDB, 2003, *Brackish Groundwater Manual for Texas Regional Water Planning Groups*, Contract Report prepared by LBG – Guyton Associates and NRS Consulting Engineers.

TWDB, 2002, Water for Texas: State Water Plan.

<http://www.twdb.state.tx.us/waterplanning/swp/2002/#2002SWP>

TWDB, 1997, Water for Texas: State Water Plan.

<https://www.twdb.state.tx.us/waterplanning/swp/1997/>

United States Environmental Protection Agency (USEPA), 2012a, Classes of Wells.

<http://water.epa.gov/type/groundwater/uic/wells.cfm>

USEPA, 2012b, Geologic Sequestration Class VI Wells.

<http://water.epa.gov/type/groundwater/uic/class6/gsclass6wells.cfm>

USEPA, 2012c, Geologic Sequestration of Carbon Dioxide: Background.

http://water.epa.gov/type/groundwater/uic/wells_sequestration.cfm

USEPA, 2010, 2010 UIC Well Inventory,

http://water.epa.gov/type/groundwater/uic/upload/UIC-Well-Inventory_2010-2.pdf

APPENDIX A

**House Bill 2654
Documents**

May 2014

**CDM
Smith**

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H.B. No. 2654

AN ACT

relating to the regulation of the use of an injection well to inject nonhazardous brine from a desalination operation or to inject nonhazardous drinking water treatment residuals.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. The heading to Section 27.021, Water Code, is amended to read as follows:

Sec. 27.021. PERMIT FOR DISPOSAL OF BRINE FROM DESALINATION OPERATIONS OR OF DRINKING WATER TREATMENT RESIDUALS IN CLASS I INJECTION WELLS.

SECTION 2. Section 27.021(a), Water Code, is amended to read as follows:

(a) The commission may issue a permit to dispose of brine produced by a desalination operation or of drinking water treatment residuals in a Class I injection well if the applicant for the permit meets all the statutory and regulatory requirements for the issuance of a permit for a Class I injection well.

SECTION 3. Subchapter B, Chapter 27, Water Code, is amended by adding Section 27.023 to read as follows:

Sec. 27.023. GENERAL PERMIT AUTHORIZING USE OF CLASS I INJECTION WELL TO INJECT NONHAZARDOUS BRINE FROM DESALINATION OPERATIONS OR NONHAZARDOUS DRINKING WATER TREATMENT RESIDUALS. (a) The commission may issue a general permit authorizing the use of a Class I injection well to inject nonhazardous brine from a desalination operation or to inject nonhazardous drinking water treatment residuals if the commission determines that the injection well and injection activities are more appropriately regulated under a general permit than under an individual permit based on findings that:

(1) the general permit has been drafted to ensure that it can be readily enforced and that the commission can adequately monitor compliance with the terms of the general permit; and

(2) the general permit will contain proper safeguards to protect ground and surface fresh water from pollution.

(b) The commission shall publish notice of a proposed general permit in one or more newspapers of statewide or regional circulation and in the Texas Register. The notice must include an invitation for written comments by the public to the commission regarding the proposed general permit and shall be published not later than the 30th day before the date the commission adopts the general permit. The commission by rule may require additional notice to be given.

(c) The commission may hold a public meeting to provide an additional opportunity for public comment. The commission shall give notice of the public meeting under this subsection by publication in the Texas Register not later than the 30th day before the date of the meeting.

(d) The commission shall issue a written response to comments on the general permit at the same time the commission issues or denies the permit. The response to comments is available to the public and shall be mailed to each person who made a comment.

(e) A general permit may provide that an owner of a Class I injection well may obtain authorization to use the well to inject nonhazardous brine from a desalination operation or to inject nonhazardous drinking water treatment residuals under a general permit by submitting to the commission written notice of intent to be covered by the general permit. The commission by rule shall establish the requirements for the notice of intent, including the

information that an owner of an injection well subject to a general permit must submit to authorize the use of the well under the general permit. A general permit may authorize the use of an injection well under the general permit on filing a complete and accurate notice of intent, including all information required by the commission's rules to be submitted, or it may specify a date or period of time after the commission receives the notice of intent, including the required information, on which the use of an injection well is authorized unless the executive director before that time notifies the owner that it is not eligible under the general permit.

(f) Authorization for the use of an injection well under a general permit does not confer a vested right. After written notice to the owner of an injection well, the executive director may suspend authorization for the use of the well under a general permit and may require the owner to obtain authorization for the use of the well under an individual permit.

(g) Notwithstanding the other provisions of this chapter, the commission, after hearing, shall deny or suspend authorization for the use of an injection well under a general permit if the commission determines that the owner's compliance history is in the lowest classification under Sections 5.753 and 5.754 and rules adopted and procedures developed under those sections. A hearing under this subsection is not subject to the requirements relating to a contested case hearing under Chapter 2001, Government Code.

(h) A general permit may be issued for a term not to exceed 10 years. After notice and comment as provided by Subsections (b)-(d), a general permit may be amended, revoked, or canceled by the commission or renewed by the commission for an additional term or terms not to exceed 10 years each. A general permit remains in effect until amended, revoked, or canceled by the commission or, unless renewed by the commission, until expired. If before a general permit expires the commission proposes to renew that general permit, that general permit remains in effect until the date on which the commission takes final action on the proposed renewal.

(i) The commission may add or delete requirements for a general permit through a renewal or amendment process. The commission shall provide a reasonable time to allow an owner of an injection well to make the changes necessary to comply with the additional requirements.

(j) The commission may impose a fee for the submission of a notice of intent to be covered by the general permit. The fee must be in the same amount as a fee collected under Section 27.014.

(k) The issuance, amendment, renewal, suspension, revocation, or cancellation of a general permit or the authorization for the use of an injection well under a general permit is not subject to the requirements relating to a contested case hearing under Chapter 2001, Government Code.

(l) The use or disposal of radioactive material under this section is subject to the applicable requirements of Chapter 401, Health and Safety Code.

(m) The commission may adopt rules as necessary to implement and administer this section.

SECTION 4. Section 27.0511, Water Code, is amended by amending Subsection (g) and adding Subsection (h) to read as follows:

(g) Except as provided by Subsection (h), a [No] person may not continue utilizing or begin utilizing industrial or municipal waste as an injection fluid for enhanced recovery purposes without first obtaining a permit from the commission.

(h) The railroad commission may authorize a person to utilize nonhazardous brine from a desalination operation or nonhazardous drinking water treatment residuals as an injection fluid for enhanced recovery purposes without first obtaining a

permit from the commission. The use or disposal of radioactive material under this subsection is subject to the applicable requirements of Chapter 401, Health and Safety Code.

SECTION 5. Section 361.086, Health and Safety Code, is amended by amending Subsection (a) and adding Subsection (d) to read as follows:

(a) Except as provided by Subsection (d), a [A] separate permit is required for each solid waste facility.

(d) A separate permit is not required for activities authorized by a general permit issued under Section 27.023, Water Code.

SECTION 6. Section 27.014, Water Code, is amended to read as follows:

Sec. 27.014. APPLICATION FEE. With each application for a disposal well permit, the commission shall collect a fee in the amount provided by and under the terms of Section 5.701 [5.235].

SECTION 7. This Act takes effect September 1, 2007.

President of the Senate

Speaker of the House

I certify that H.B. No. 2654 was passed by the House on May 4, 2007, by the following vote: Yeas 144, Nays 0, 2 present, not voting.

Chief Clerk of the House

I certify that H.B. No. 2654 was passed by the Senate on May 23, 2007, by the following vote: Yeas 31, Nays 0.

APPROVED: _____
Date

Secretary of the Senate

Governor

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The Texas Commission on Environmental Quality (commission) proposes to amend §50.113.

BACKGROUND AND SUMMARY OF THE FACTUAL BASIS FOR THE PROPOSED RULE

This rulemaking implements House Bill (HB) 2654, 80th Legislature, 2007. HB 2654 amended Texas Water Code (TWC), §27.021 and added new TWC, §27.023 to allow the commission to issue a general permit authorizing the use of a Class I injection well to inject nonhazardous brine from desalination operations or nonhazardous drinking water treatment residuals. These legislative changes are intended to promote desalination technology and address the need for public water supply systems to dispose of drinking water treatment residuals. To implement HB 2654, this rulemaking amends §50.113(d).

The amended rule adds two new types of applications and actions to a listing of applications that the commission may act on without holding a contested case hearing. This listing is in §50.113(d). There are two paragraphs under §50.113(d) that are affected by the proposed amendment.

First, the proposed amendment to §50.113(d)(5) will update the list of applications that are not subject to a contested case hearing by adding an application for a Class I injection well used only for the disposal of nonhazardous drinking water treatment residuals. This exception is in addition to the exception for applications for disposal of desalination brine which was added by a previous rulemaking in the September 10, 2004 issue of the *Texas Register* (29 TexReg 8814). Amendment of §50.113(d)(5) also includes updates to reflect use of the term "nonhazardous brine from a desalination operation" instead of "desalination brine," and inserts the word "injection" into the phrase "Class I injection wells," to achieve consistency with the title of TWC, §27.021 as amended by HB 2654.

Second, a new paragraph has been inserted as §50.113(d)(6) with renumbering of subsequent paragraphs. The new paragraph implements part of TWC, §27.023 in HB 2654 that allows the commission to issue a general permit authorizing a Class I injection well to inject nonhazardous brine from desalination operations or nonhazardous drinking water treatment residuals, without providing the opportunity for a contested case hearing, as long as all requirements for a Class I injection well permit are met. Public notice of, and the opportunity to comment on, a permit application will not be affected by this rulemaking. Removing the opportunity for a contested case hearing may expedite the approval of Class I injection well permits for the disposal of nonhazardous desalination brine and nonhazardous drinking water treatment residuals. The commission's ability to hold a discretionary hearing under the provisions of TWC, §5.102(b) was not amended by HB 2654.

Changes to 30 TAC Chapters 55, 305 and 331 are also proposed in this issue of the *Texas Register* to implement HB 2654 and to incorporate other changes to facilitate disposal of nonhazardous desalination brine and nonhazardous drinking water treatment residuals.

SECTION DISCUSSION

§50.113. Applicability and Action on Application.

The proposal would amend §50.113(d)(5) by adding a permit application for a Class I injection well used only for the disposal of nonhazardous desalination concentrate or nonhazardous drinking water treatment residuals to the list of applications upon which the commission may act without holding a contested case hearing. The proposal would add §50.113(d)(6) to include the issuance, amendment, renewal, suspension, revocation or cancellation of a general permit, or the authorization for the use of an injection

well under a general permit in the list of items upon which the commission may act without holding a contested case hearing. Section 50.113(d)(6) - (8) will be renumbered as (d)(7) - (9), respectively.

FISCAL NOTE: COSTS TO STATE AND LOCAL GOVERNMENT

Nina Chamness, Analyst, Strategic Planning and Assessment, has determined that, for the first five-year period the proposed amendment is in effect, no significant fiscal implications are anticipated for the agency or other units of state or local governments as a result of administration or enforcement of the proposed rule. The agency will utilize existing resources to develop rules and guidelines for a general permit to authorize the use of Class I injection wells for disposal of nonhazardous desalination concentrate or nonhazardous drinking water treatment residuals.

HB 2654, 80th Legislature, Regular Session allows the commission to issue a general permit to authorize the use of a Class I injection well for disposal of nonhazardous desalination concentrate or nonhazardous drinking water treatment residuals and allows the Railroad Commission of Texas to authorize the use of these wastes as appropriate injection fluids for enhanced recovery purposes without the necessity of obtaining a permit from the commission. HB 2654 requires agency rules governing the issuance of the general permit including the requirement for the submission of a notice of intent by the prospective permittee. In addition, HB 2654 specifies that the general permit is not subject to the requirements of a contested case hearing. The proposed rulemaking is part of the agency's effort to establish a general permit program authorizing the use of Class I injection wells as specified by the legislation. In addition to this rulemaking, amendments are also proposed for appropriate sections of Chapters 55, 305, and 331. This fiscal note addresses only the fiscal implication of proposed changes to Chapter 50. The fiscal implications for needed amendments to other chapters are addressed in separate fiscal notes.

The proposed rule would comply with the contested case hearing requirements of HB 2654. These administrative changes allow the agency to authorize disposal of nonhazardous desalination concentrate or nonhazardous drinking water treatment residuals under a general permit without holding a contested case hearing if all permit requirements are met.

Local governments and state agencies that are suppliers of public drinking water are not expected to experience significant fiscal implications because of the proposed rule. Governmental entities supplying public drinking water are expected to choose the most economical method of disposal of nonhazardous desalination and drinking water residual wastes, and disposal of these wastes in these injection wells is one option among various options available to suppliers of public drinking water regarding waste disposal.

If a local government or state agency chooses to own or operate a Class I injection well qualifying for authorization under the proposed general permit, the proposed rule could streamline the process for the governmental entity by deleting the requirement for contested case hearings, public notice, and public meetings. Savings generated by not holding contested case hearings could be as much as \$500,000 although a contested case hearing would likely cost less. Not being required to publish public notices required by individual permits could save as much as \$1,000 to \$3,000 depending on the circulation size of the newspapers used. Savings generated by not being required to hold a public meeting, if an application had generated sufficient public interest for the agency to require one for an individual permit, could range from \$1,700 to \$4,700 depending on the cost of notices and the price for renting a meeting place.

PUBLIC BENEFITS AND COSTS

Nina Chamness also determined that for each year of the first five years the proposed amendment is in effect, the public benefit anticipated from the changes seen in the proposed rule will be to allow desalination projects to come on line in a shorter time frame thus providing an increased supply of public drinking water while continuing to safeguard public health and the environment.

Individuals and business entities that are suppliers of public drinking water are not expected to experience significant fiscal implications because of the proposed rule. Suppliers of public drinking water are expected to choose the most economic method of disposal of nonhazardous desalination concentrate and drinking water treatment residuals, and disposal of these wastes in these injection wells is one option among various options available to suppliers of public drinking water regarding waste disposal.

Large businesses that own or operate these types of injection wells could possibly save both time and money since the proposed rule does not subject them to contested case hearings, requirements of public notice, and requirements for public meetings that would be required under an individual permit. Savings generated by not holding contested case hearings could be as much as \$500,000 although a contested case hearing would likely cost less. Public notices required for individual permits could cost as much as \$1,000 to \$3,000 depending on the circulation size of the newspapers used. If applying for authorization under a general permit, applicants could be expected to save this expense. Applicants for authorization under this general permit could also save on the public meeting costs incurred for individual notices if an application would have had a public meeting under the requirements for an individual permit. These

costs could range from \$1,700 to \$4,700 depending on the number of notices of public meeting that would have been required and the price of rentals for meeting places in the area.

Oil and gas businesses that might utilize enhanced recovery methods by injecting nonhazardous desalination concentrate or nonhazardous drinking water treatment residuals are expected to experience the same cost savings regarding contested case hearings, public notice and public meetings as those experienced by suppliers of public drinking water.

SMALL BUSINESS AND MICRO-BUSINESS ASSESSMENT

No adverse fiscal implications are anticipated for small or micro-businesses as a result of the proposed rule. Staff knows of no small or micro-businesses that are owners of Class I wells. The proposed rule establishes that wells authorized under the general permit for Class I injection wells disposing of nonhazardous desalination and drinking water treatment residual wastes are not subject to the requirements of a contested case hearing, requirements of public notice, and requirements of public meetings as are those required by individual permits. If a small or micro-business decides to request authorization under a general permit to own or operate a Class I injection well for nonhazardous desalination concentrate or drinking water treatment residual waste disposal, it should experience the same cost savings associated with contested case hearings, public notices, and public meetings as those experienced by large businesses.

SMALL BUSINESS REGULATORY FLEXIBILITY ANALYSIS

The commission has reviewed this proposed rulemaking and determined that a small business regulatory flexibility analysis is not required because the proposed rule is needed to comply with state law and does

not adversely affect a small or micro-business in a material way for the first five years that the proposed rule is in effect.

LOCAL EMPLOYMENT IMPACT STATEMENT

The commission has reviewed this proposed rulemaking and determined that a local employment impact statement is not required because the proposed rule does not adversely affect a local economy in a material way for the first five years that the proposed rule is in effect.

DRAFT REGULATORY IMPACT ANALYSIS DETERMINATION

The commission reviewed the proposed rulemaking in light of the regulatory analysis requirements of Texas Government Code, §2001.0225, and determined that the rulemaking does not meet the definition of a "major environmental rule" as defined by that statute. A "major environmental rule" means a rule the specific intent of which is to protect the environment or reduce risks to human health from environmental exposure and that may adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state. This rulemaking does not meet the statutory definition of a "major environmental rule" because it is not intended to reduce risks to human health from environmental exposure, nor does it adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector of the state.

The intent of the proposed rulemaking is to implement HB 2654, passed during the 80th Legislature, 2007, and to revise criteria for authorizing Class I nonhazardous wells injecting desalination concentrate and other water treatment residuals from public water systems so that the state's rules are no more

stringent than federal Class I nonhazardous injection well regulations. The specific intent of the proposed amendment to Chapter 50 is to address the authority of the commission to take actions regarding the proposed general permit and authorizations under the proposed general permit. The rule substantially advances this purpose by adding notices of intent submitted under §331.203 to the applicability of Chapter 50, Subchapter F. Further, applications for a Class I injection well permit used only for the disposal of drinking water treatment residuals and the issuance, amendment, renewal, suspension, revocation or cancellation of a general permit or authorization under a general permit for a Class I injection well used only for the disposal of nonhazardous brine from desalination operations or drinking water treatment residuals are added to the list of items upon which the commission may act without holding a contested case hearing.

This rulemaking does not meet the statutory definition of a "major environmental rule" because the proposed amendment would not adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or public health and safety of the state or a sector of the state. It is not anticipated that the cost of complying with the proposed amendment will be significant with respect to the economy; therefore, the proposed amendment will not adversely affect in a material way the economy, a sector of the economy, competition, or jobs.

Additionally, this rulemaking does not meet any of the four applicability requirements listed in Texas Government Code, §2001.0225(a). Texas Government Code, §2001.0225 only applies to a major environmental rule, the result of which is to: 1) exceed a standard set by federal law, unless the rule is specifically required by state law; 2) exceed an express requirement of state law, unless the rule is specifically required by federal law; 3) exceed a requirement of a delegation agreement or contract

between the state and an agency or representative of the federal government to implement a state and federal program; or 4) adopt a rule solely under the general powers of the agency instead of under a specific state law. This rulemaking does not meet any of these four applicability requirements because this rulemaking does not exceed any standard set by federal law but rather amends the rules so that they are no more stringent or restrictive than the federal regulations. The proposed rule does not exceed the requirements of state law under the TWC, Chapter 27. Further, the proposed rule does not exceed a requirement of a delegation agreement or contract between the state and an agency or representative of the federal government to implement any state and federal program. Finally, the rule is not proposed solely under the general powers of the agency, but rather specifically under TWC, §27.023(m), which allows the commission to adopt rules to implement the general permit authorizing use of a Class I injection well to inject nonhazardous brine from desalination operations or nonhazardous drinking water treatment residuals and TWC, §27.109, which authorizes the commission to adopt rules to implement TWC, Chapter 27 (regarding Injection Wells), as well as the other general powers of the agency.

The commission invites public comment regarding this draft regulatory impact analysis determination. Written comments on the draft regulatory impact analysis determination may be submitted to the contact person at the address listed under the SUBMITTAL OF COMMENTS section of this preamble.

TAKING IMPACT ASSESSMENT

The commission evaluated the proposed amendment to Chapter 50 and performed a preliminary assessment of whether the proposed amendment would constitute a taking under Texas Government Code, Chapter 2007. The primary purpose of the proposed amendment is to implement HB 2654, authorizing use of a general permit for Class I injection wells injecting only nonhazardous desalination

concentrate or nonhazardous drinking water treatment residuals. The proposed amendment would substantially advance this purpose by amending §50.113 to add to the list of actions upon which the commission may act without first holding a contested case hearing applications for a Class I injection well permit used only for the disposal of drinking water treatment residuals and the issuance, amendment, renewal, suspension, revocation or cancellation of a general permit or authorization under a general permit for a Class I injection well permit used only for the disposal of nonhazardous brine from desalination operations or drinking water treatment residuals.

Promulgation and enforcement of the proposed amendment would constitute neither a statutory nor a constitutional taking of private real property. There are no burdens imposed on private real property under this rule because the proposed amendments neither relate to, nor have any impact on the use or enjoyment of private real property, and there would be no reduction in property value as a result of this rule. Therefore, the proposed rule would not constitute a taking under Texas Government Code, Chapter 2007.

The commission has no reasonable alternative that could accomplish the specific purpose of addressing the commission's authority to act other than by amending Chapter 50.

CONSISTENCY WITH THE COASTAL MANAGEMENT PROGRAM

The commission reviewed the proposed rule and found that it is neither identified in Coastal Coordination Act Implementation Rules, 31 TAC §505.11(b)(2) or (4), nor will it affect any action/authorization identified in Coastal Coordination Act Implementation Rules, 31 TAC §505.11(a)(6). Therefore, the proposed rule is not subject to the Texas Coastal Management Program.

ANNOUNCEMENT OF HEARING

The commission will hold a public hearing on this proposal in Austin on April 8, 2008 at 10:00 a.m. in Building E Room 201S, at the commission's central office located at 12100 Park 35 Circle. The hearing is structured for the receipt of oral or written comments by interested persons. Individuals may present oral statements when called upon in order of registration. Open discussion will not be permitted during the hearing; however, commission staff members will be available to discuss the proposal 30 minutes prior to the hearing.

Persons who have special communication or other accommodation needs who are planning to attend the hearing should contact Ms. Kristin Smith, Office of Legal Services at (512) 239-0177. Requests should be made as far in advance as possible.

SUBMITTAL OF COMMENTS

Written comments may be submitted to Ms. Kristin Smith, MC 205, Office of Legal Services, Texas Commission on Environmental Quality, P.O. Box 13087, Austin, Texas 78711-3087, or faxed to (512) 239-4808. Electronic comments may be submitted at: <http://www5.tceq.state.tx.us/rules/ecomments/>. File size restrictions may apply to comments being submitted via the eComments system. All comments should reference Rule Project Number 2007-030-331-PR. The comment period closes April 14, 2008. Copies of the proposed rulemaking can be obtained from the commission's Web site at http://www.tceq.state.tx.us/nav/rules/propose_adopt.html. For further information, please contact Ms. Kathryn Hoffman, Waste Permits Division, (512) 239-6890.

SUBCHAPTER F: ACTION BY THE COMMISSION

§50.113

STATUTORY AUTHORITY

The amendment is proposed under Texas Water Code (TWC), §5.103, which provides the commission with the authority to adopt any rules necessary to carry out its powers and duties under this code and other laws of this state and to adopt rules repealing any statement of general applicability that interprets law or policy; §5.105, which authorizes the commission to establish and approve all general policy of the commission by rule; §27.019, which requires the commission to adopt rules reasonably required for the regulation of injection wells; and §27.023, which allows the commission to adopt rules as necessary to implement and administer a general permit authorizing the use of Class I injection wells to inject nonhazardous brine from desalination operations or nonhazardous drinking water treatment residuals.

The proposed amendment implements TWC, §27.023, relating to General Permit Authorizing Use of Class I Injection Wells to Inject Nonhazardous Brine from Desalination Operations or Nonhazardous Drinking Water Treatment Residuals, and TWC, Chapter 27.

§50.113. Applicability and Action on Application.

(a) Applicability. This subchapter applies to applications that are declared administratively complete on or after September 1, 1999. Applications that are declared administratively complete before September 1, 1999, are subject to Subchapter B of this chapter (relating to Action by the Commission).

(b) This chapter does not create a right to a contested case hearing where the opportunity for a contested case hearing does not exist under other law.

(c) After the deadline for filing a request for reconsideration or contested case hearing under §55.201 of this title (relating to Requests for Reconsideration or Contested Case Hearing), the commission may act on an application without holding a contested case hearing or acting on a request for reconsideration, if:

(1) no timely request for reconsideration or hearing has been received;

(2) all timely requests for reconsideration or hearing have been withdrawn, or have been denied by the commission;

(3) a judge has remanded the application because of settlement; or

(4) for applications under Texas Water Code, Chapters 26 and 27 and Texas Health and Safety Code, Chapters 361 and 382, the commission finds that there are no issues that:

(A) involve a disputed question of fact;

(B) were raised during the public comment period; and

(C) are relevant and material to the decision on the application.

- (d) Without holding a contested case hearing, the commission may act on:
- (1) an application for any air permit amendment, modification, or renewal application that would not result in an increase in allowable emissions and would not result in the emission of an air contaminant not previously emitted;
- (2) an application for any initial issuance of an air permit for a voluntary emission reduction or electric generating facility;
- (3) an application for a hazardous waste permit renewal under §305.631(a)(8) of this title (relating to Renewal);
- (4) an application for a wastewater discharge permit renewal or amendment under Texas Water Code, §26.028(d), unless the commission determines that an applicant's compliance history as determined under Chapter 60 of this title (relating to Compliance History) raises issues regarding the applicant's ability to comply with a material term of its permit;
- (5) an application for a Class I injection well permit used only for the disposal of nonhazardous [desalination] brine produced by a desalination operation or nonhazardous drinking water treatment residuals under Texas Water Code, §27.021, concerning Permit for Disposal of Brine From Desalination Operations or of Drinking Water Treatment Residuals in Class I Injection Wells;

(6) the issuance, amendment, renewal, suspension, revocation, or cancellation of a general permit, or the authorization for the use of an injection well under a general permit under Texas Water Code, §27.023, concerning General Permit Authorizing Use of Class I Injection Well to Inject Nonhazardous Brine from Desalination Operations or Nonhazardous Drinking Water Treatment Residuals;

(7)[(6)] an application for pre-injection unit registration under §331.17 of this title (relating to Pre-Injection Units Registration);

(8)[(7)] an application for a permit, registration, license, or other type of authorization required to construct, operate, or authorize a component of the FutureGen project as defined in §91.30 of this title (relating to Definitions), if the application was submitted on or before January 1, 2018; and

(9)[(8)] other types of applications where a contested case hearing request has been filed but no opportunity for hearing is provided by law.

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
APPENDIX B

**Spatial Distribution
Maps of Class II Wells
in Texas**

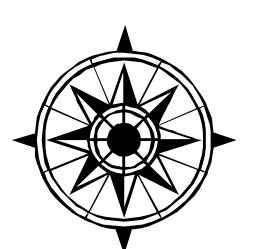
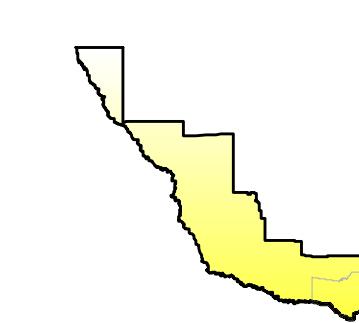
May 2014

**CDM
Smith**

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


TWDB Regional Water Planning Areas



SOURCE: Railroad Commission Underground Injection
Control (UIC) and Well Bore Data databases, 2012.

0 12.5 25 50 75 100 Miles

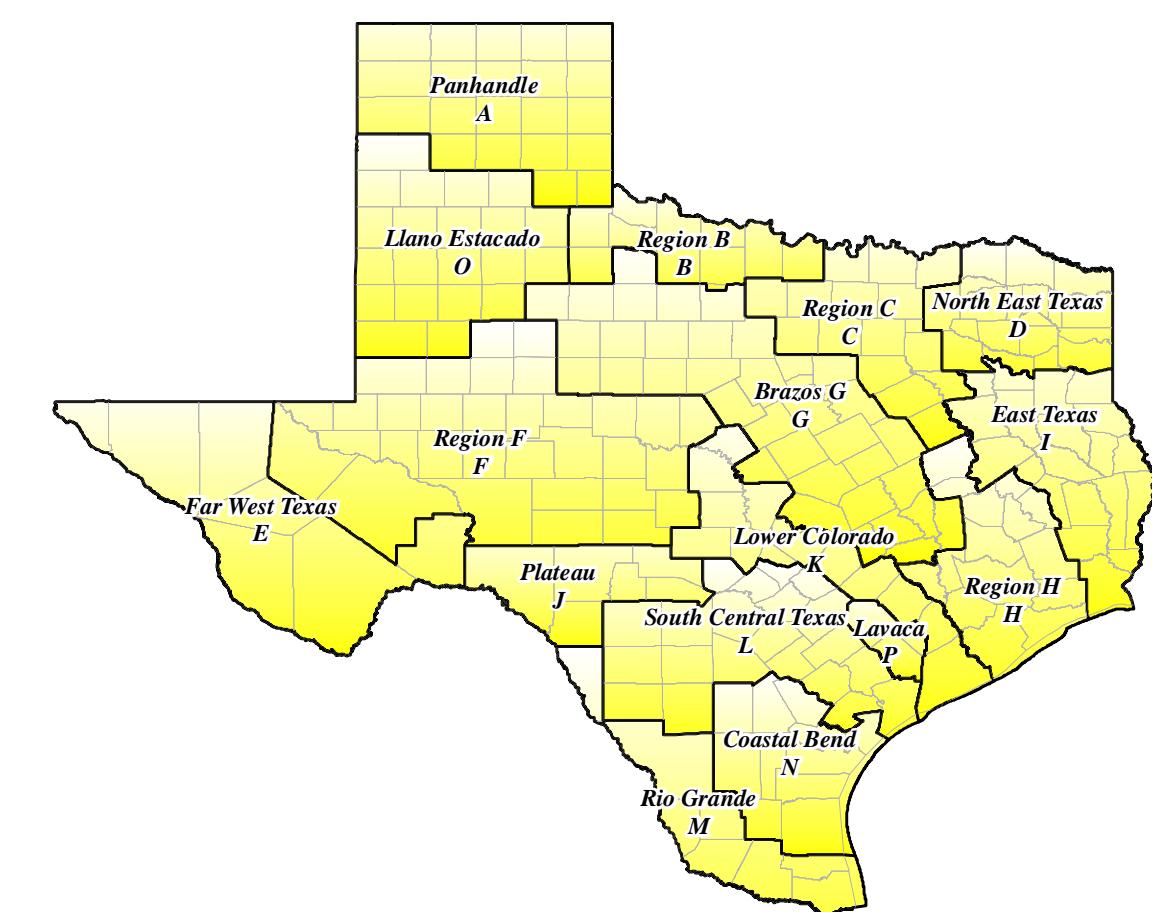
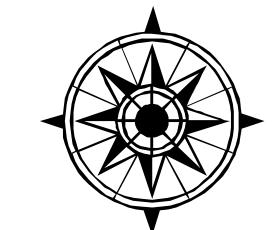
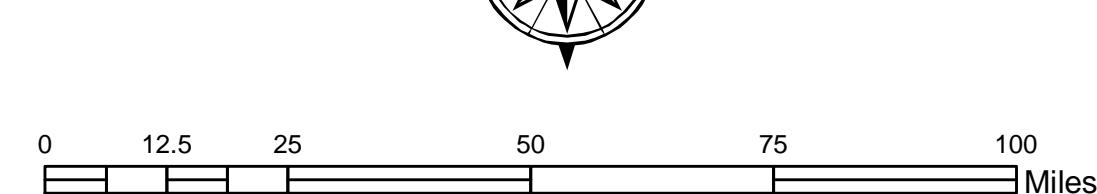


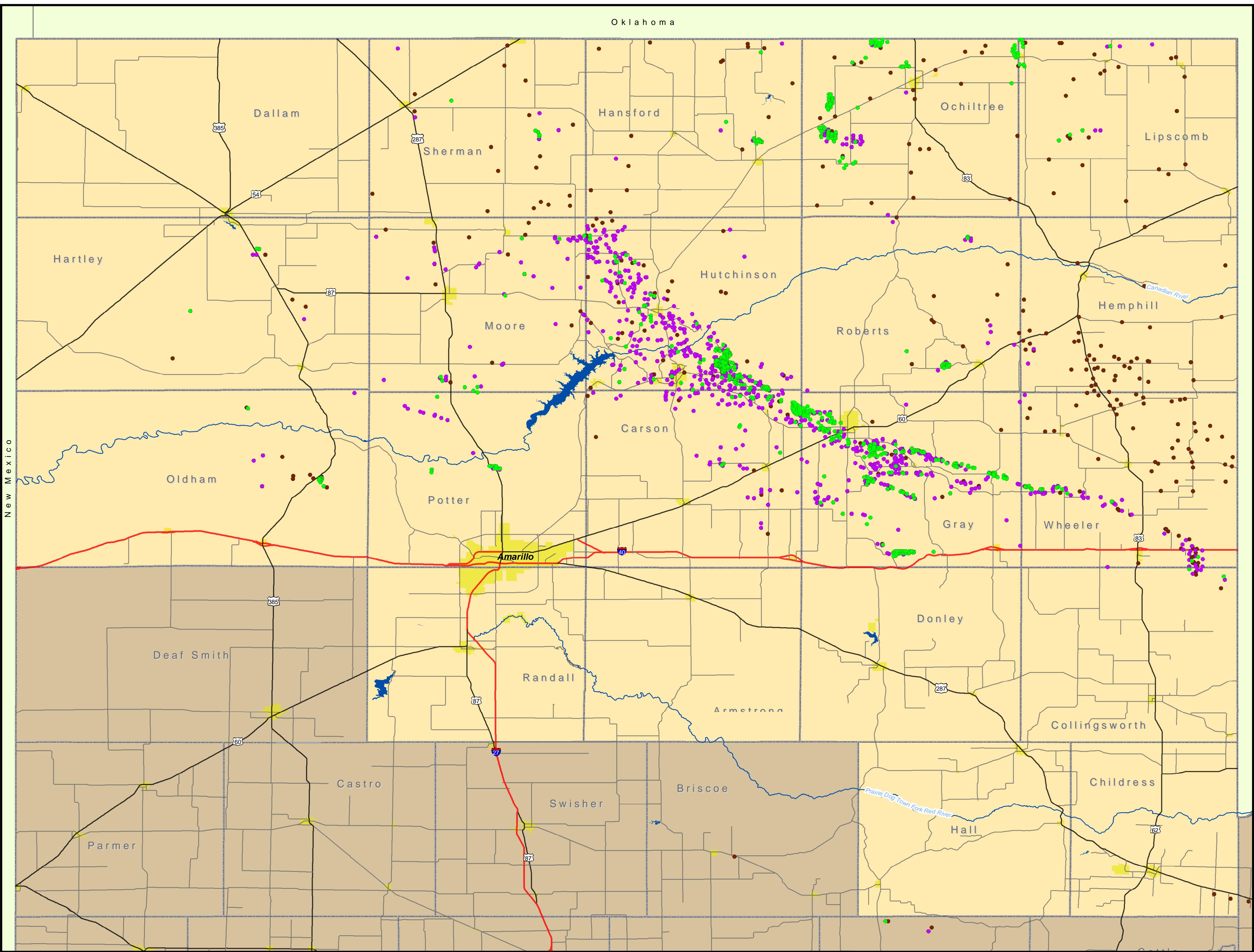
Class II, Type 3 Active Injection Wells

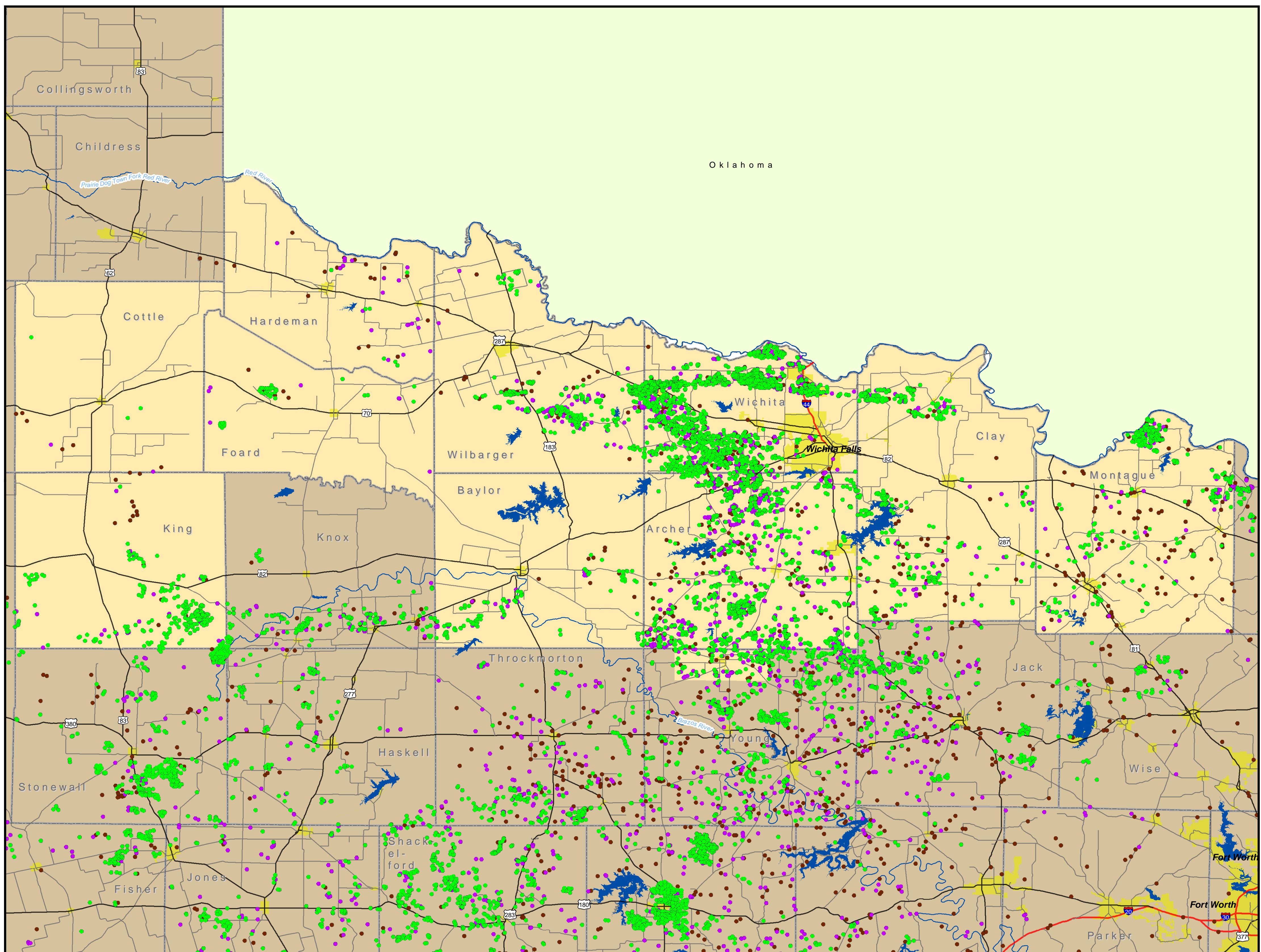
TWDB Regional Water Planning Areas

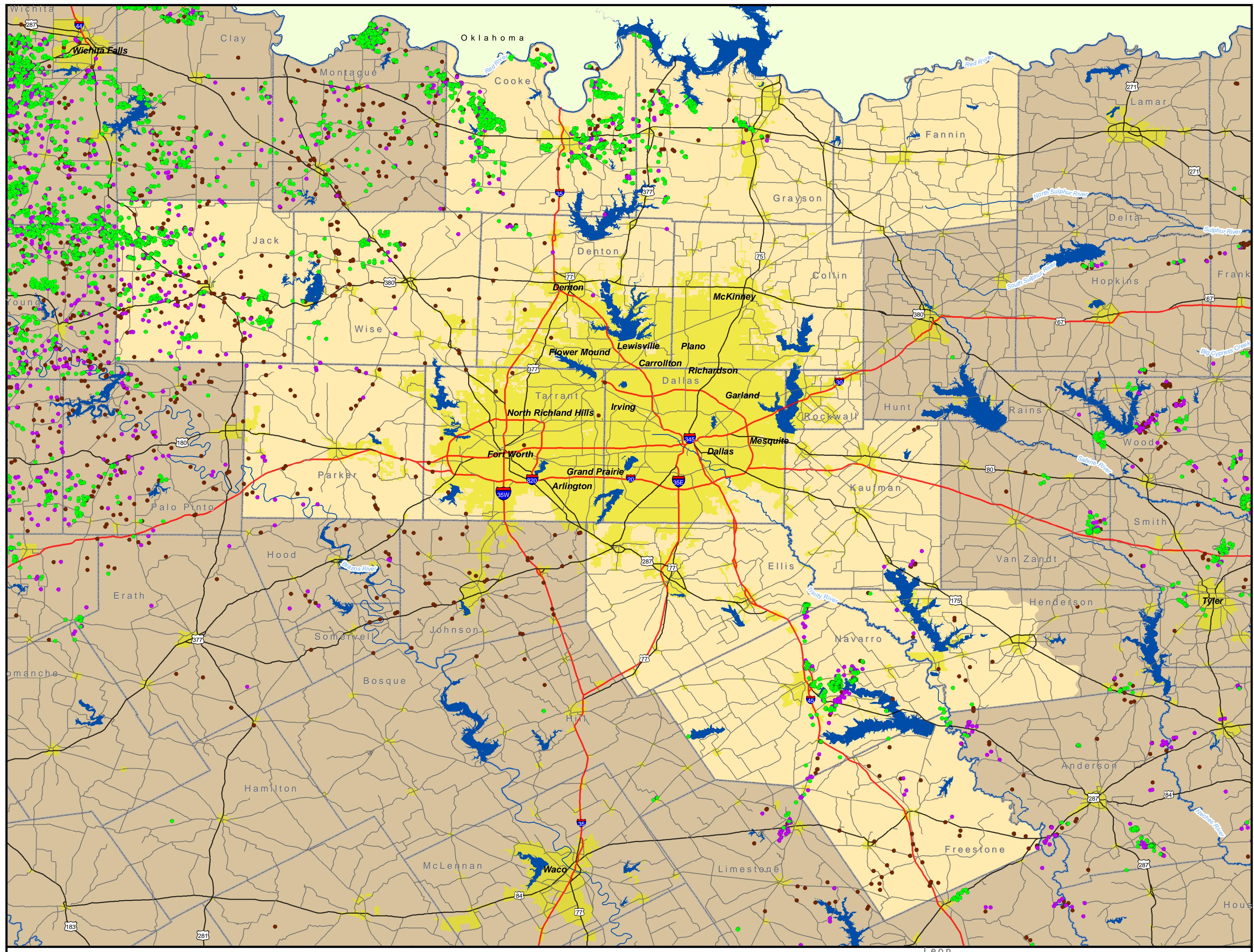
Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



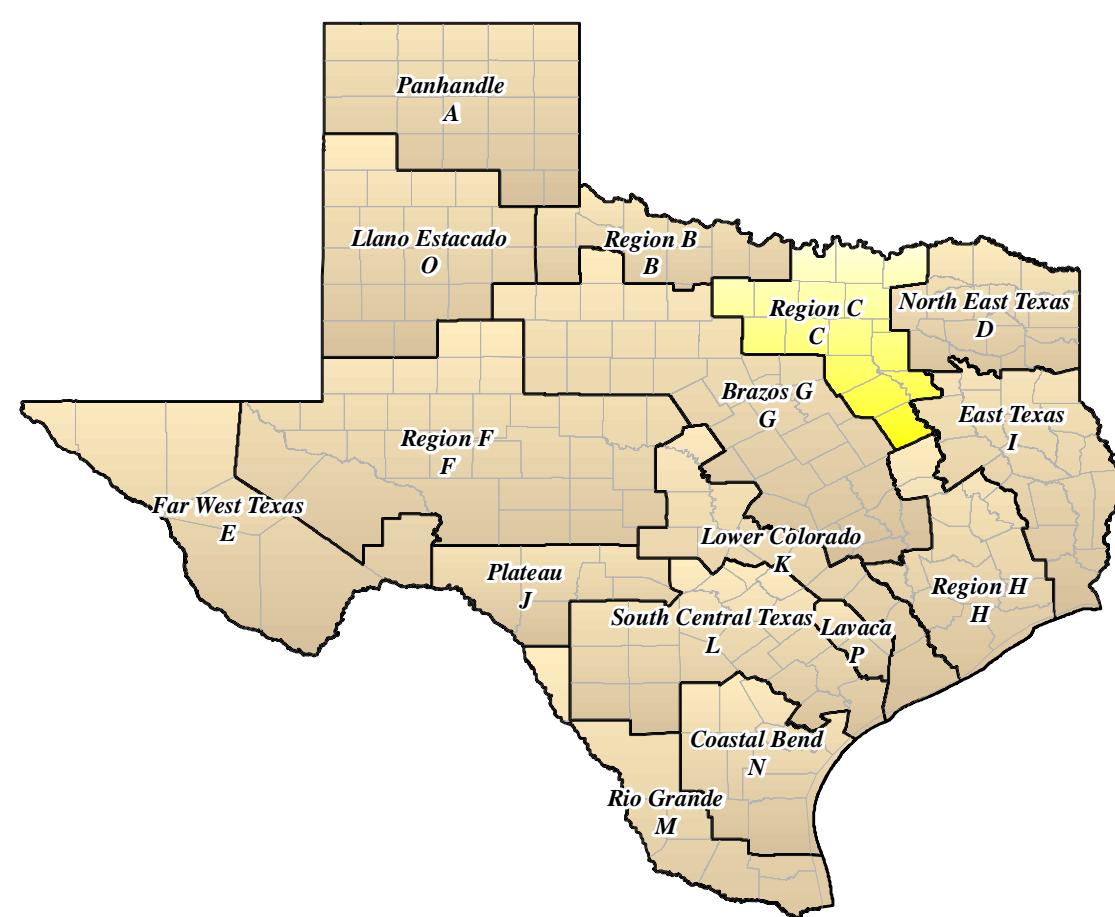






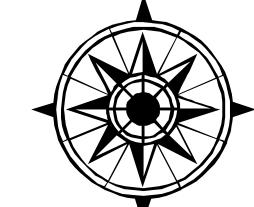
Class II Injection/Disposal Wells with Active Permits

Regional Water Planning Area C:
Region C

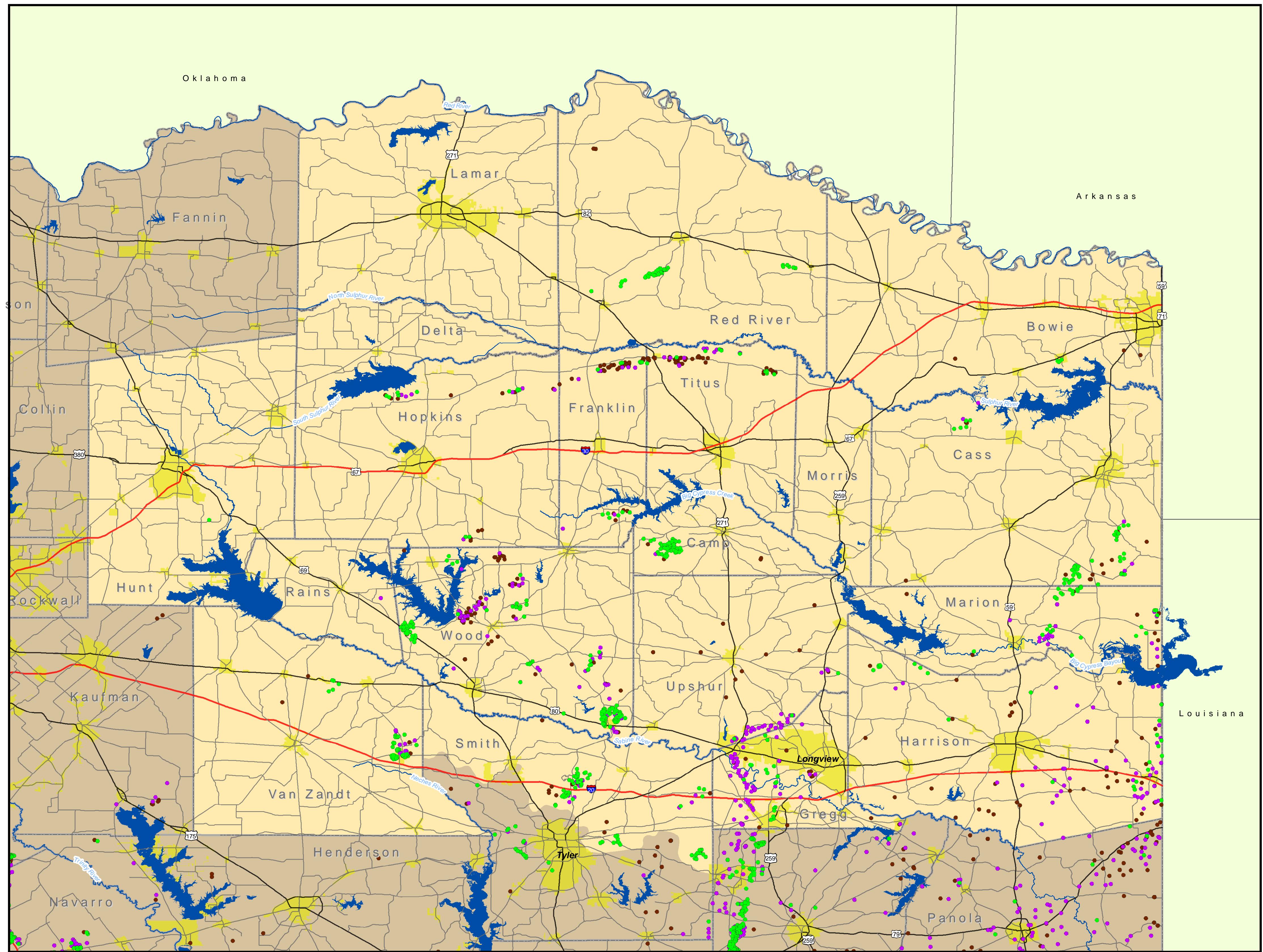


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

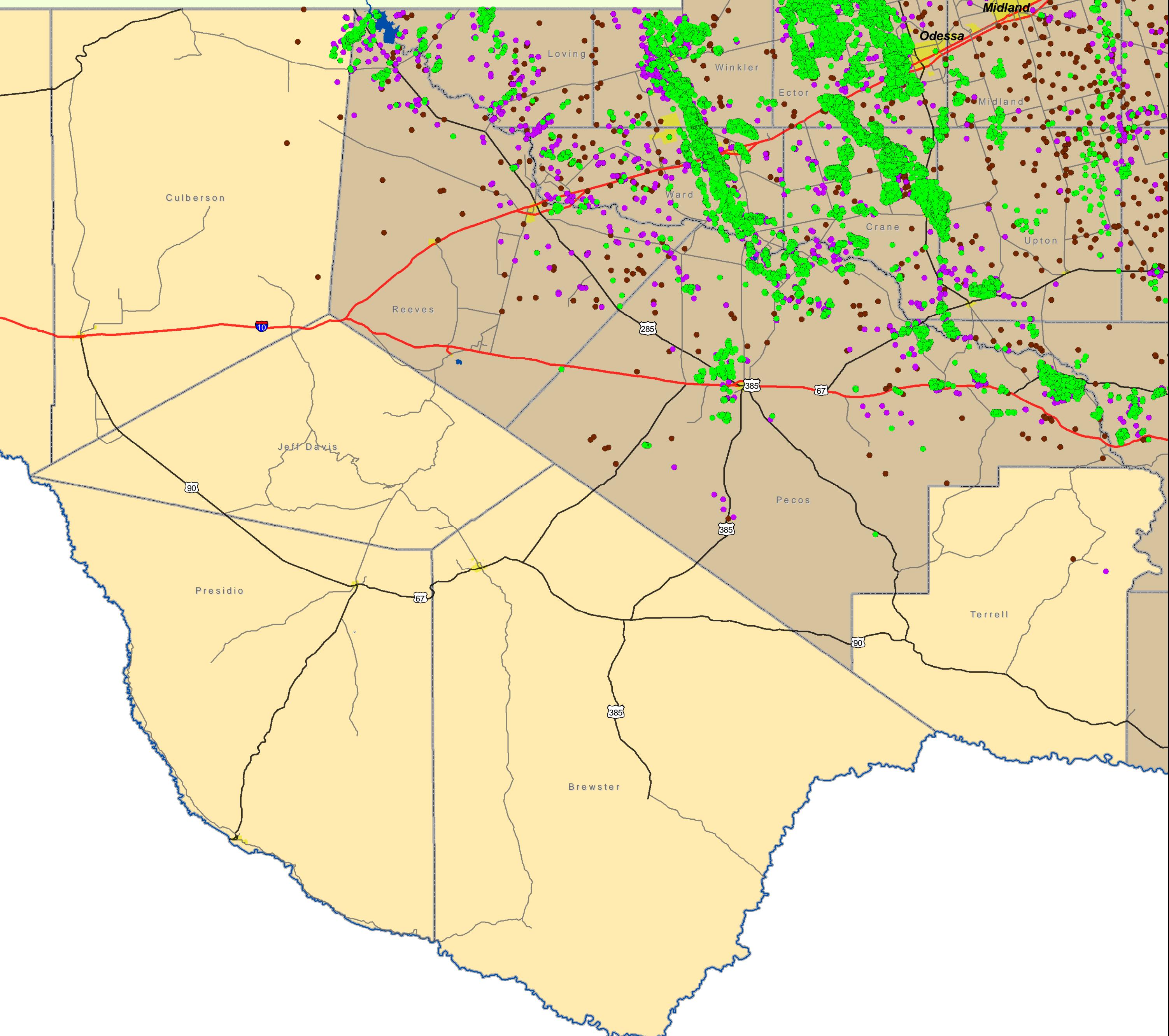
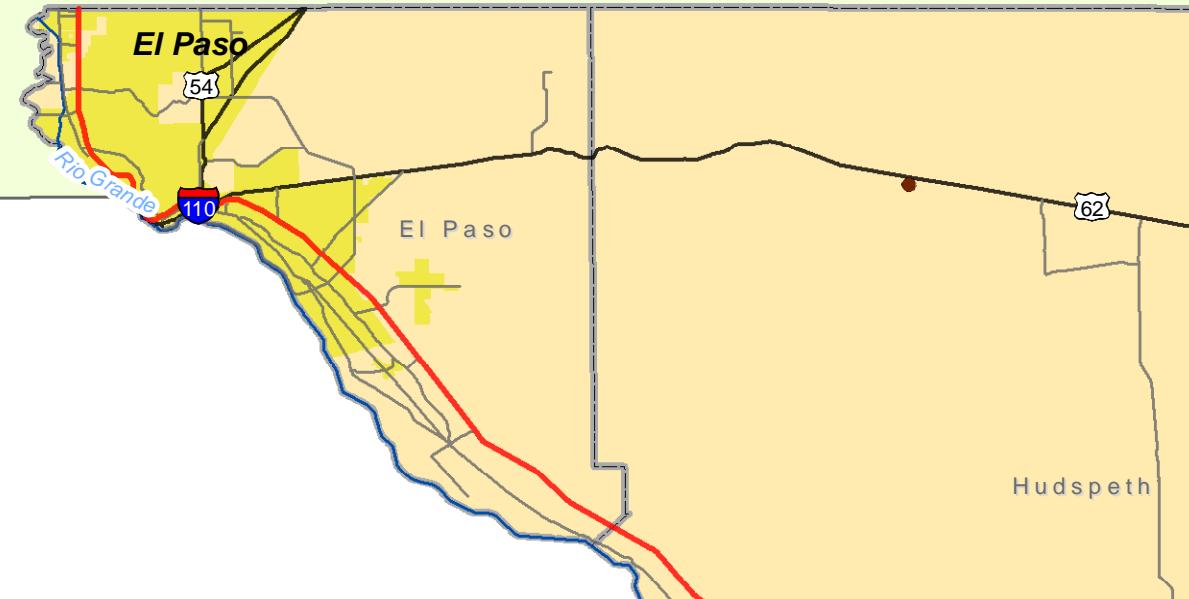
SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles



New Mexico

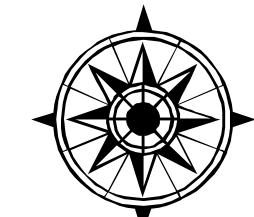
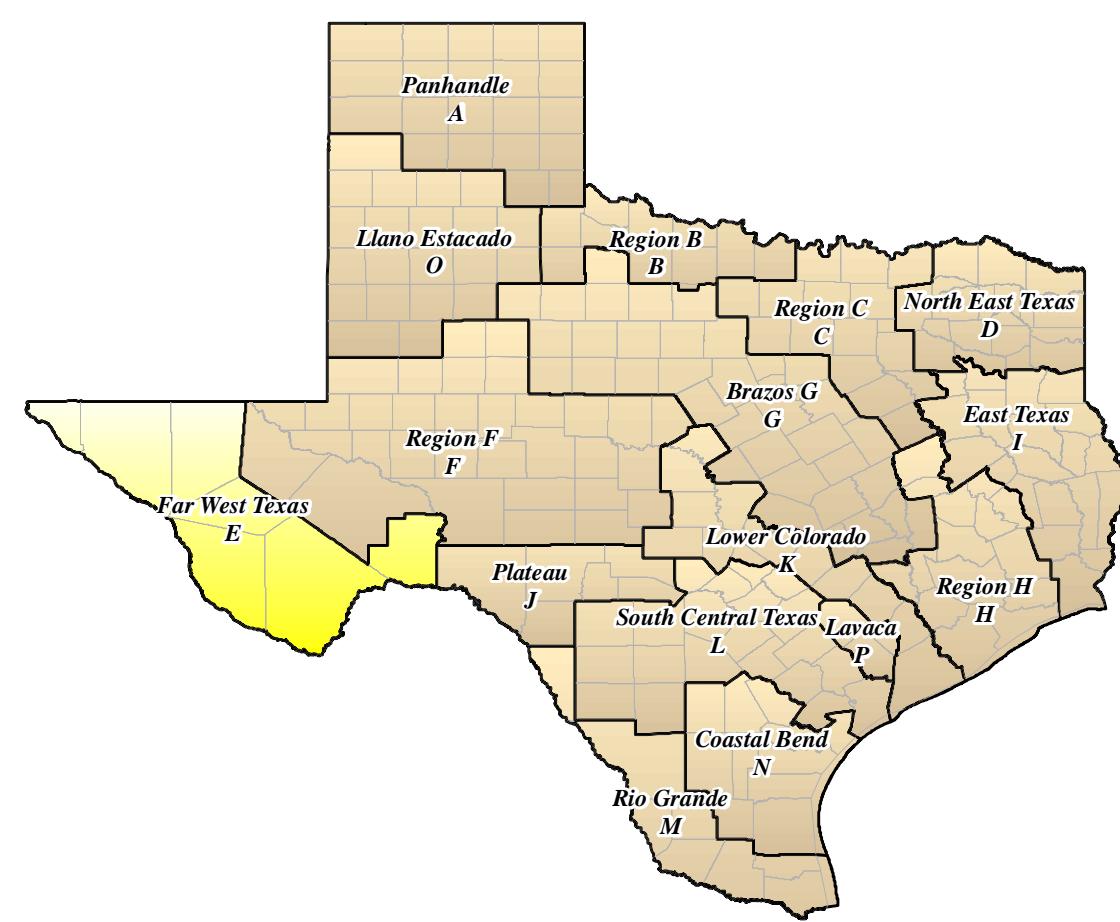


Class II Injection/Disposal Wells with Active Permits

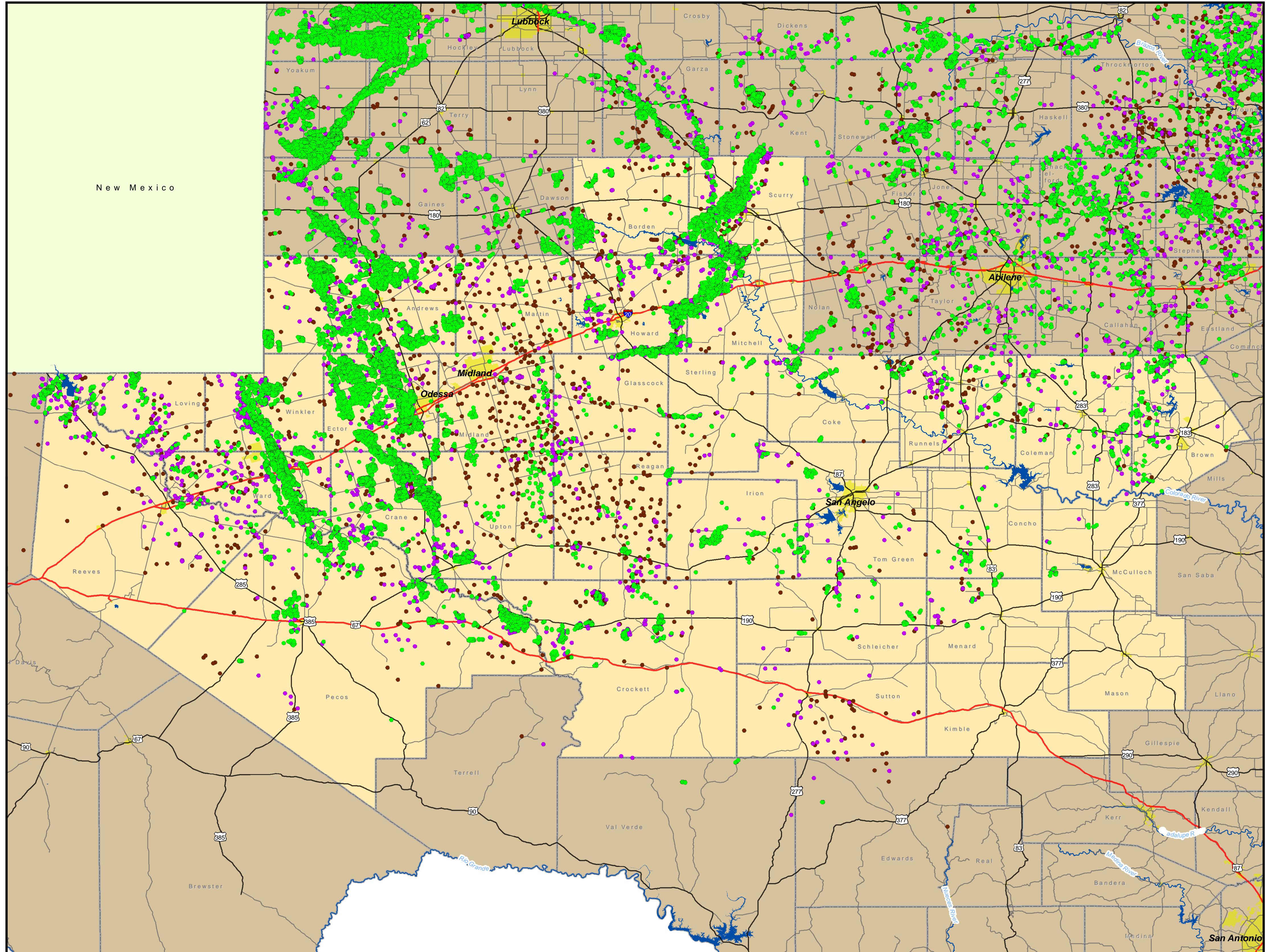
Regional Water Planning Area E:
Far West Texas

- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

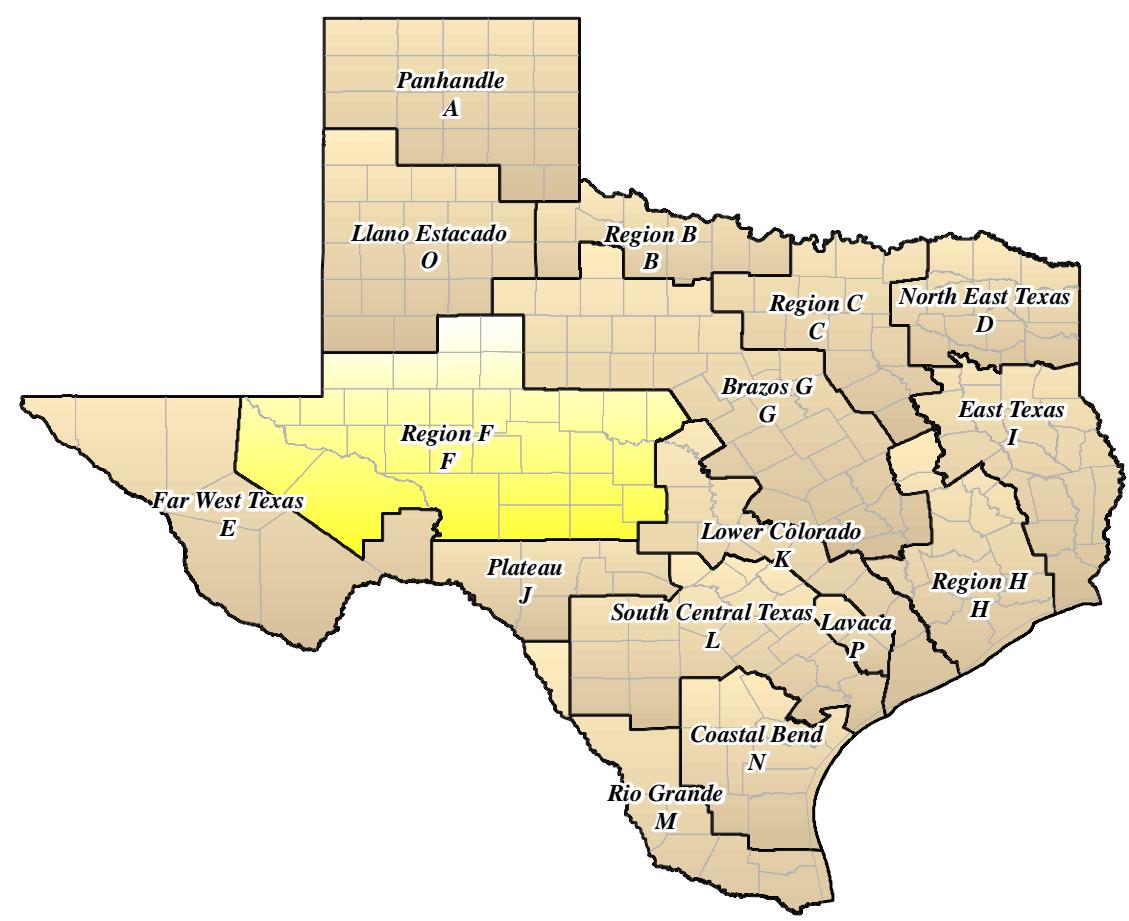


0 5 10 20 30 40 Miles



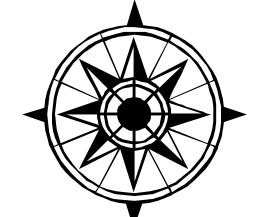
Class II Injection/Disposal Wells with Active Permits

Regional Water Planning Area F:
Region F

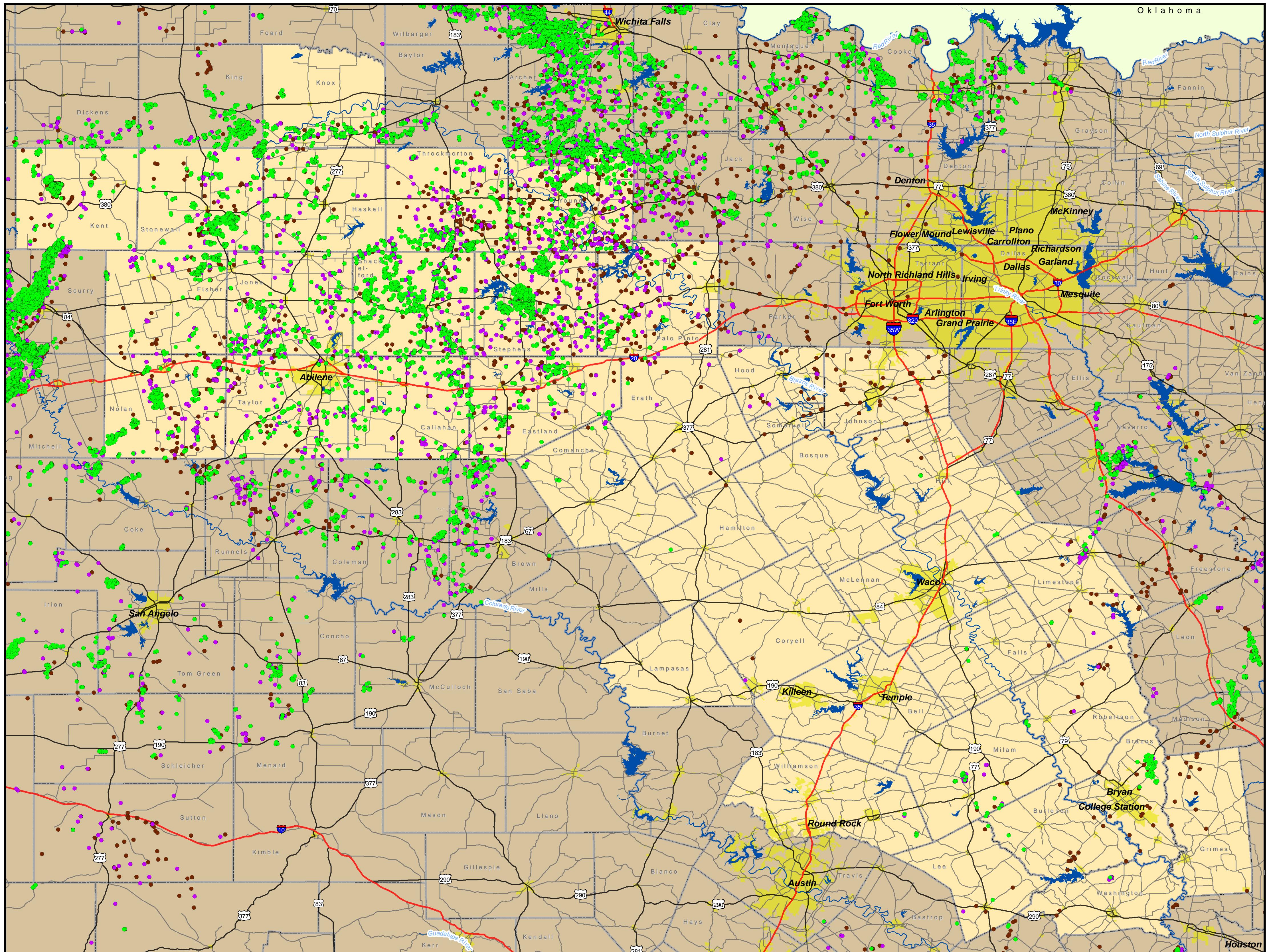


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles

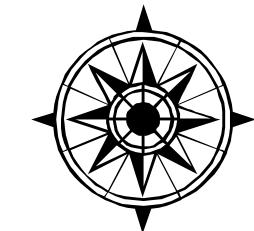
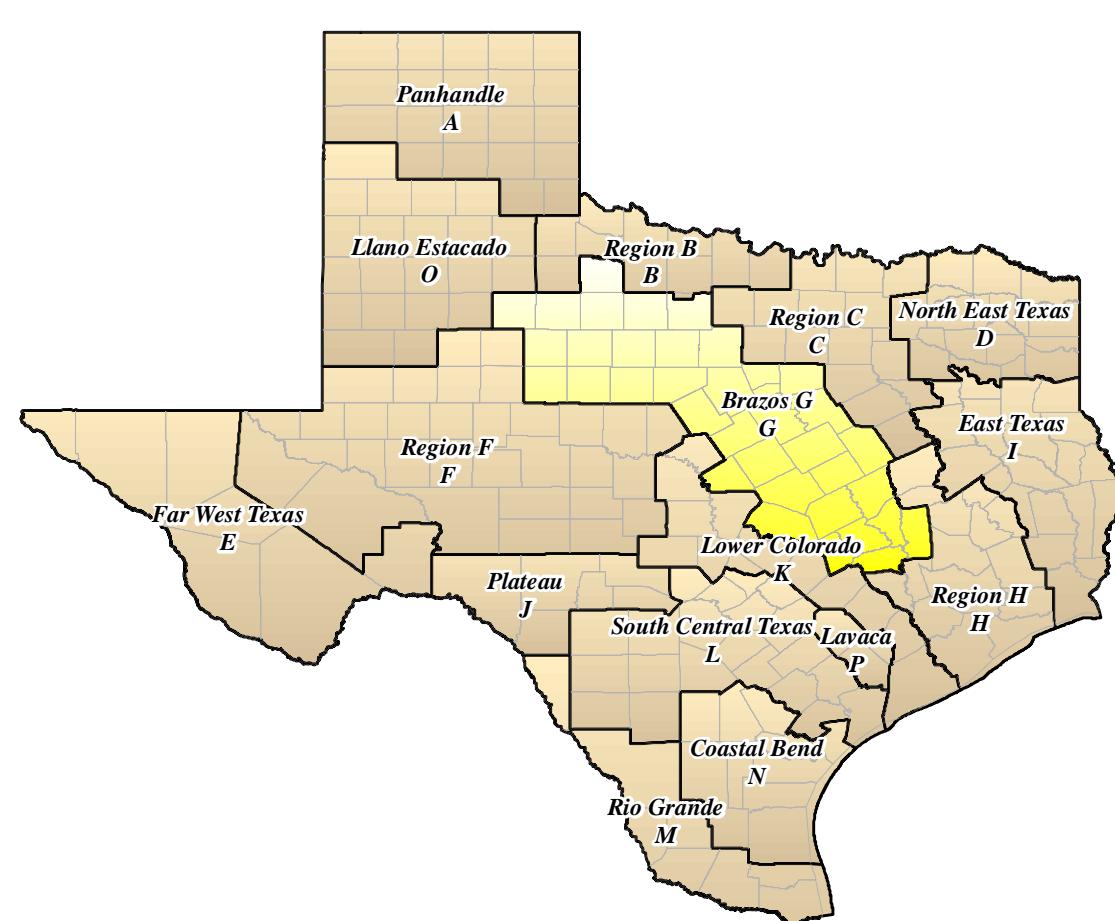


Class II Injection/Disposal Wells with Active Permits

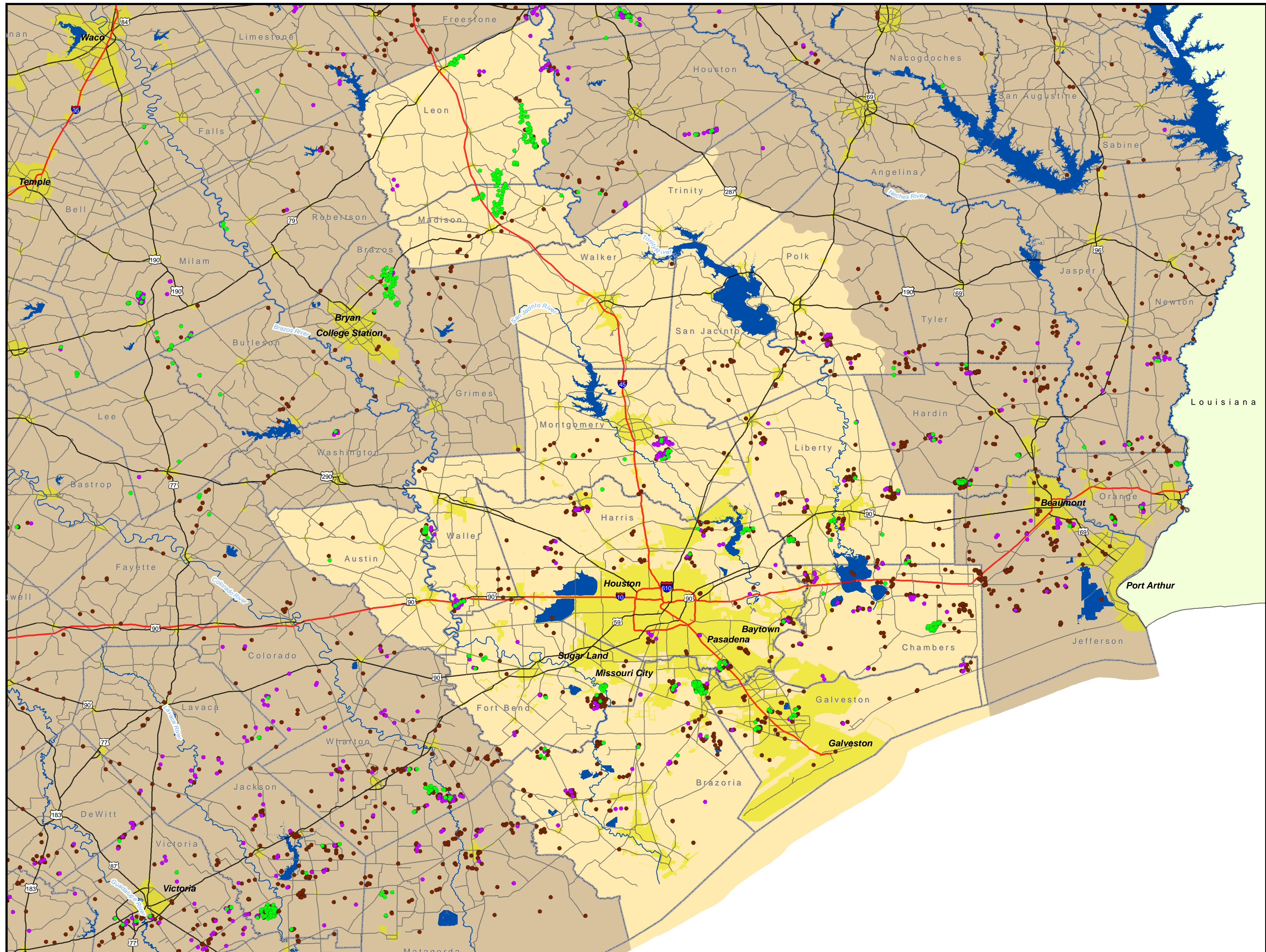
Regional Water Planning Area G:
Brazos

- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

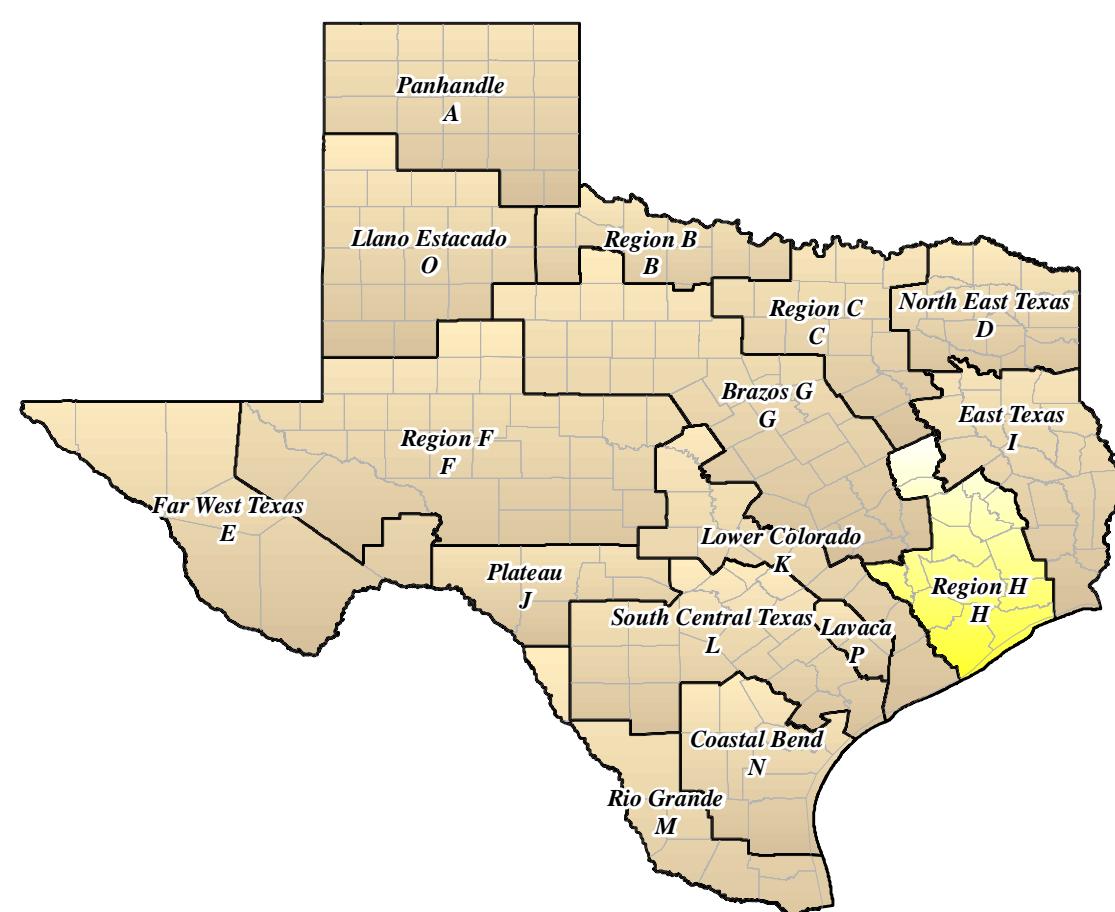


0 5 10 20 30 40 Miles



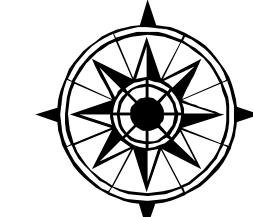
Class II Injection/Disposal Wells with Active Permits

Regional Water Planning Area H:
Region H

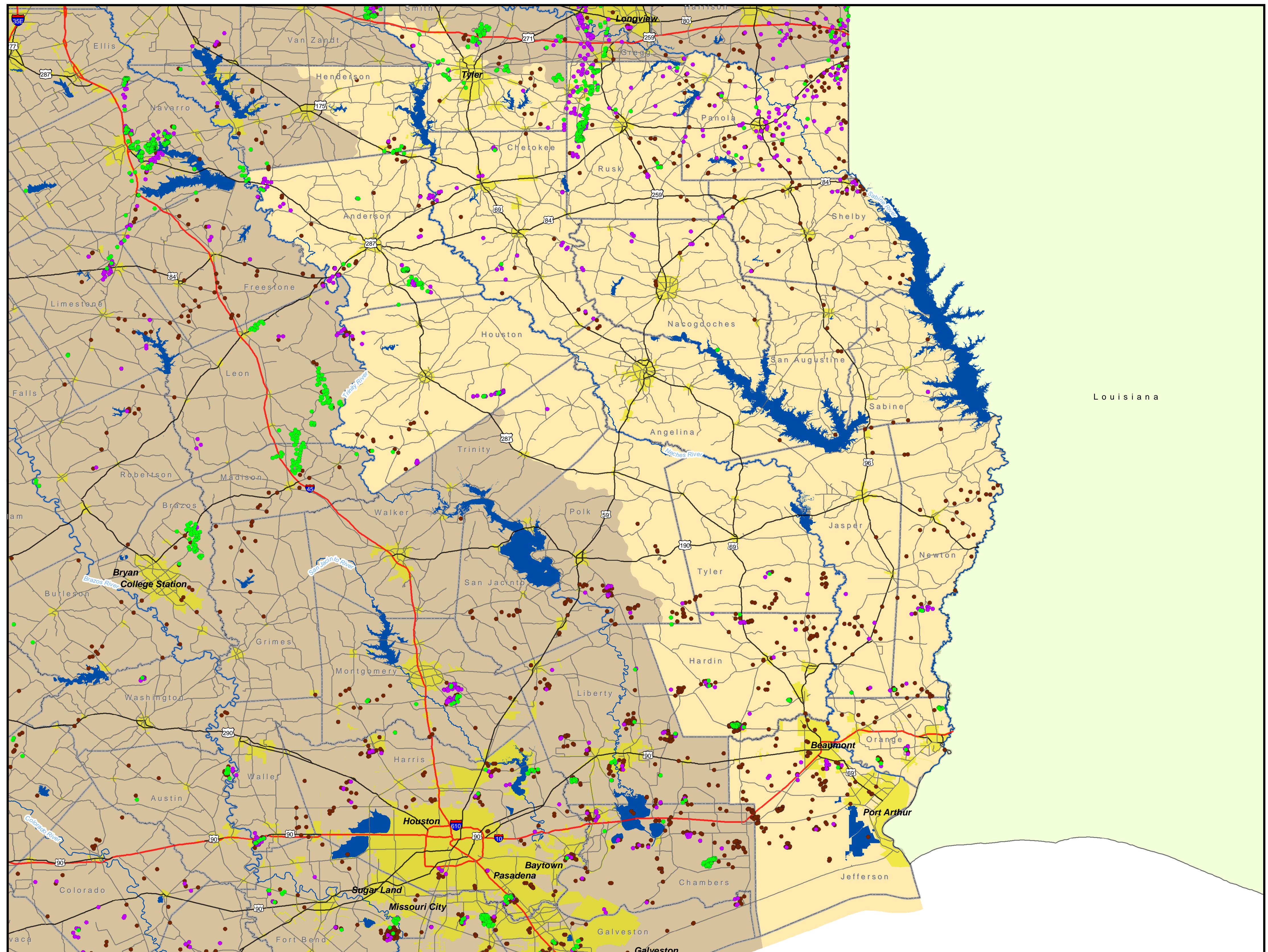


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles

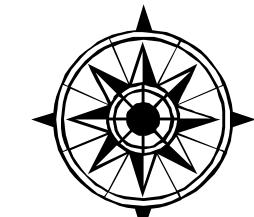


Class II Injection/Disposal Wells with Active Permits

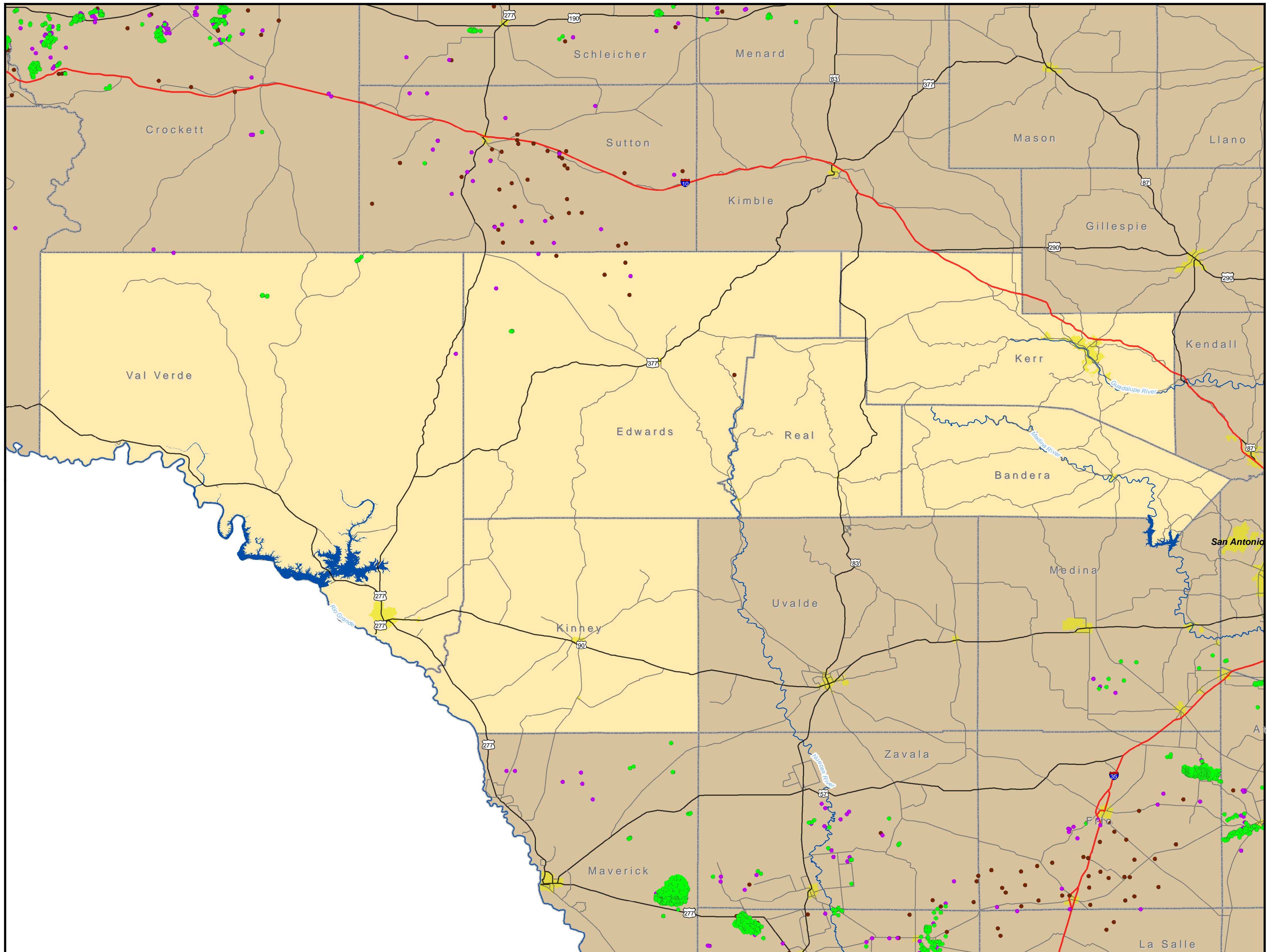
Regional Water Planning Area I: East Texas

- Type 3 Enhanced Recovery
 - Type 2 Productive Zone
 - Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

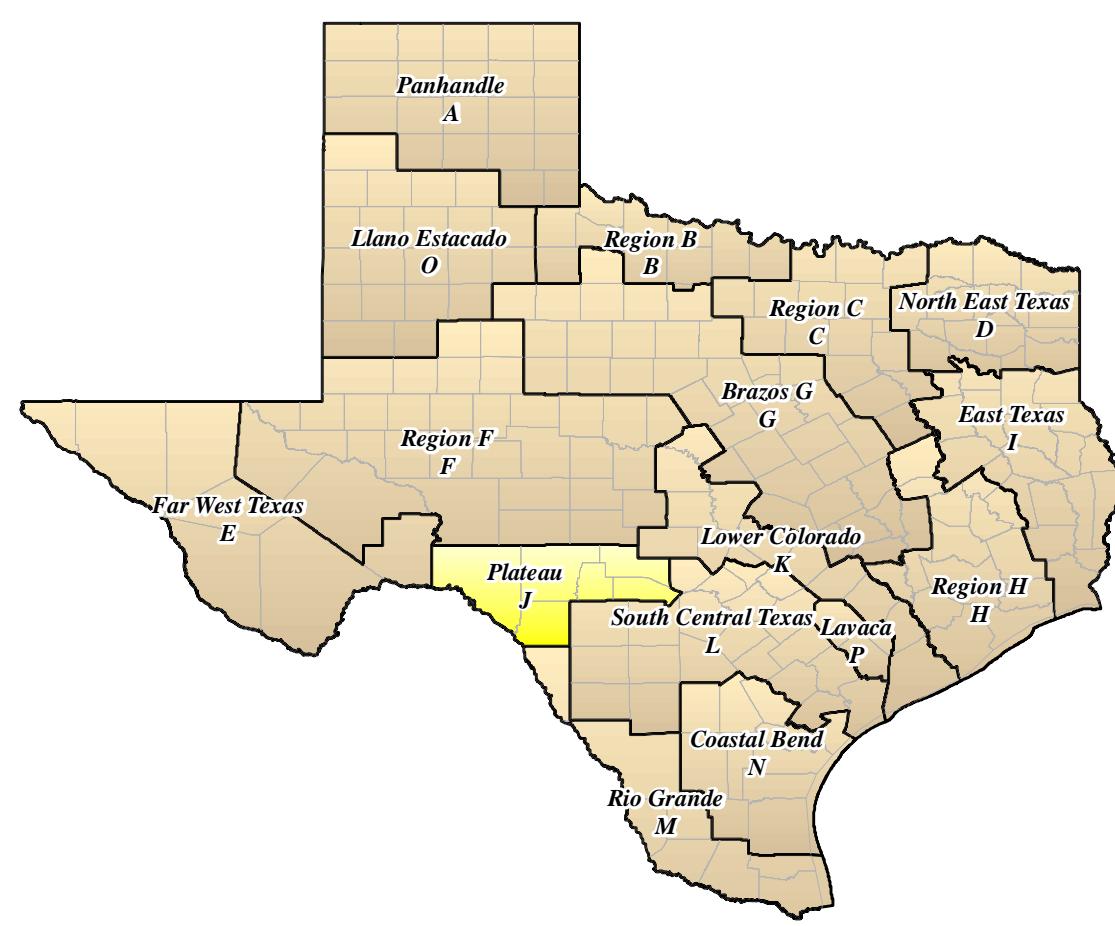


A horizontal number line representing distance in miles. The line starts at 0 and ends at 40, with major tick marks every 5 units. Below the line, there are six empty rectangular boxes. The first five boxes are aligned under the numbers 0 through 4 respectively. The sixth box is aligned under the number 20.



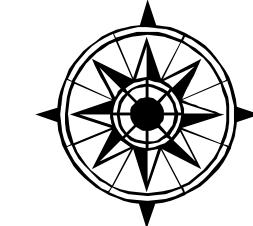
Class II Injection/Disposal Wells with Active Permits

**Regional Water Planning Area J:
Plateau**

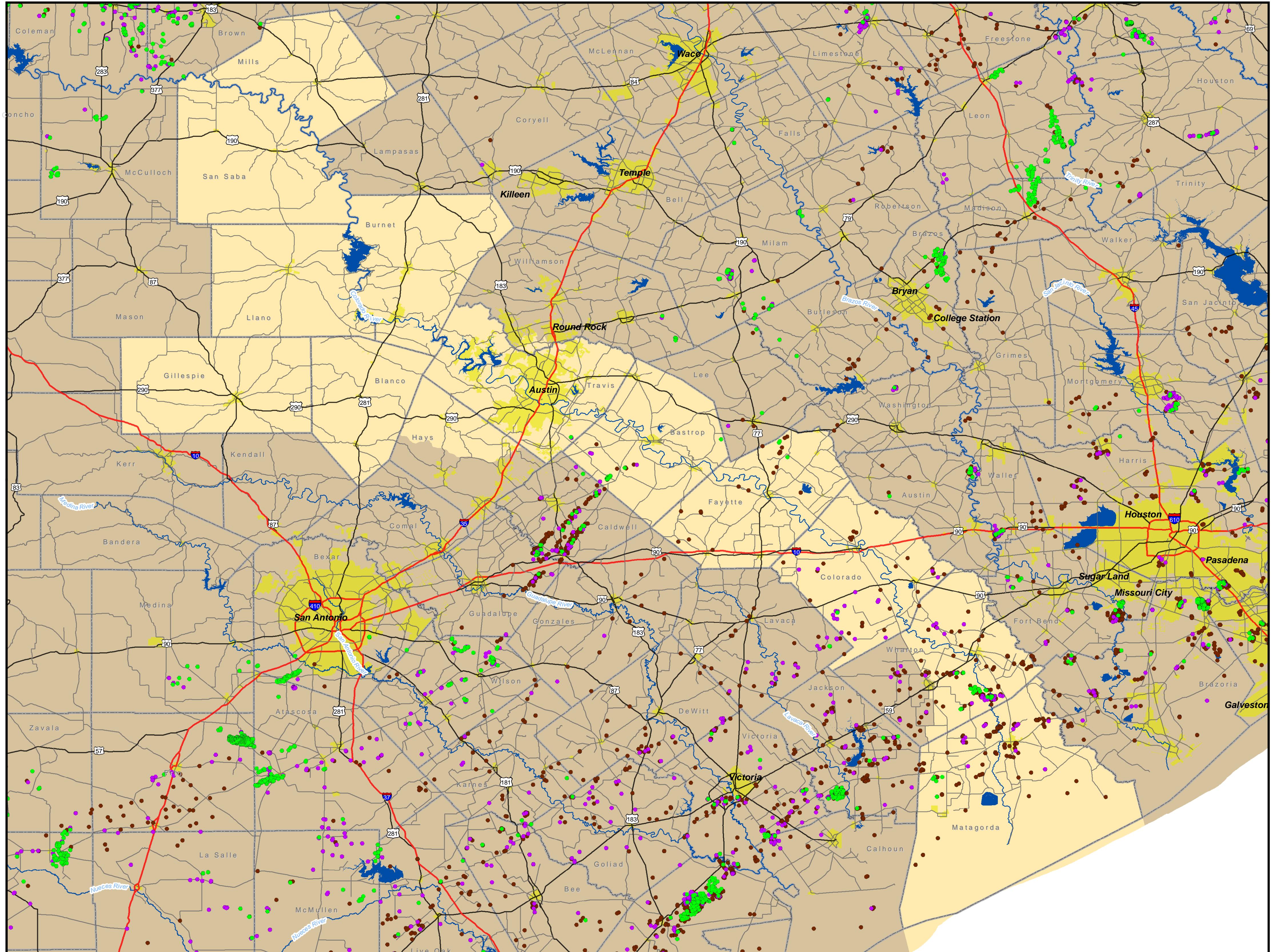


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles

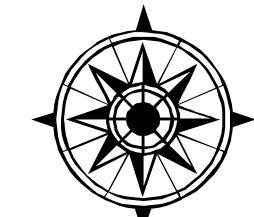
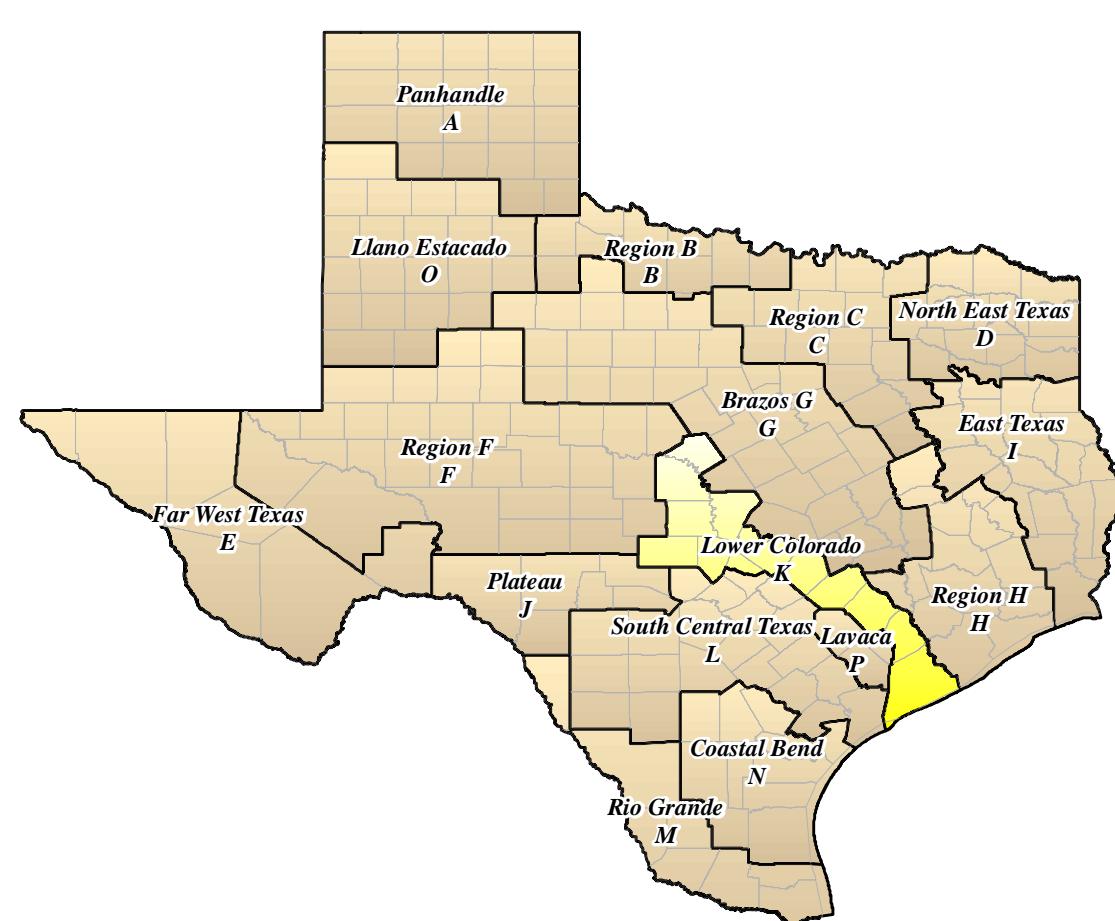


Class II Injection/Disposal Wells with Active Permits

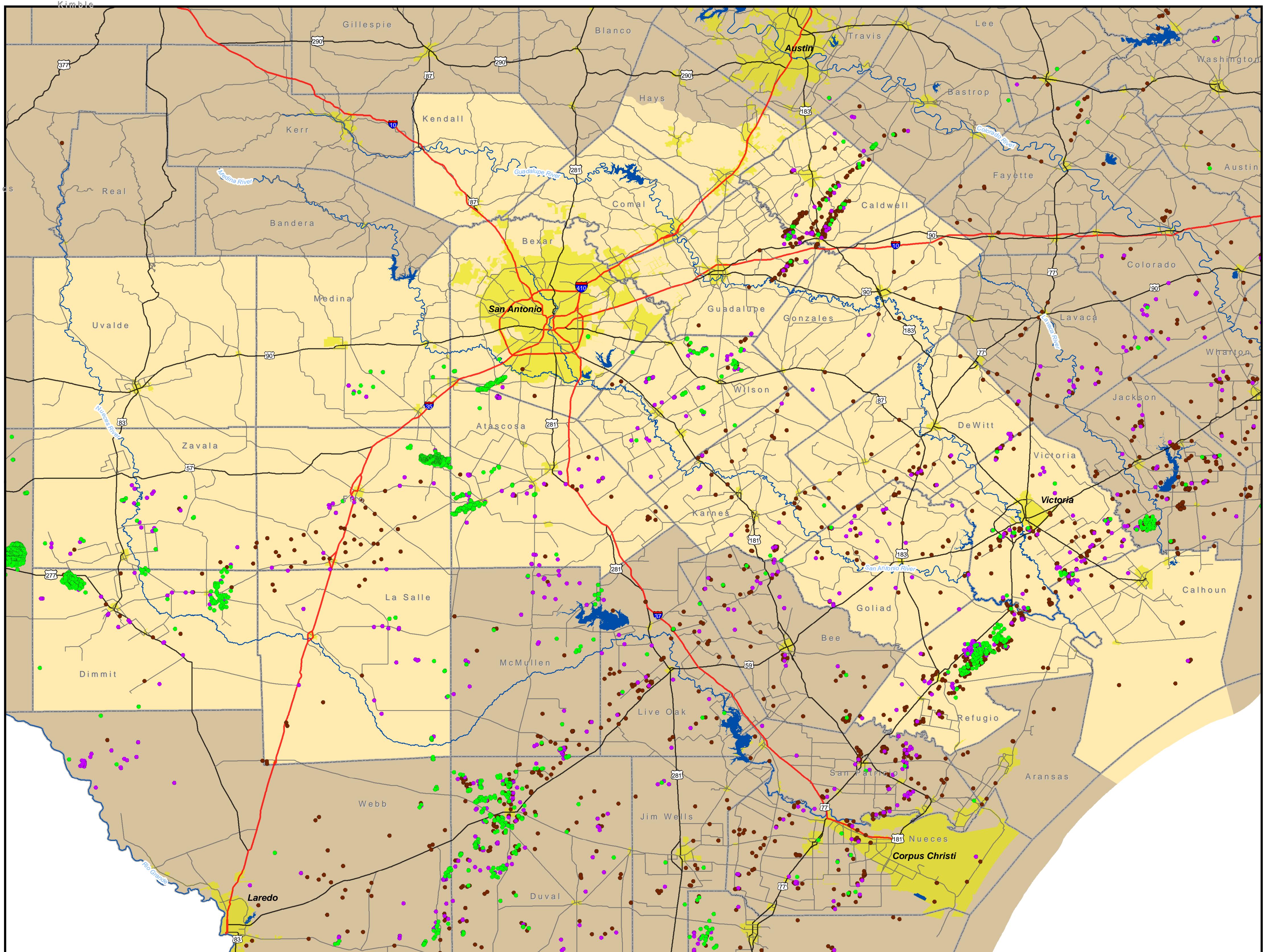
**Regional Water Planning Area K:
Lower Colorado**

- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

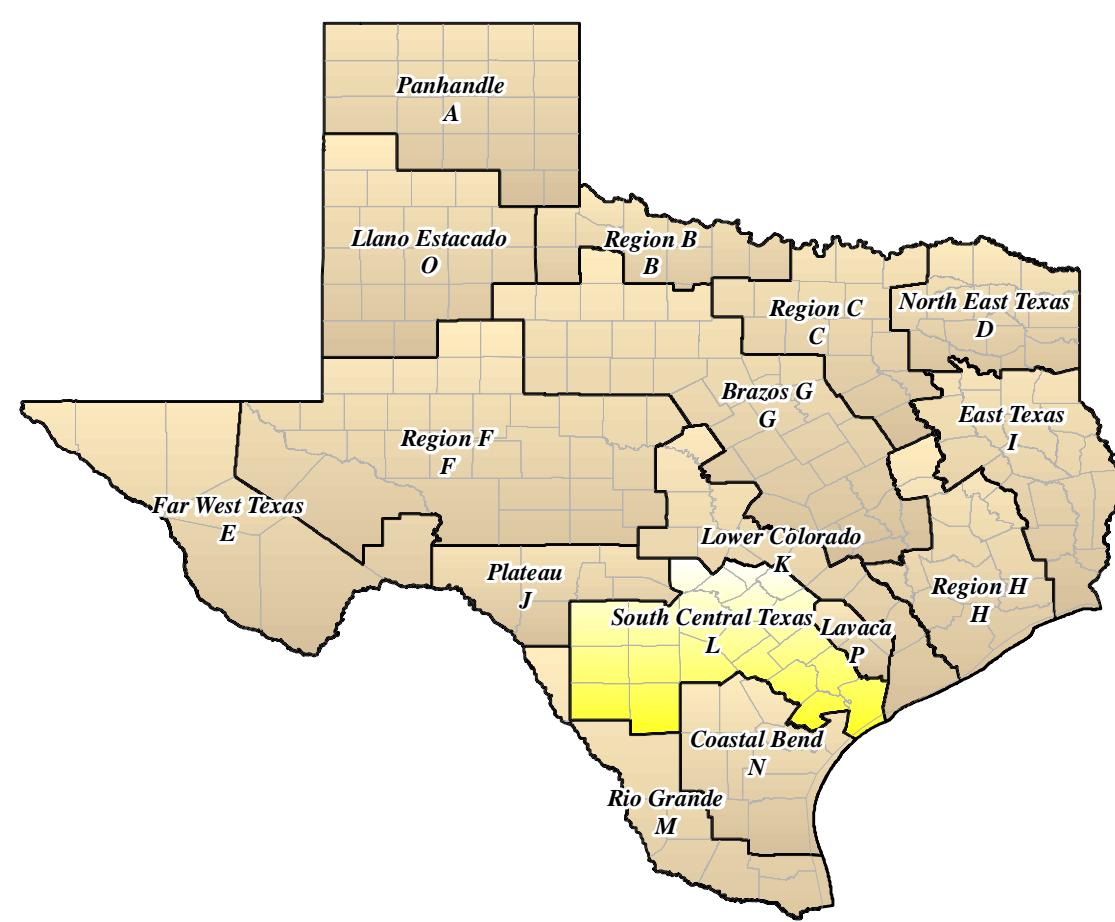


0 5 10 20 30 40 Miles



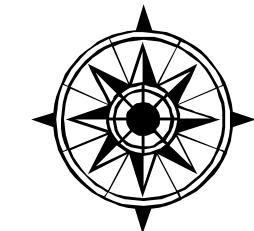
Class II Injection/Disposal Wells with Active Permits

**Regional Water Planning Area L:
South Central Texas**

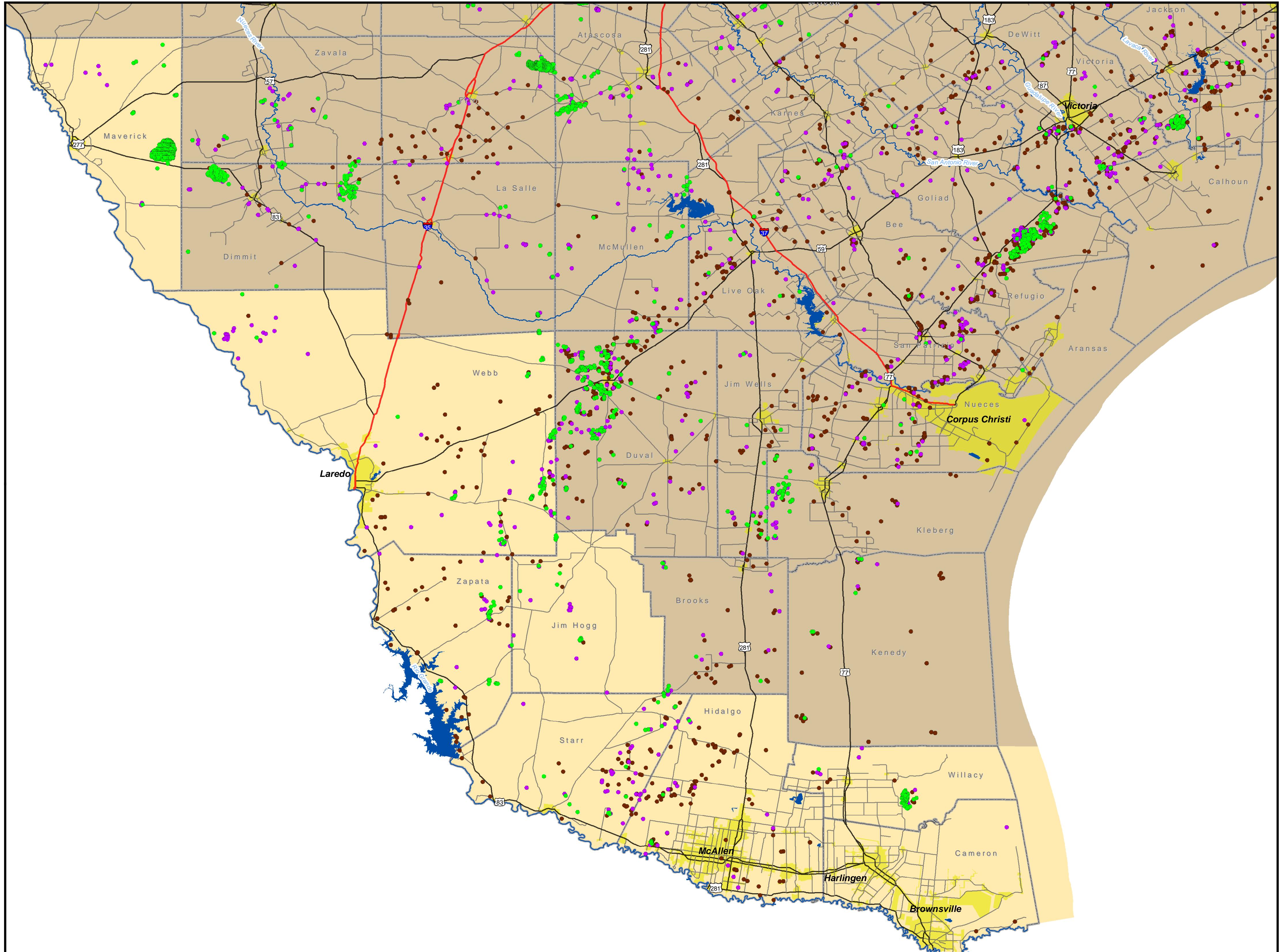


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

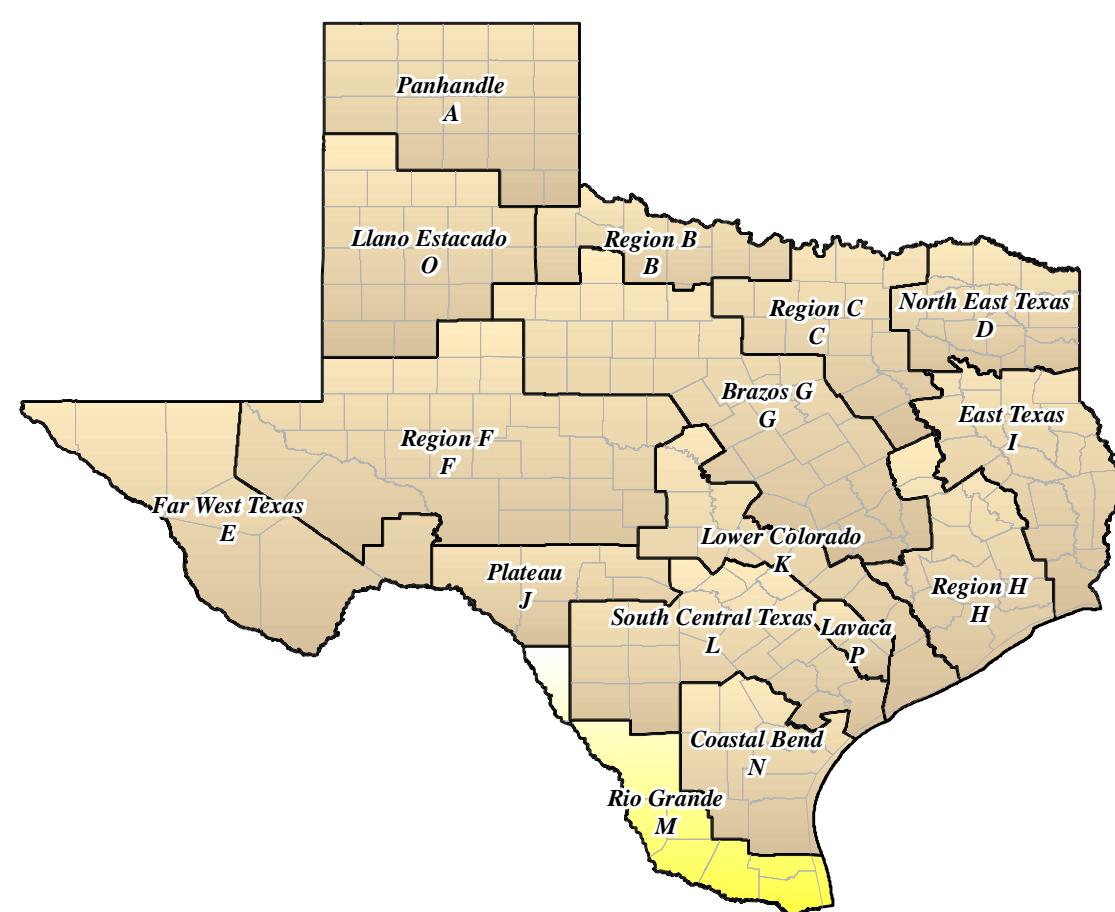


0 5 10 20 30 40 Miles



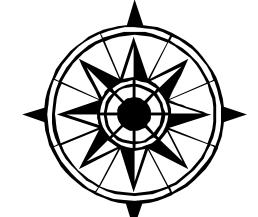
Class II Injection/Disposal Wells with Active Permits

Regional Water Planning Area M: Rio Grande

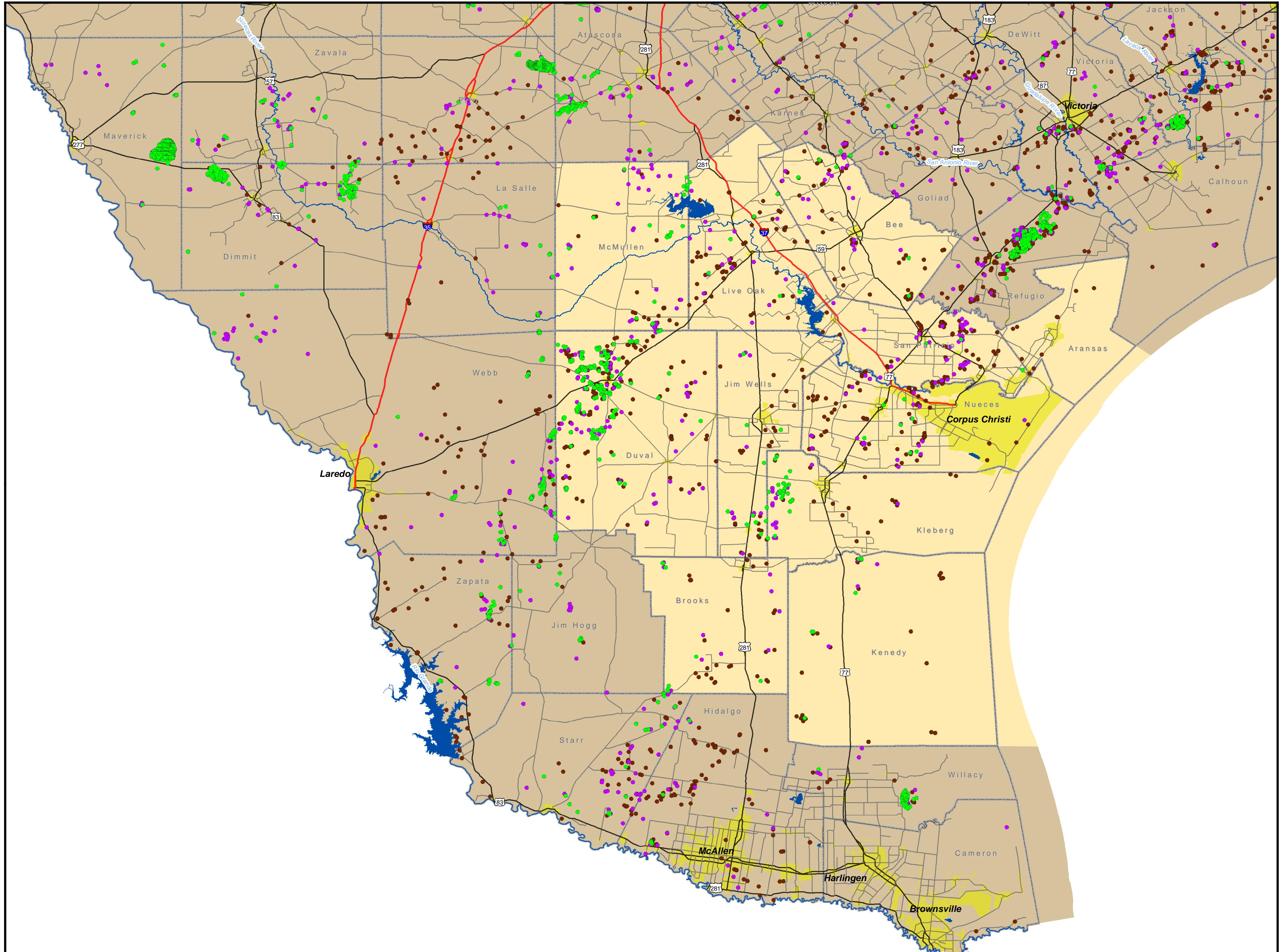


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

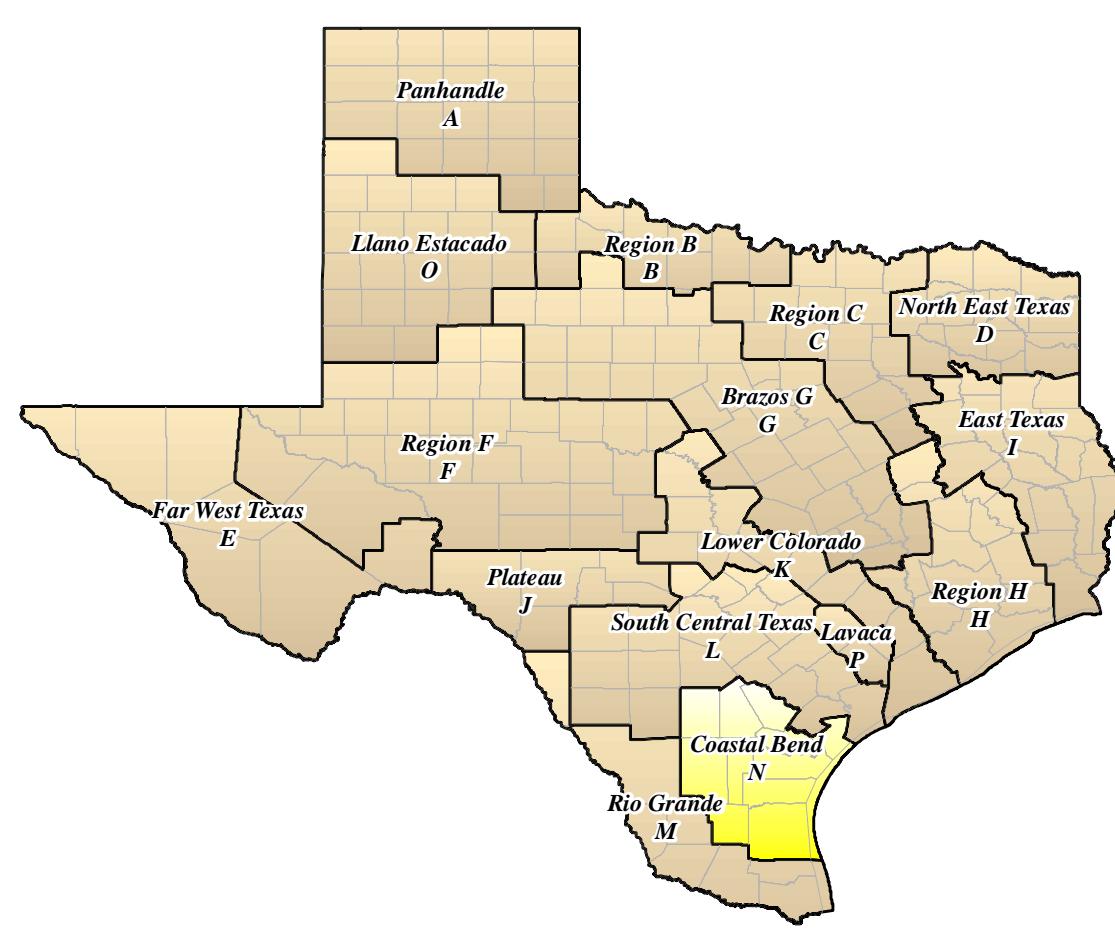


0 5 10 20 30 40 Miles



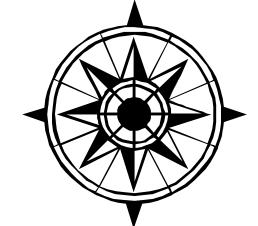
Class II Injection/Disposal Wells with Active Permits

**Regional Water Planning Area N:
Coastal Bend**

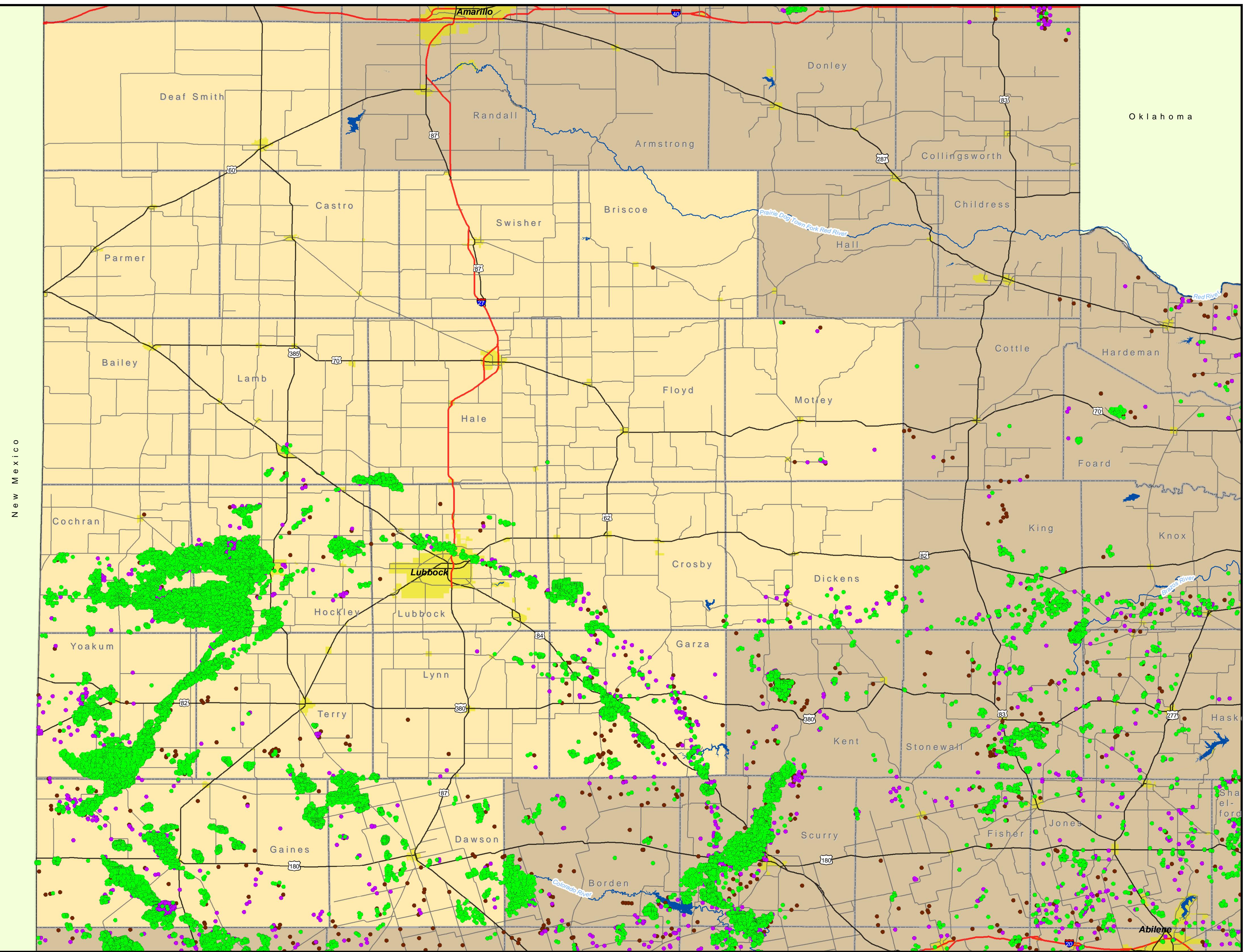


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

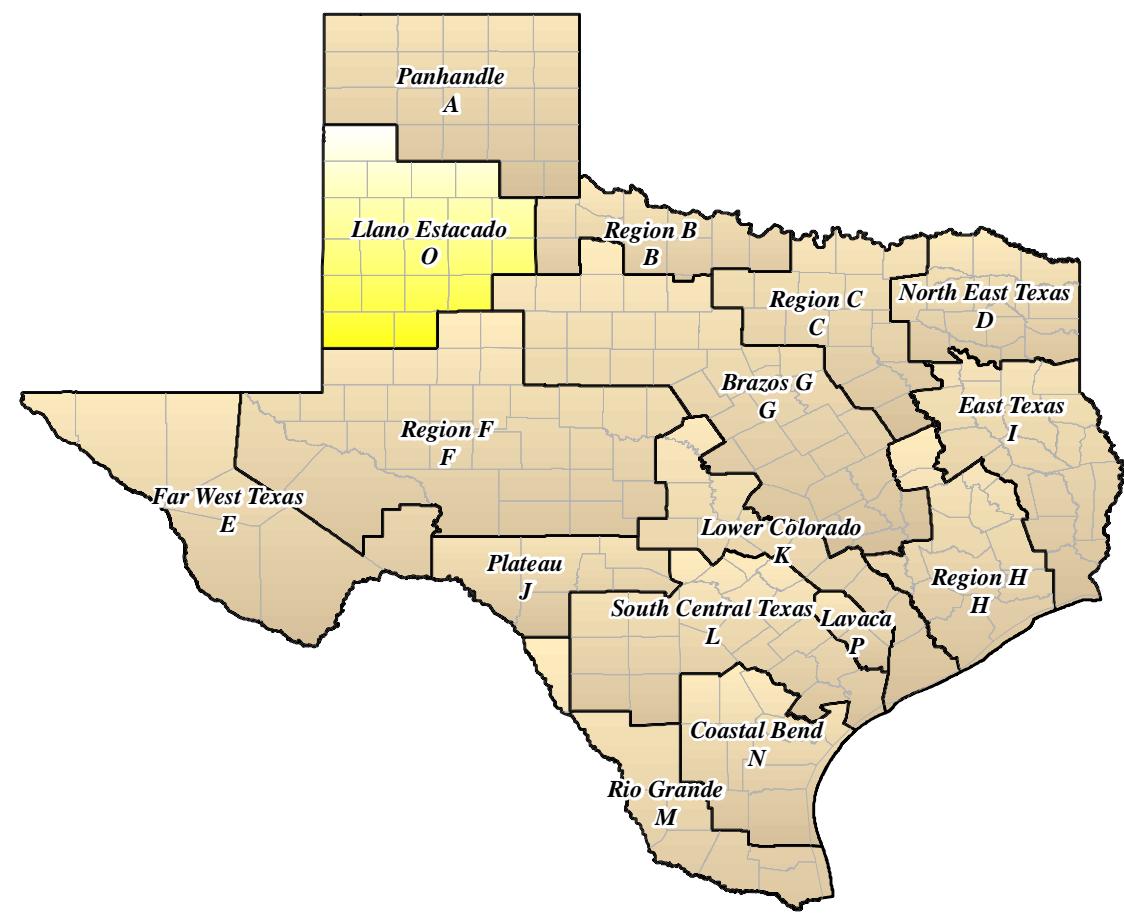


0 5 10 20 30 40 Miles



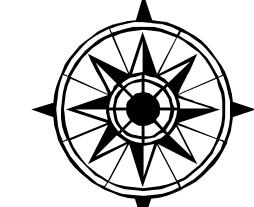
Class II Injection/Disposal Wells with Active Permits

Regional Water Planning Area O:
Llano Estacado

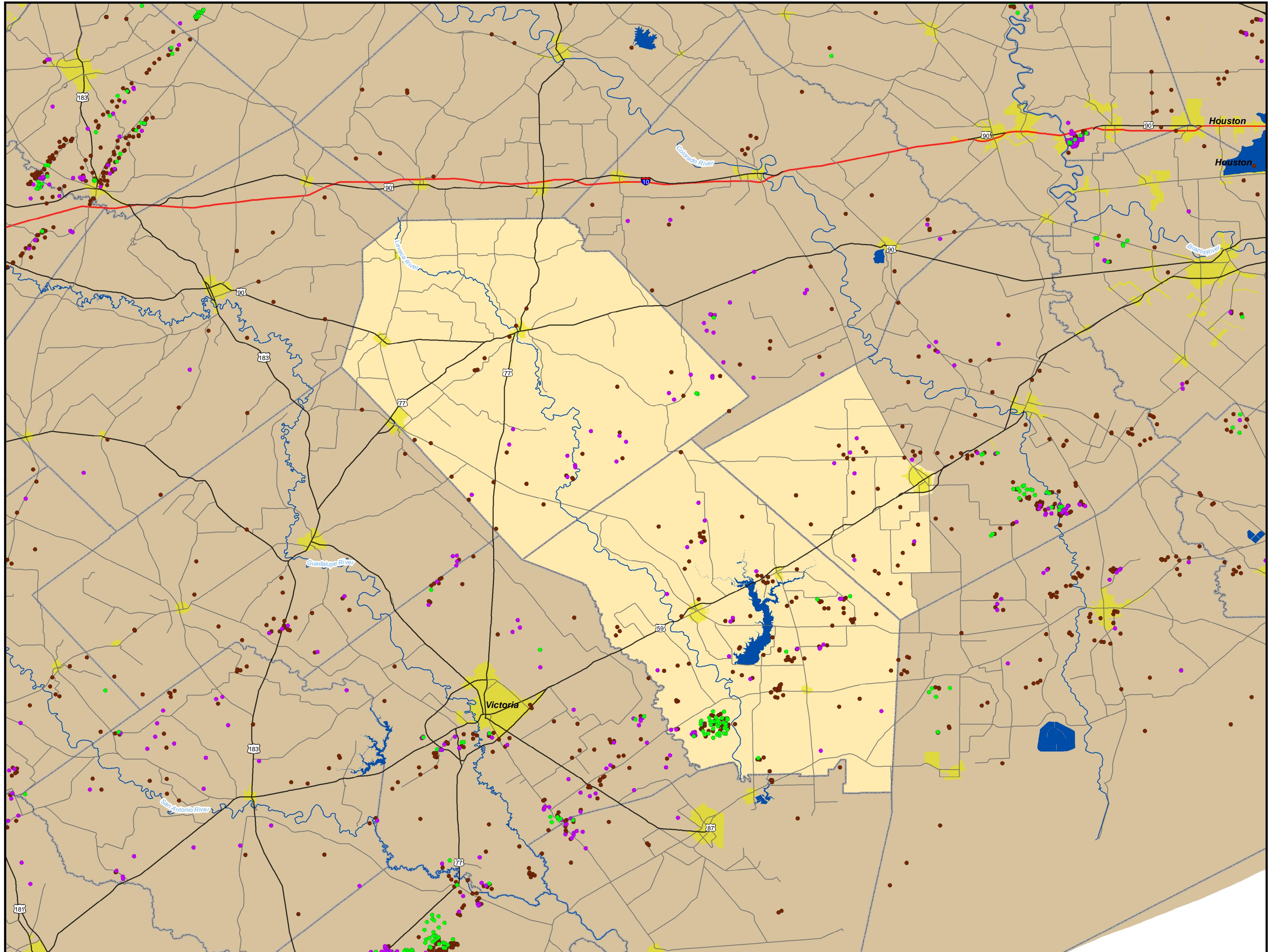


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles



Class II Injection/Disposal Wells with Active Permits

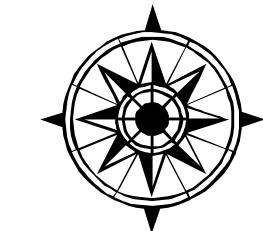
Regional Water Planning Area P:
Lavaca

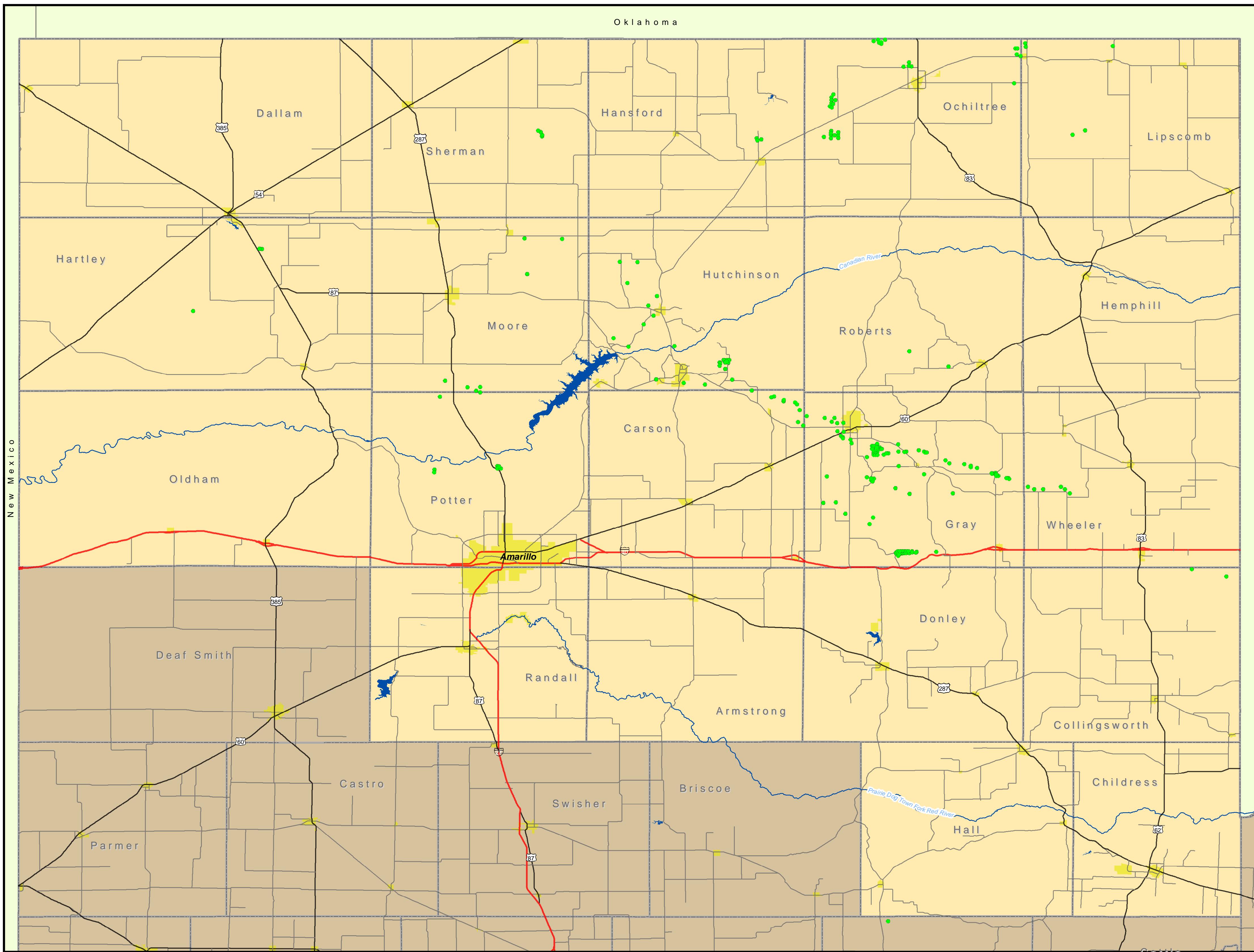


- Type 3 Enhanced Recovery
- Type 2 Productive Zone
- Type 1 Non-Productive Zone

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

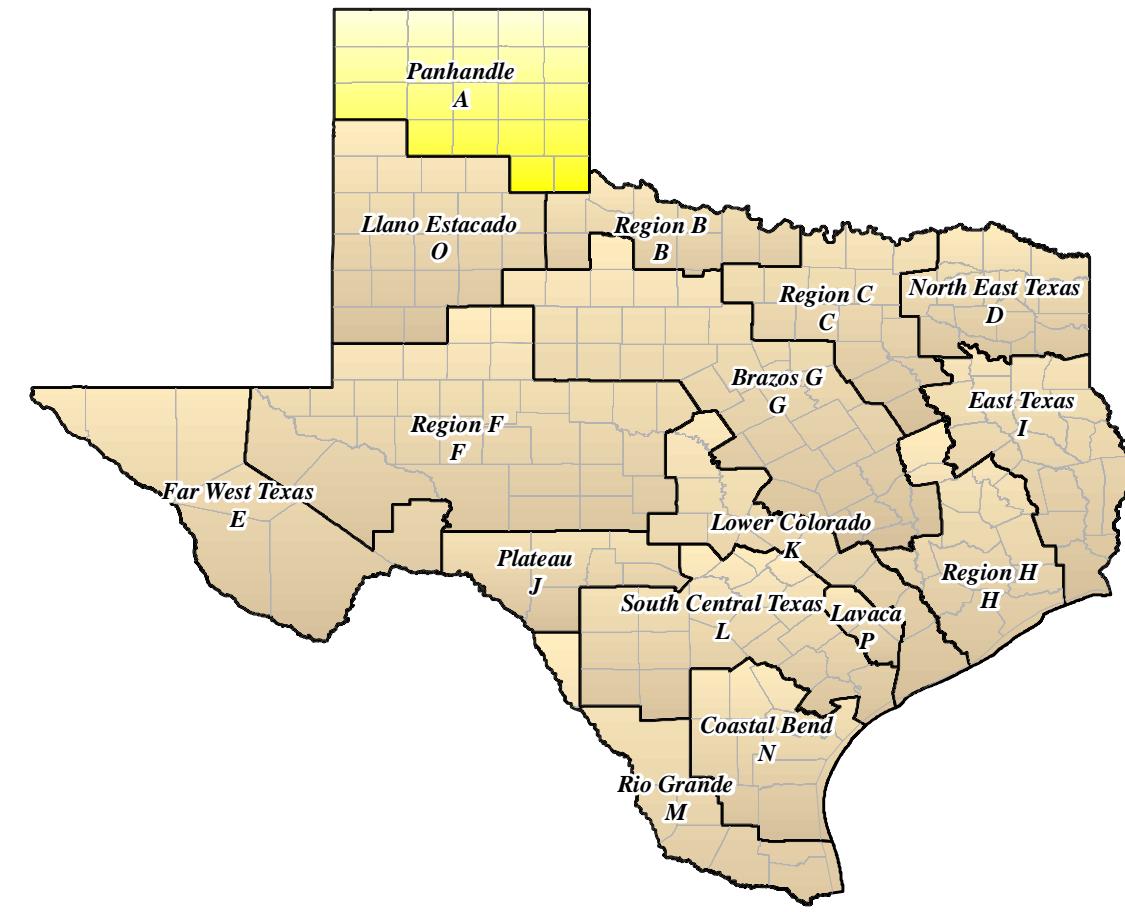
0 5 10 20 30 40 Miles





Class II, Type 3 Active Injection Wells

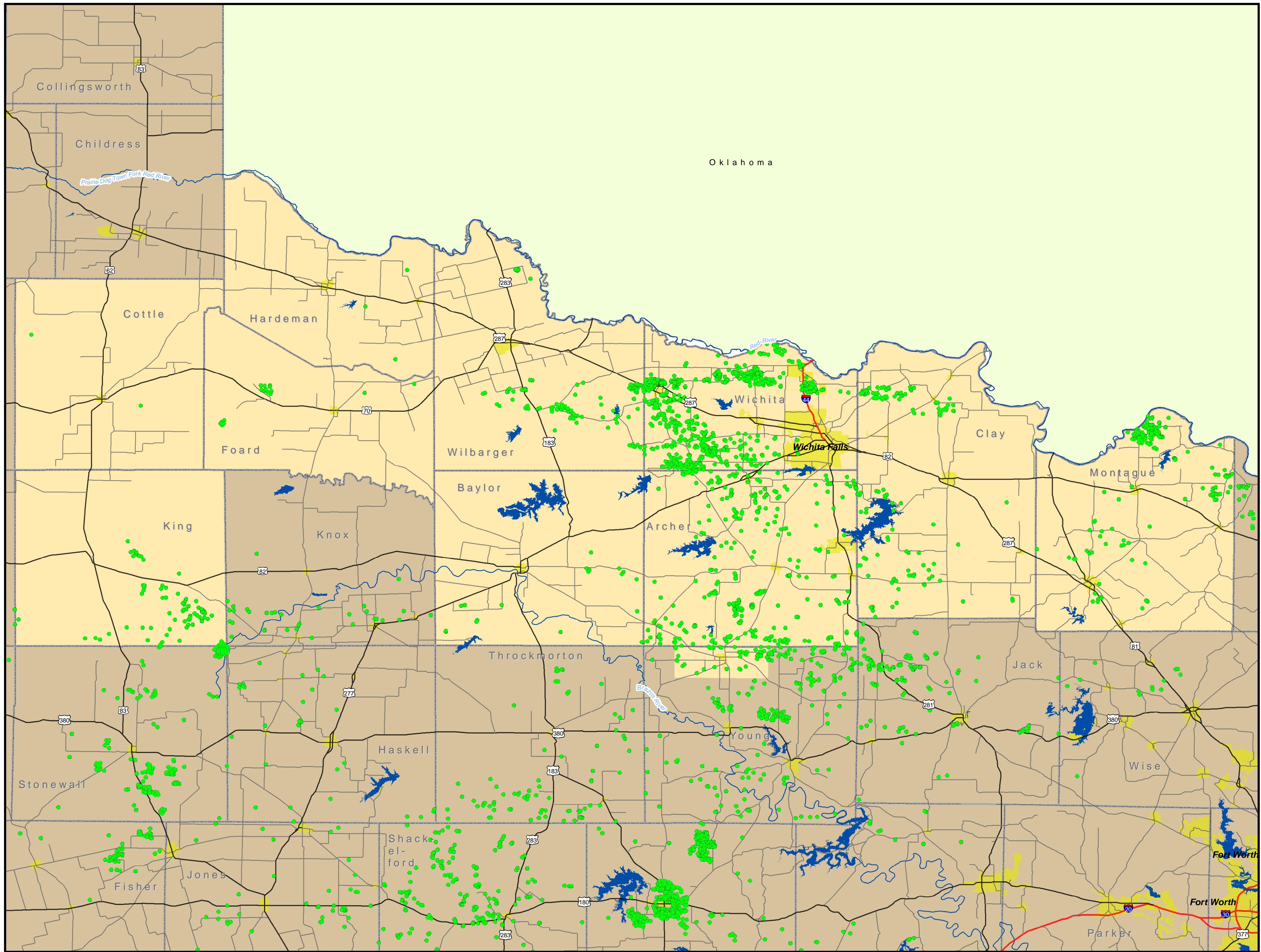
**Regional Water Planning Area A:
Panhandle Region**



- Active Type 3 Enhanced Recovery

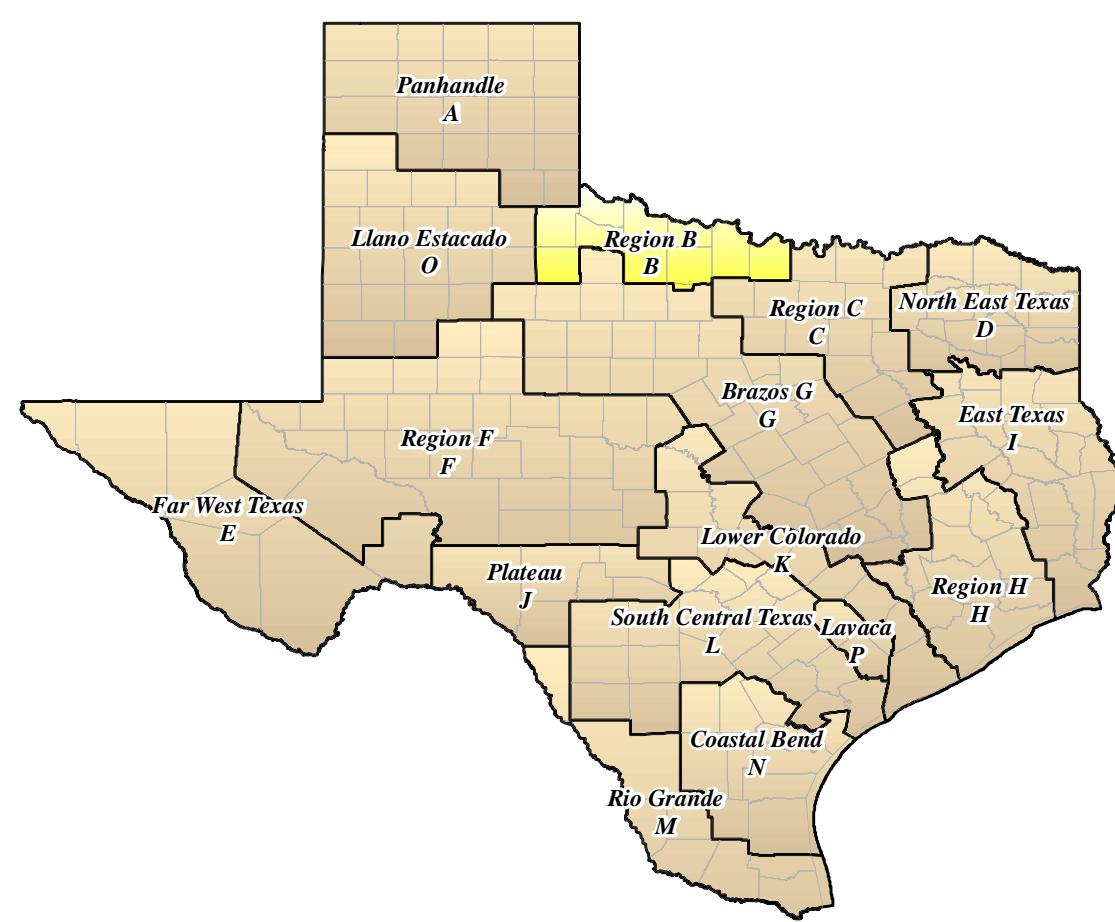
SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

0 5 10 20 30 40 Miles



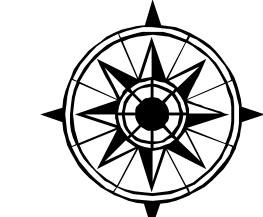
Class II, Type 3 Active Injection Wells

Regional Water Planning Area B:
Region B

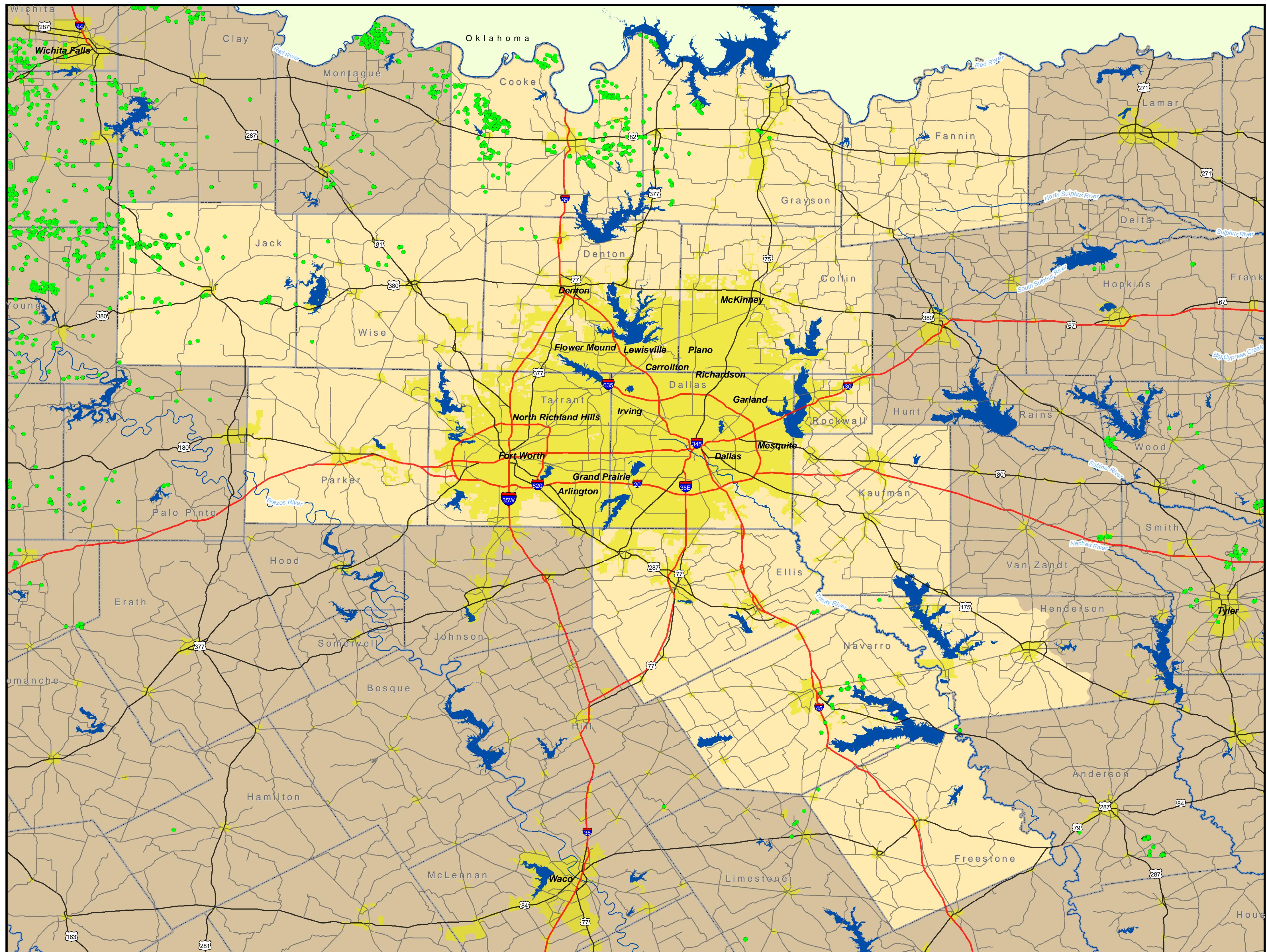


- Active Type 3 Enhanced Recovery
- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles

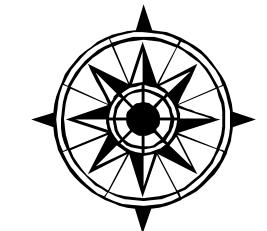
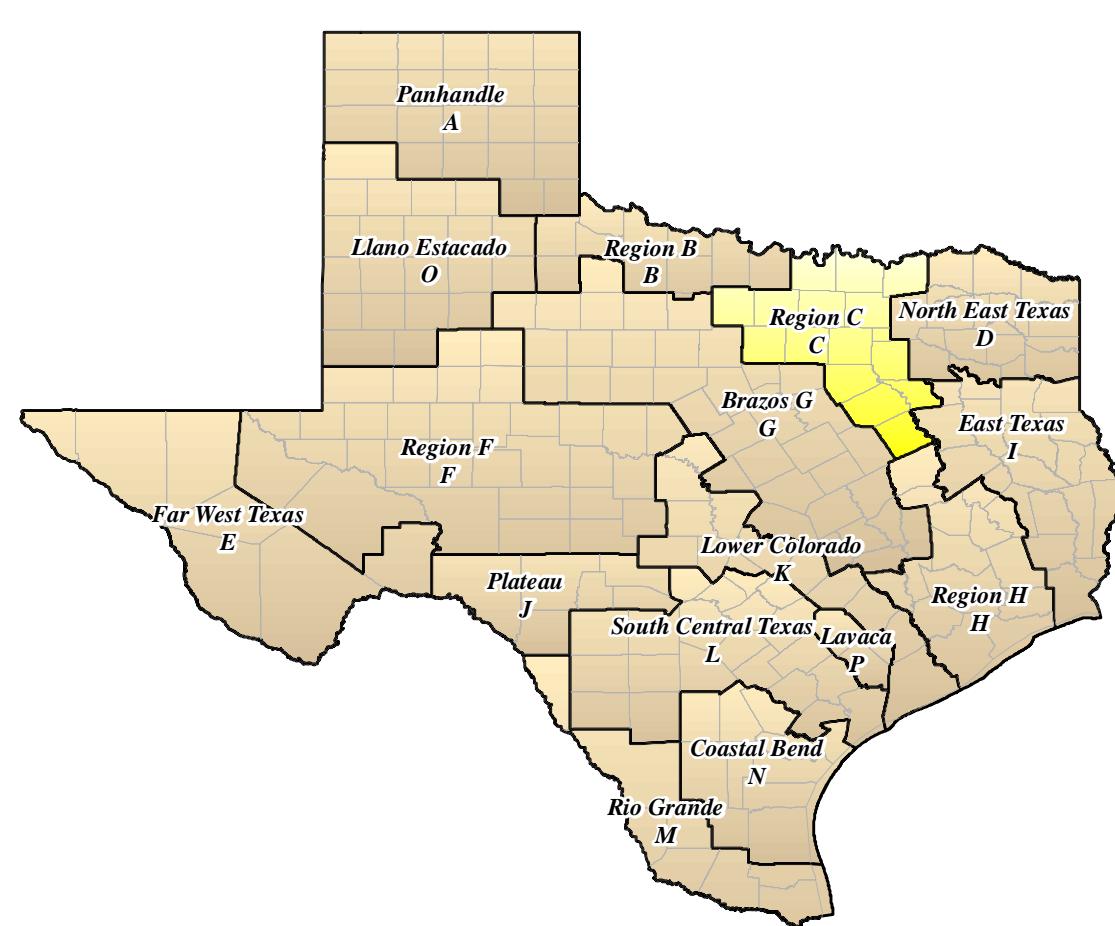


Class II, Type 3 Active Injection Wells

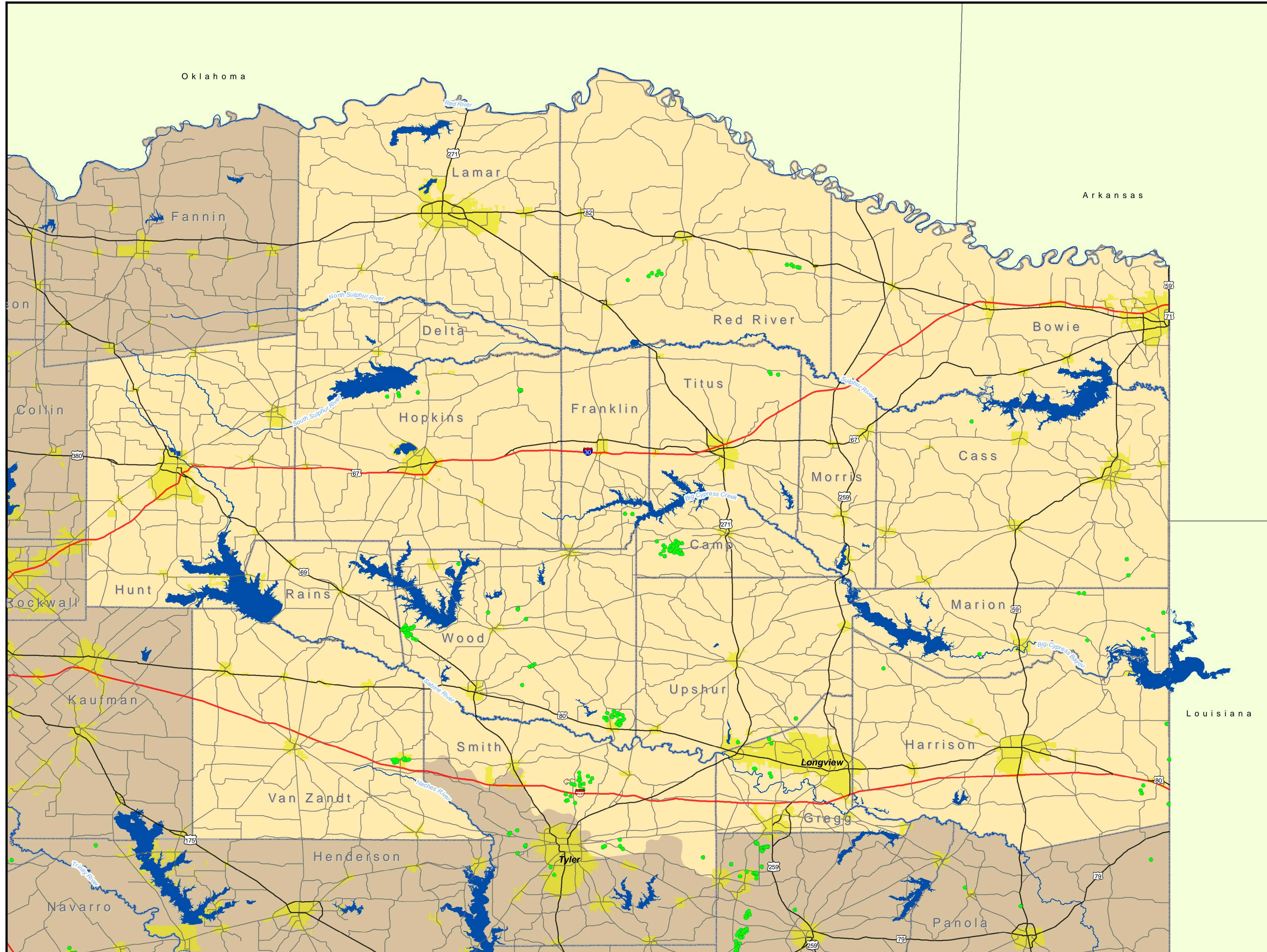
Regional Water Planning Area C:
Region C

- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

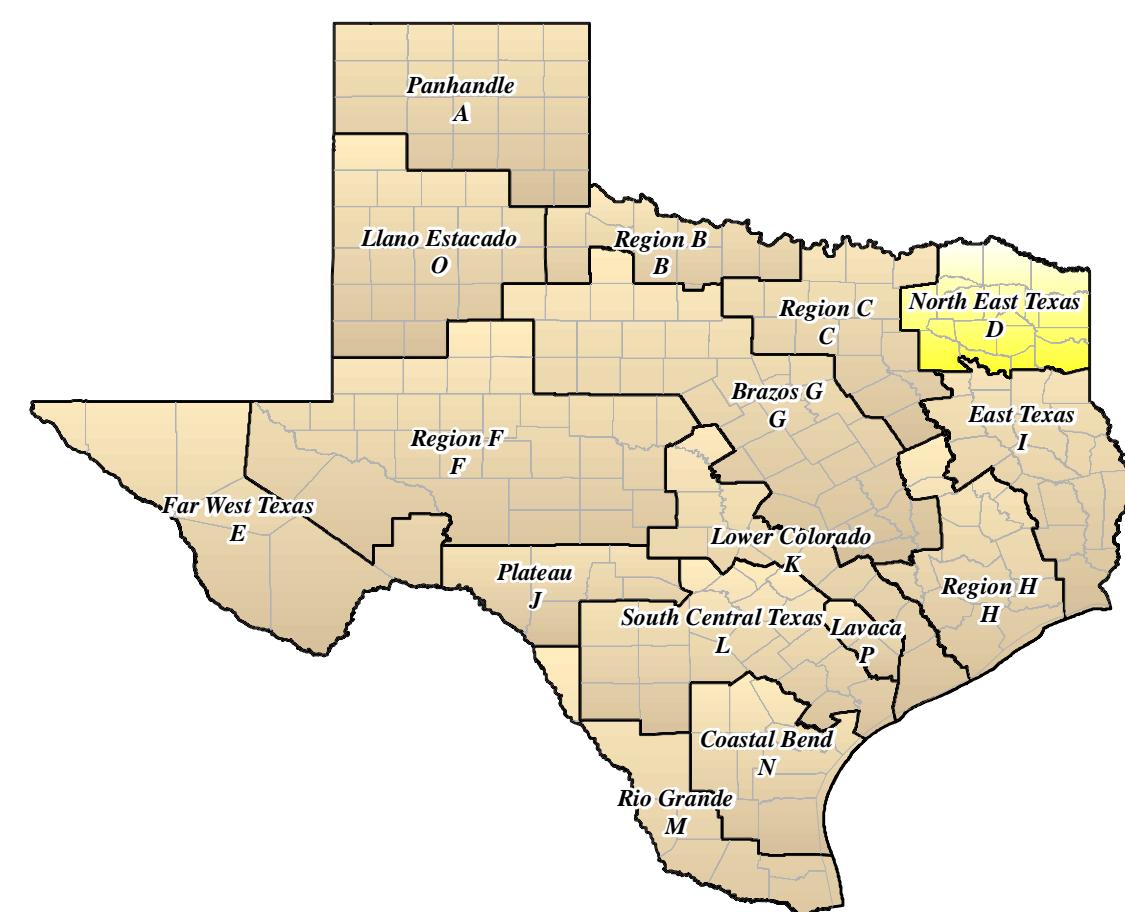


0 5 10 20 30 40 Miles



Class II, Type 3 Active Injection Wells

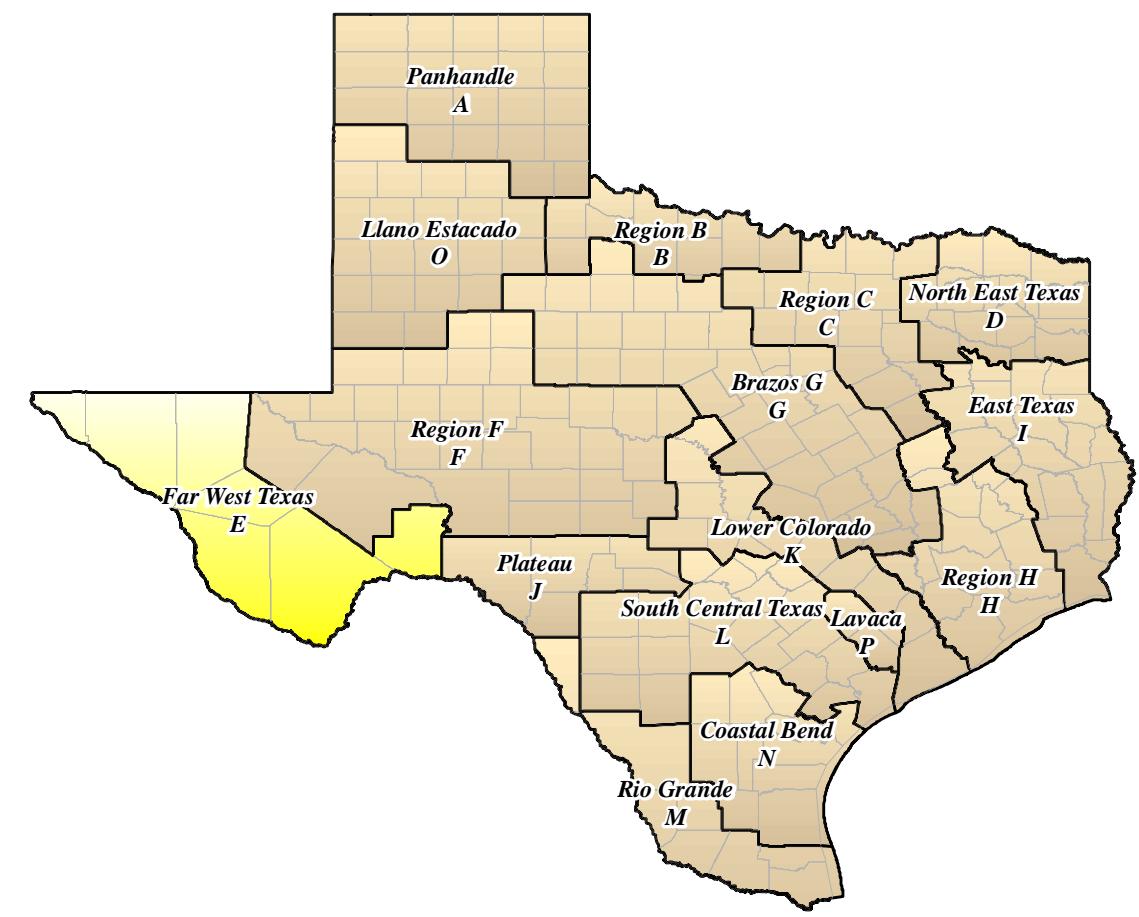
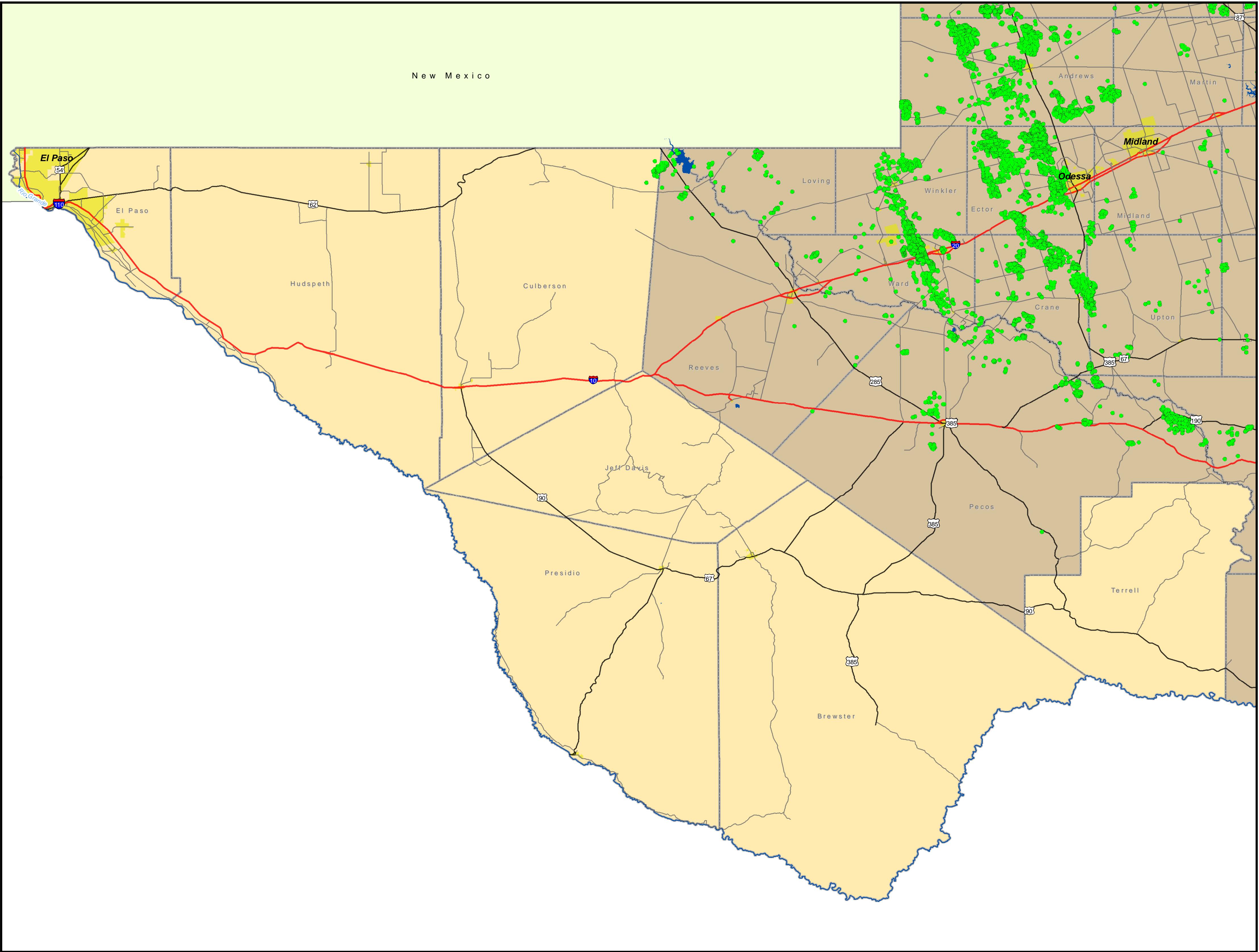
Regional Water Planning Area D:
North East Texas



- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

0 5 10 20 30 40 Miles

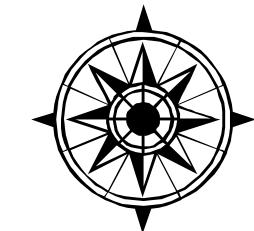


Class II, Type 3 Active Injection Wells

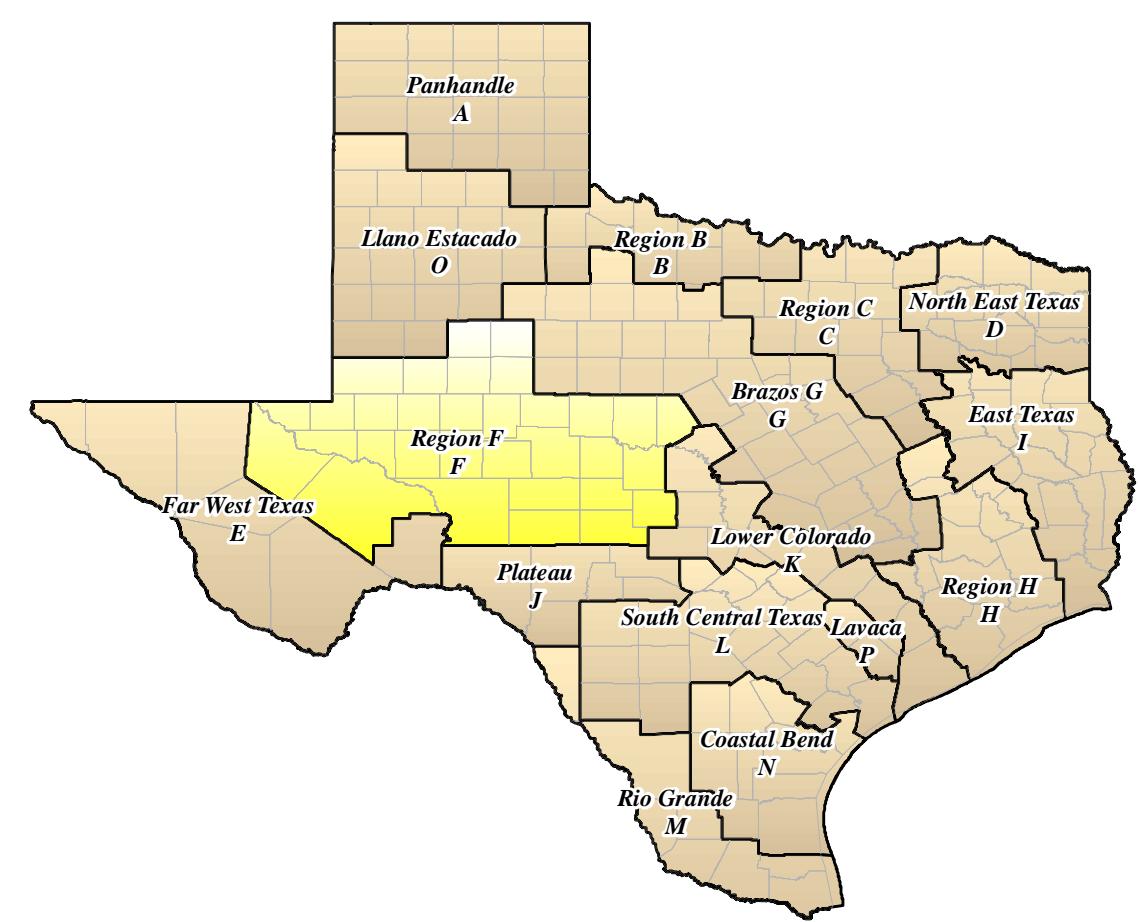
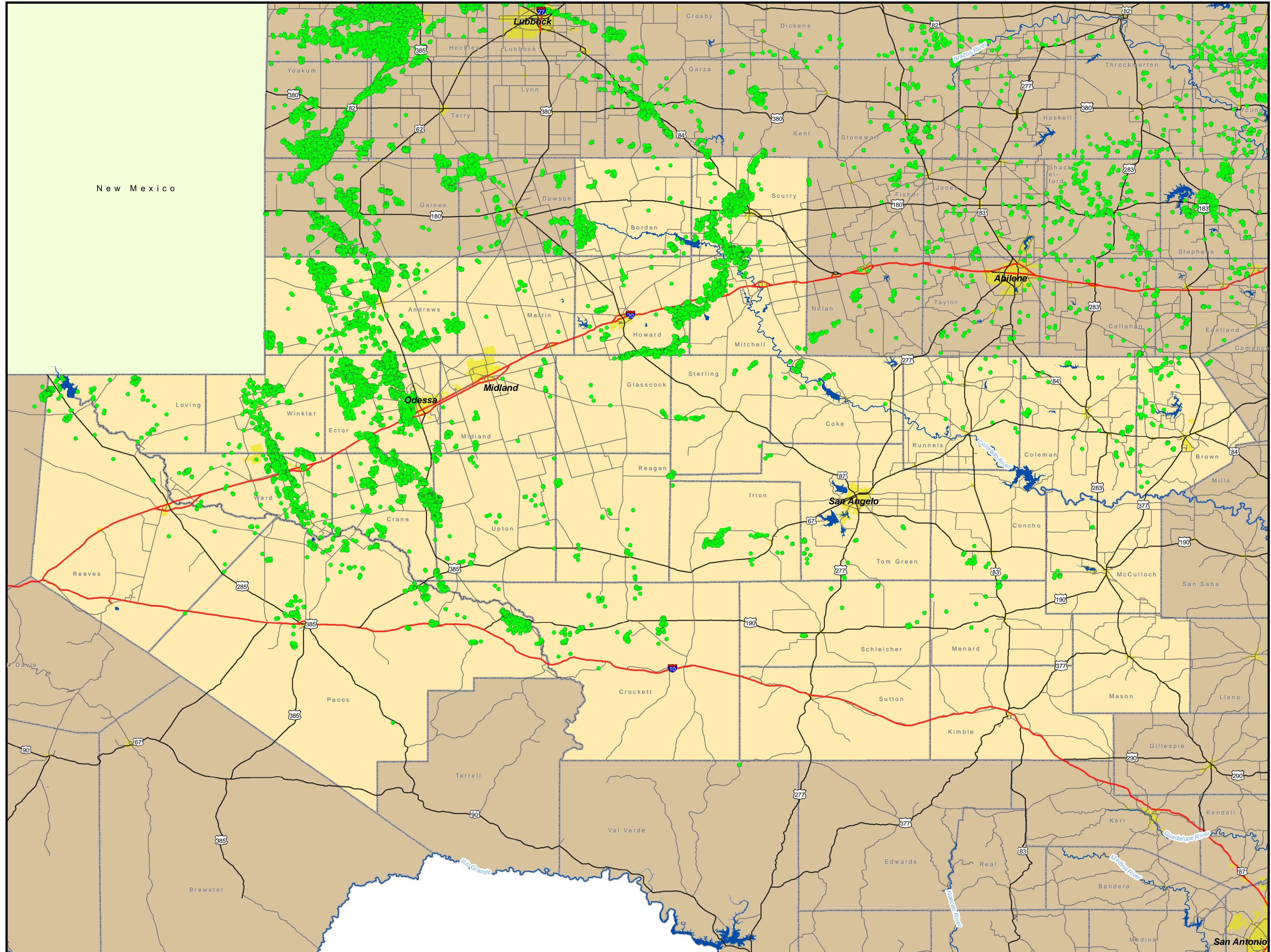
Regional Water Planning Area E:
Far West Texas

- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles

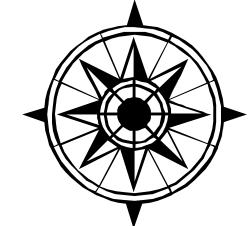


Class II, Type 3 Active Injection Wells

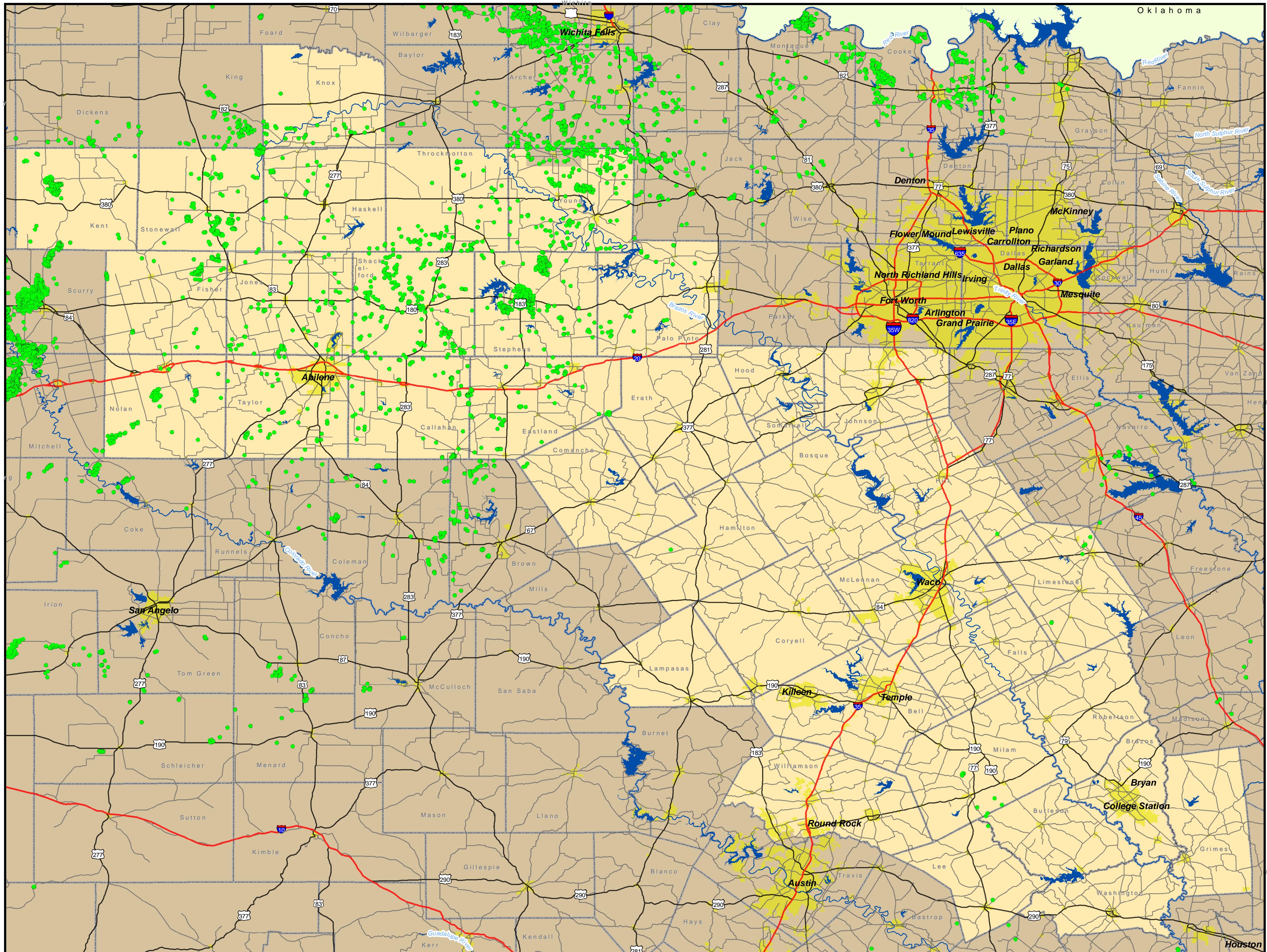
**Regional Water Planning Area F:
Region F**

- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

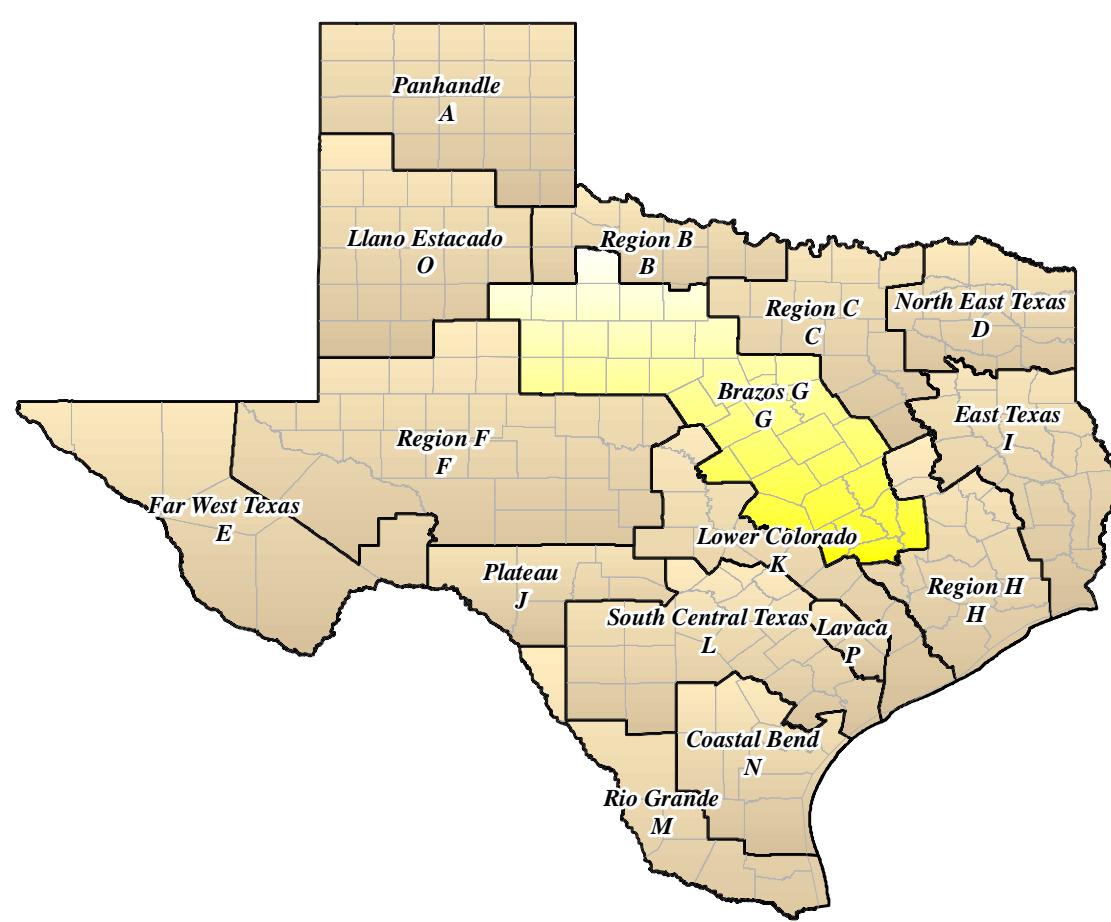


0 5 10 20 30 40 Miles



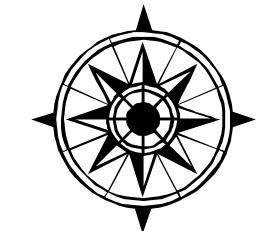
Class II, Type 3 Active Injection Wells

Regional Water Planning Area G:
Brazos

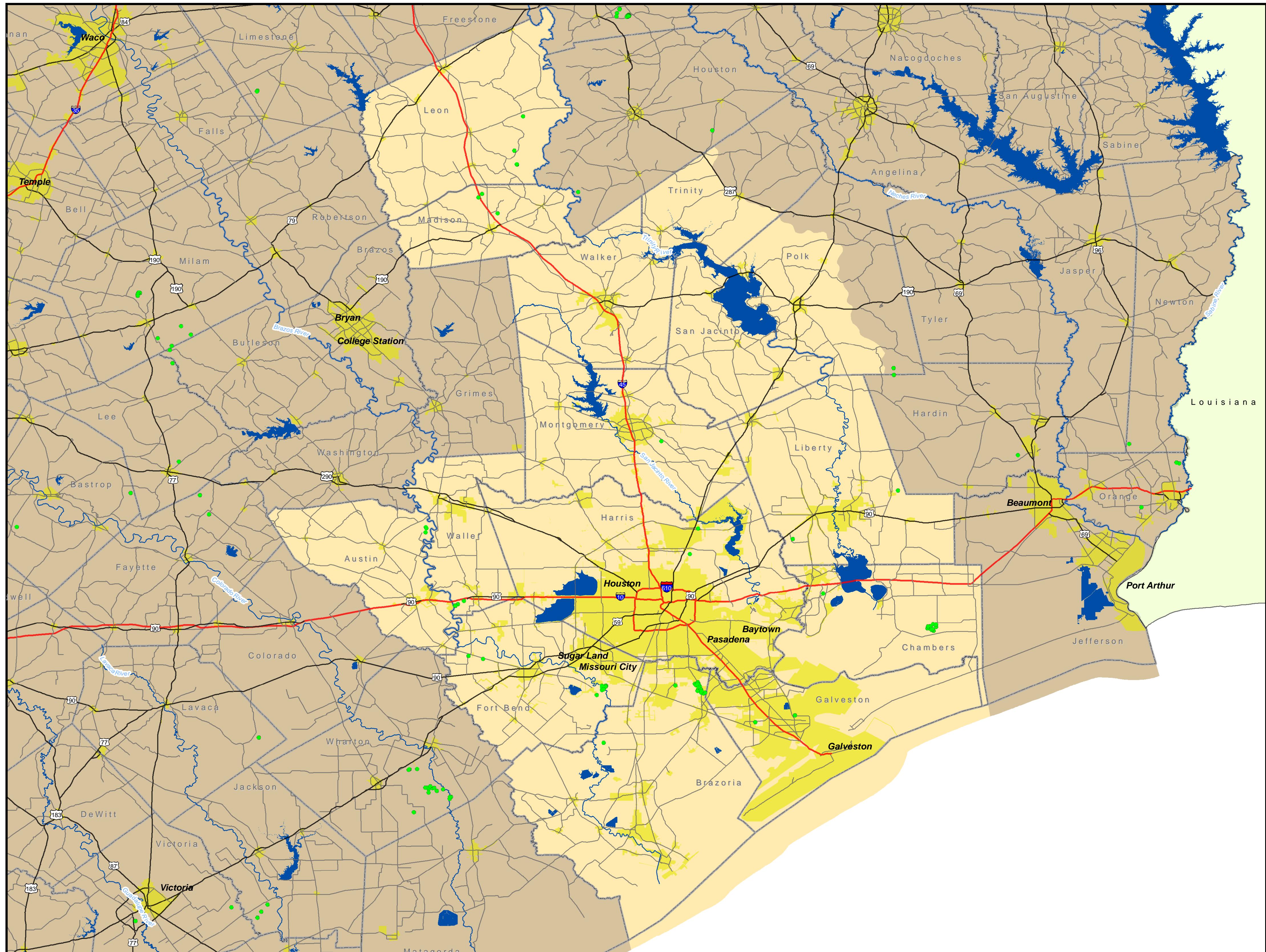


- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles

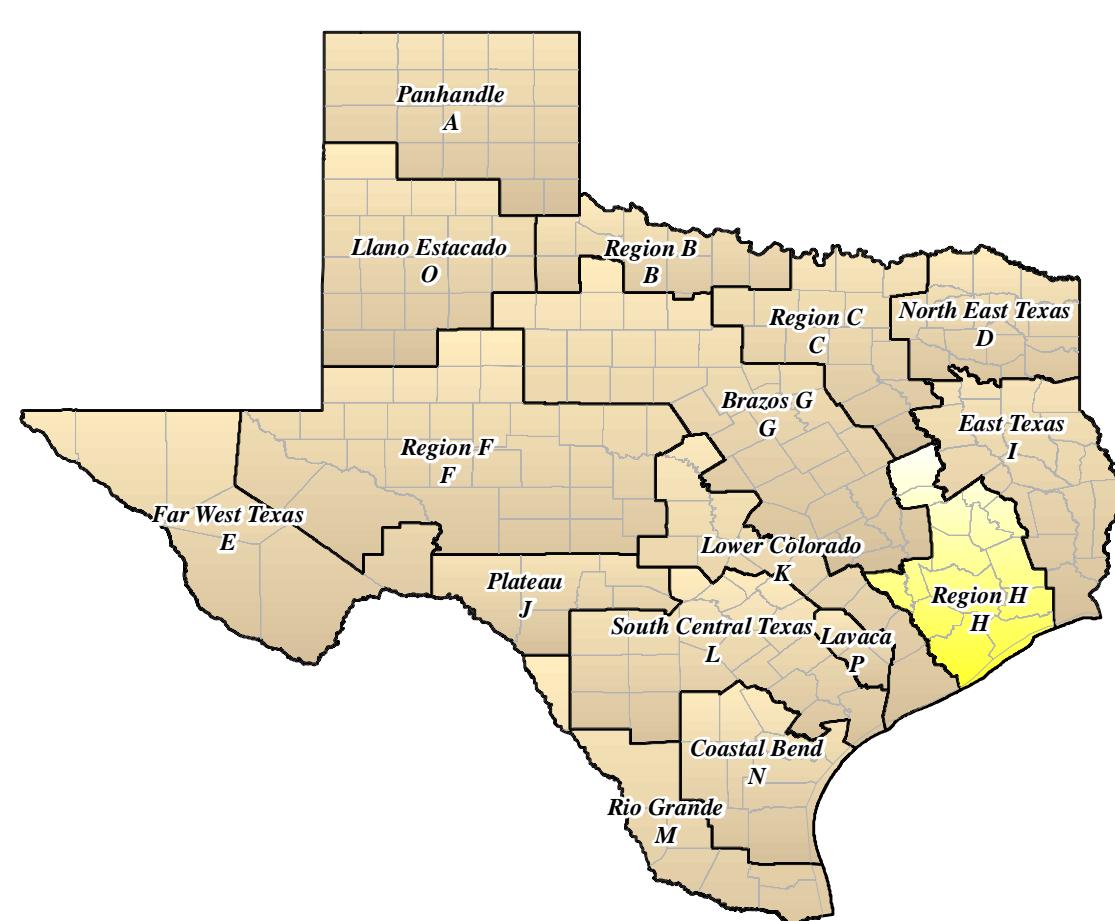


Class II, Type 3 Active Injection Wells

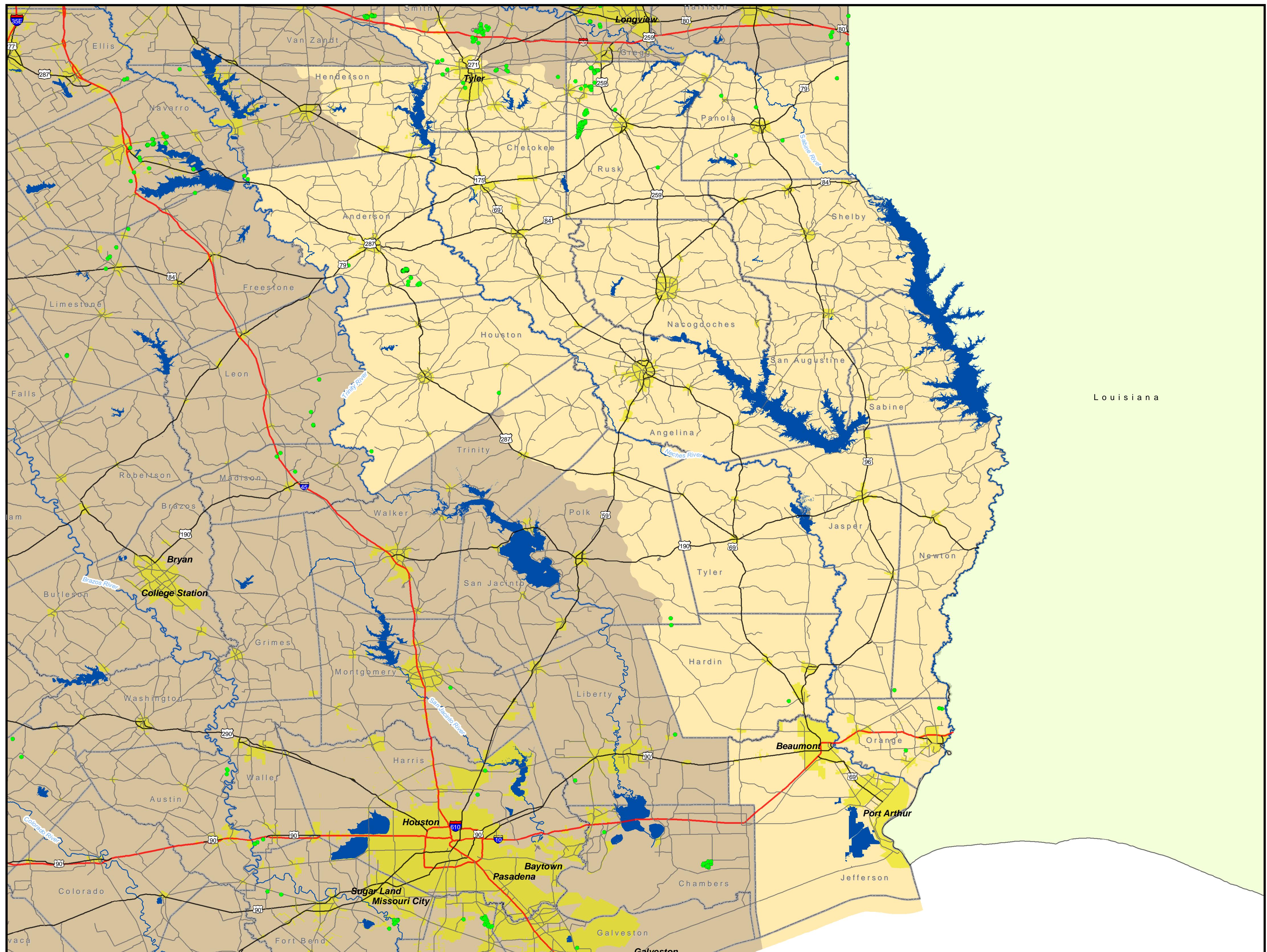
Regional Water Planning Area H:
Region H

- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



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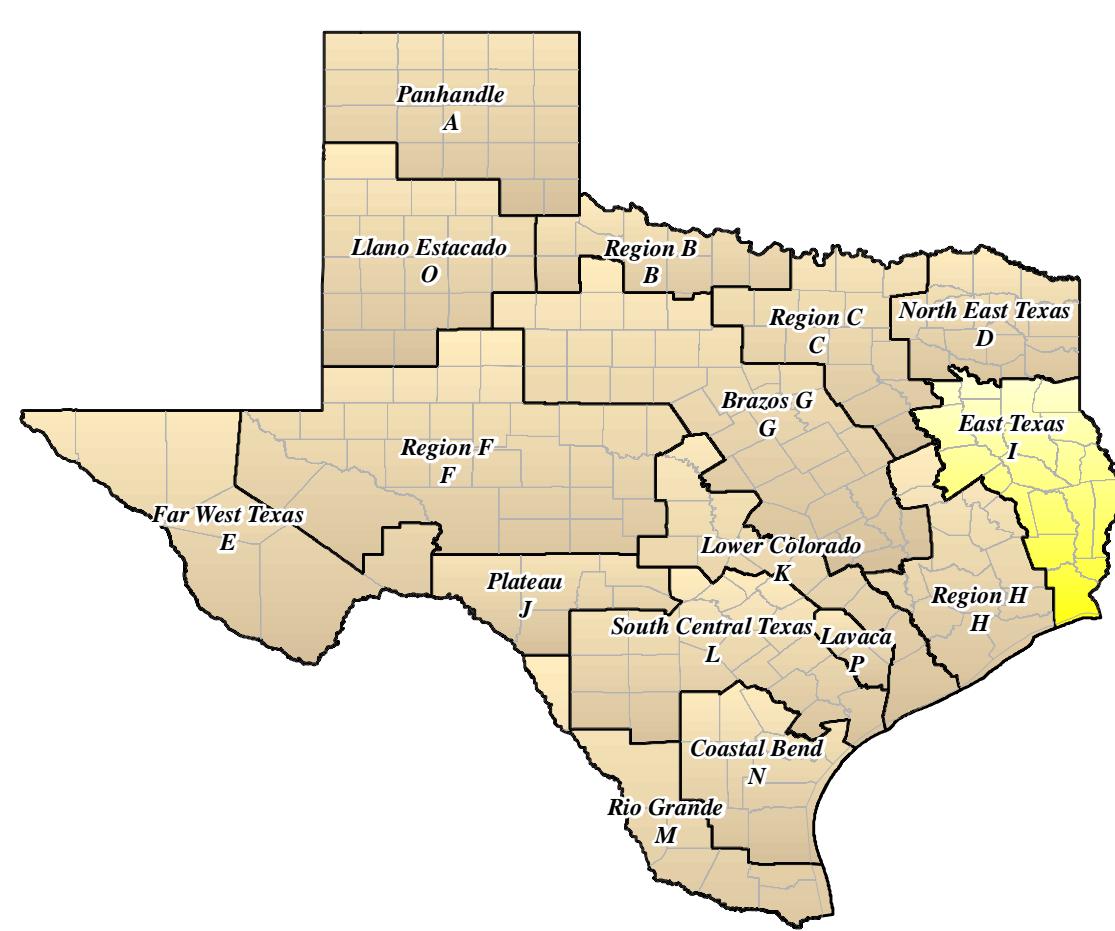
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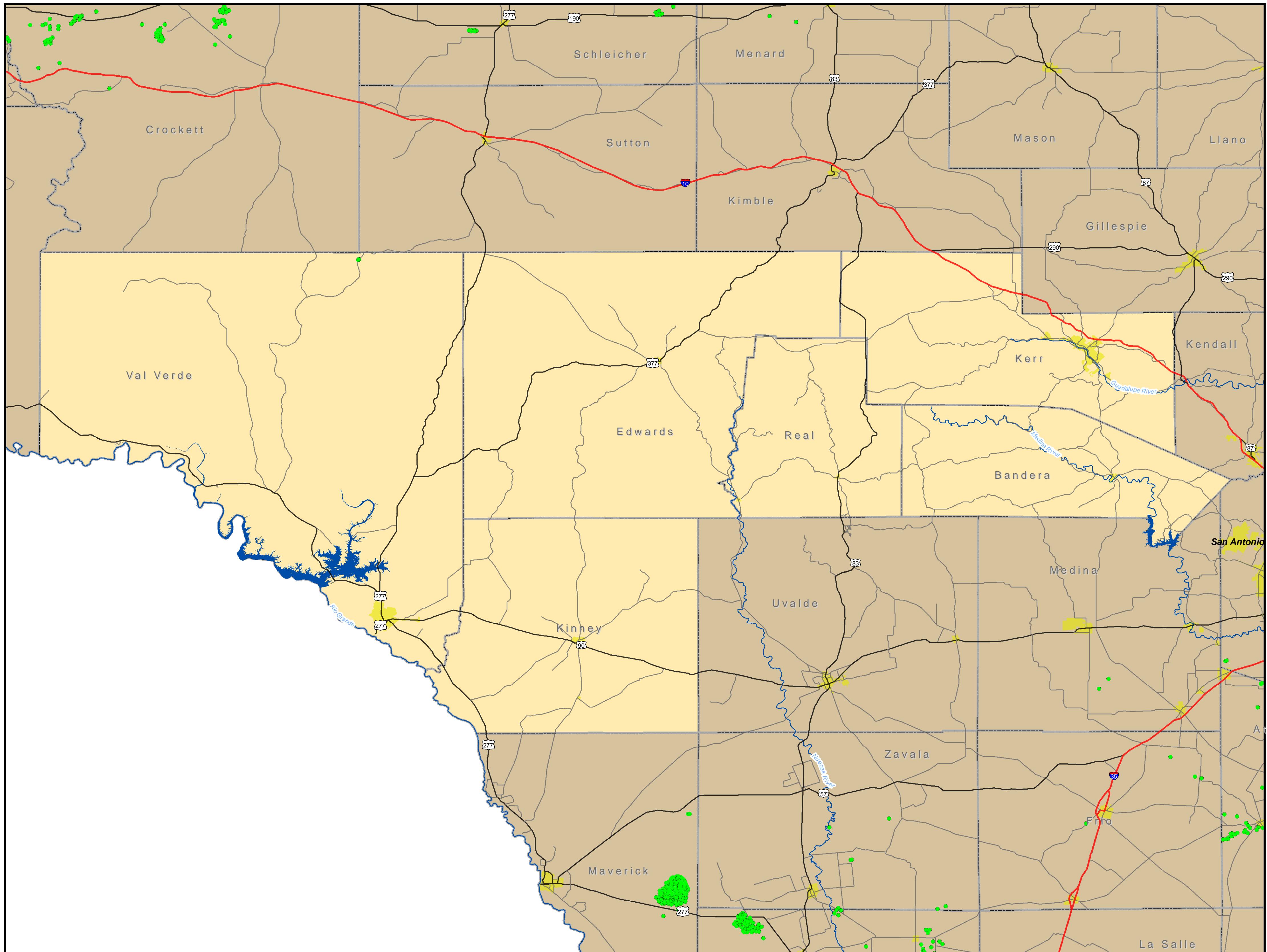
Regional Water Planning Area I:
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- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

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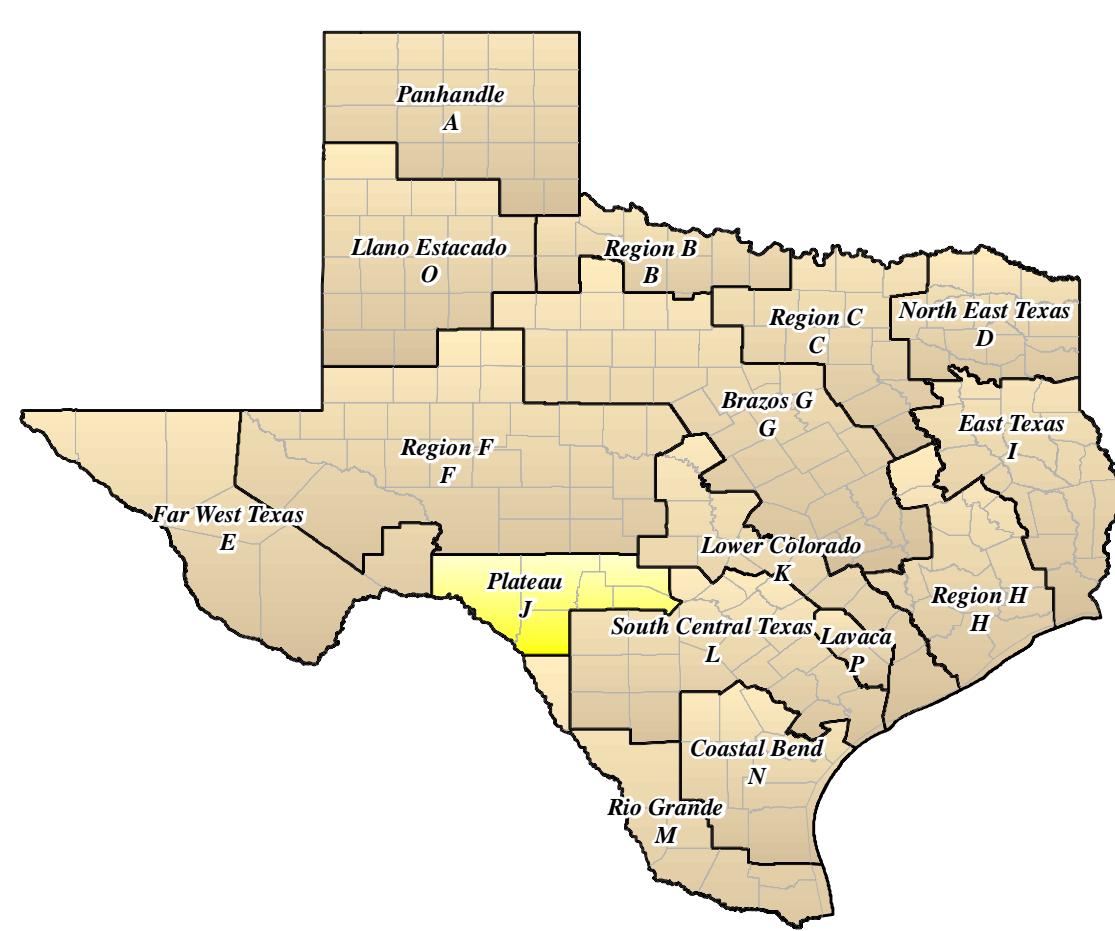
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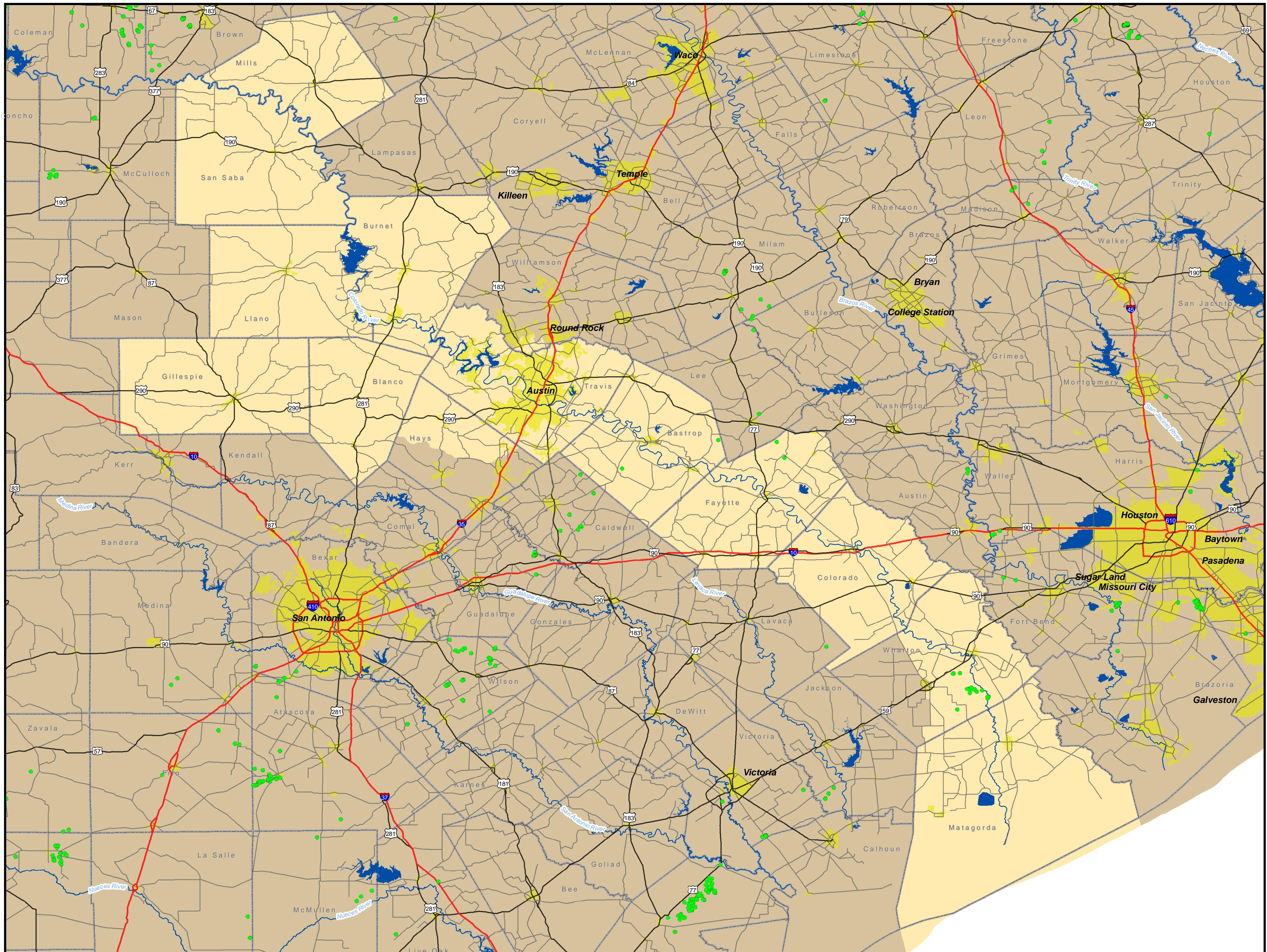
Regional Water Planning Area J: Plateau

- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

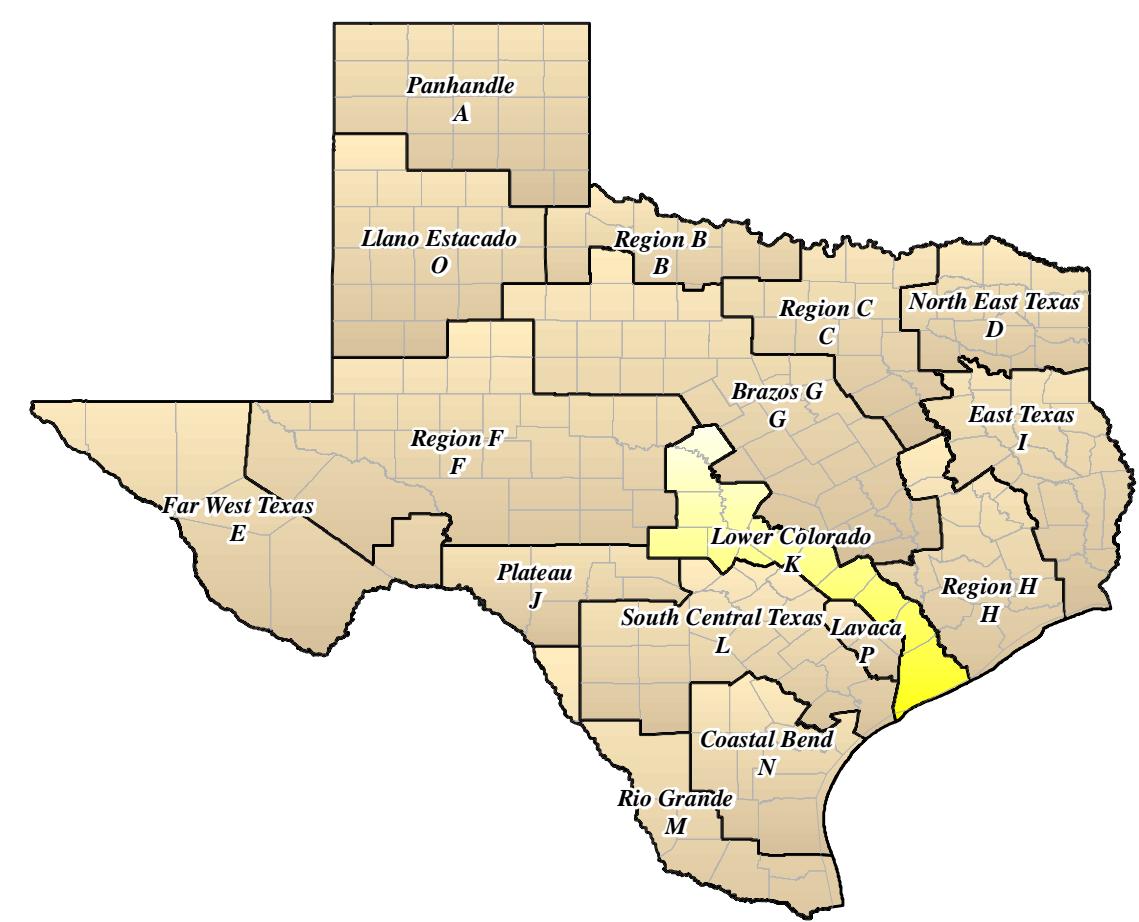
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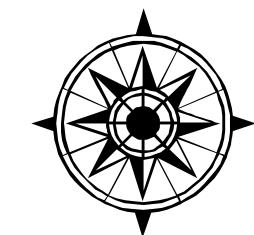
Class II, Type 3 Active Injection Wells

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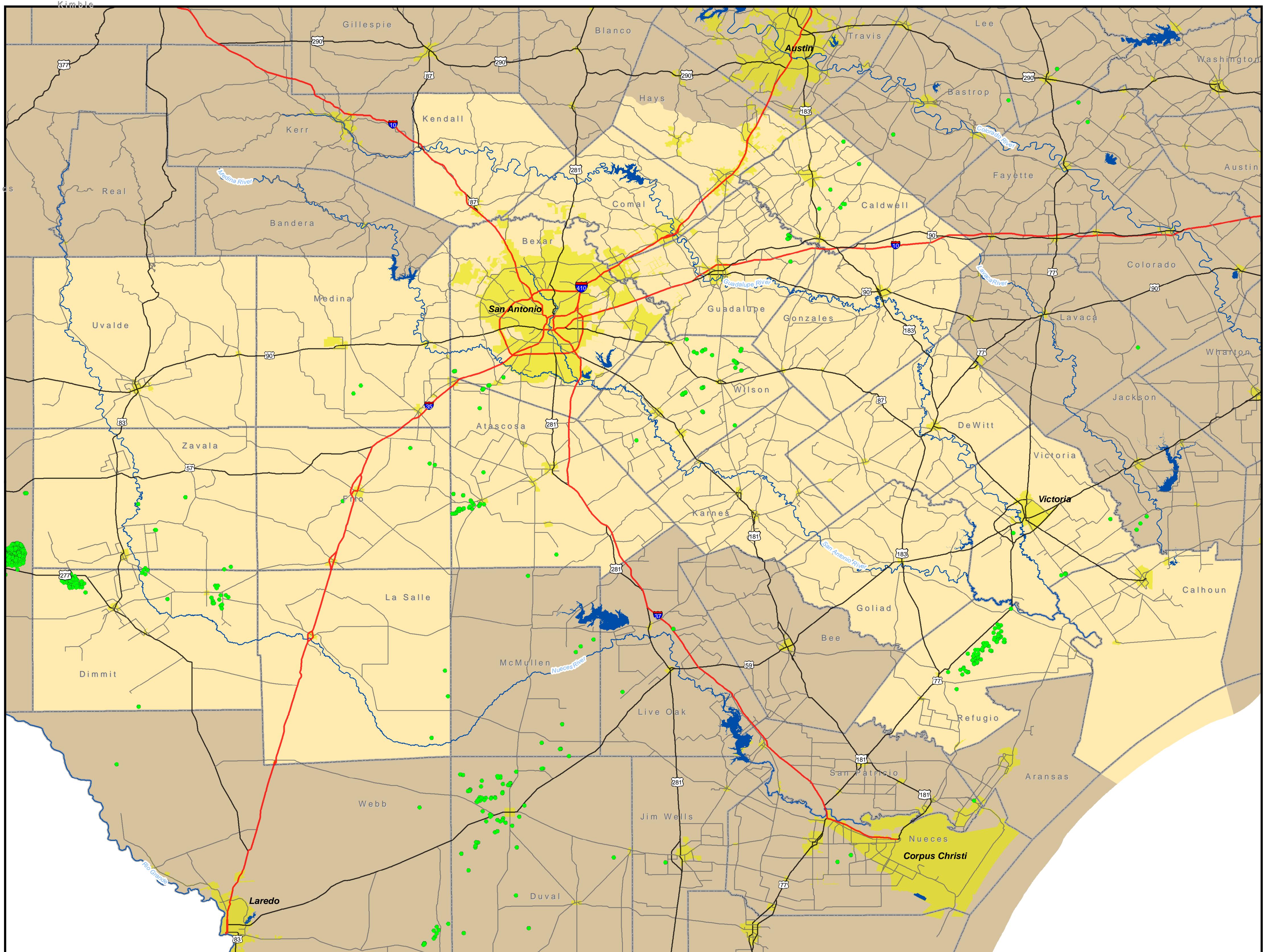


- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

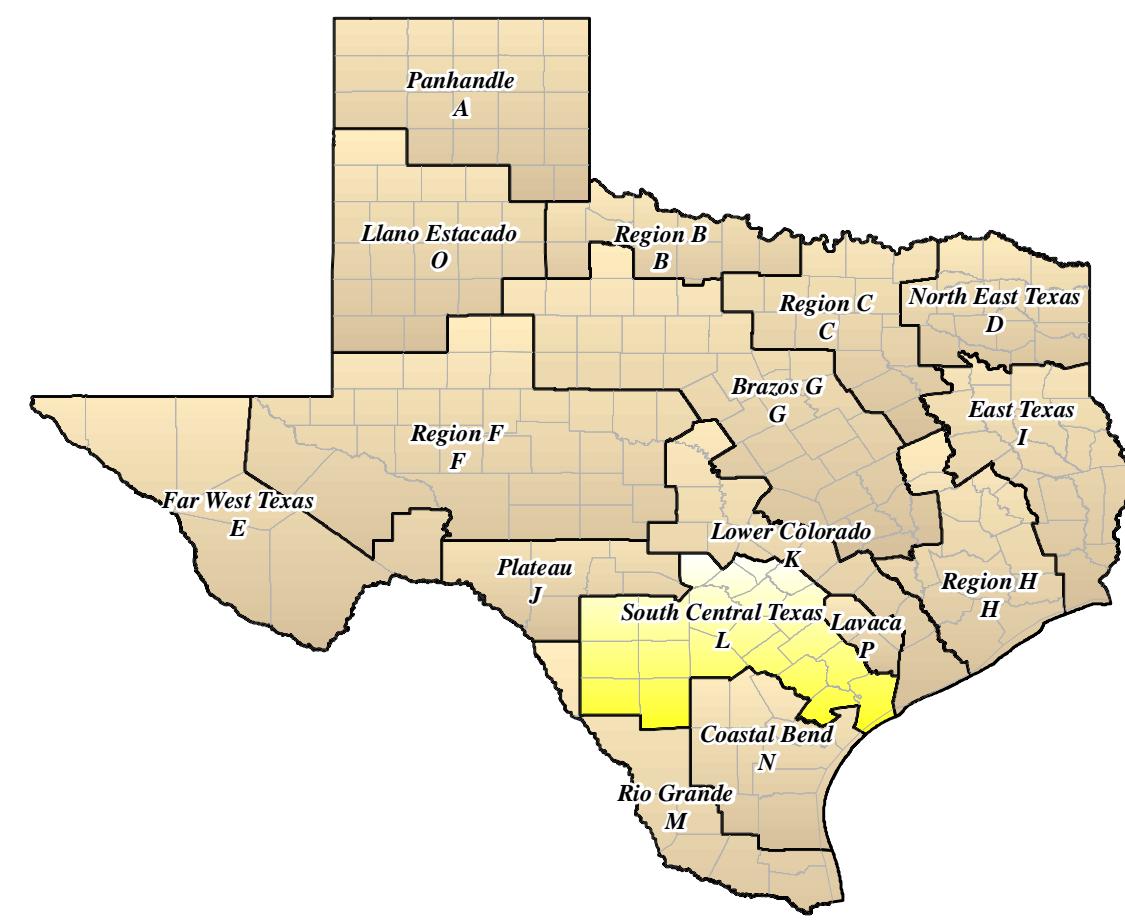


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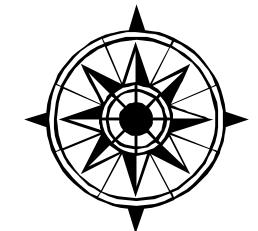
Class II, Type 3 Active Injection Wells

Regional Water Planning Area L:
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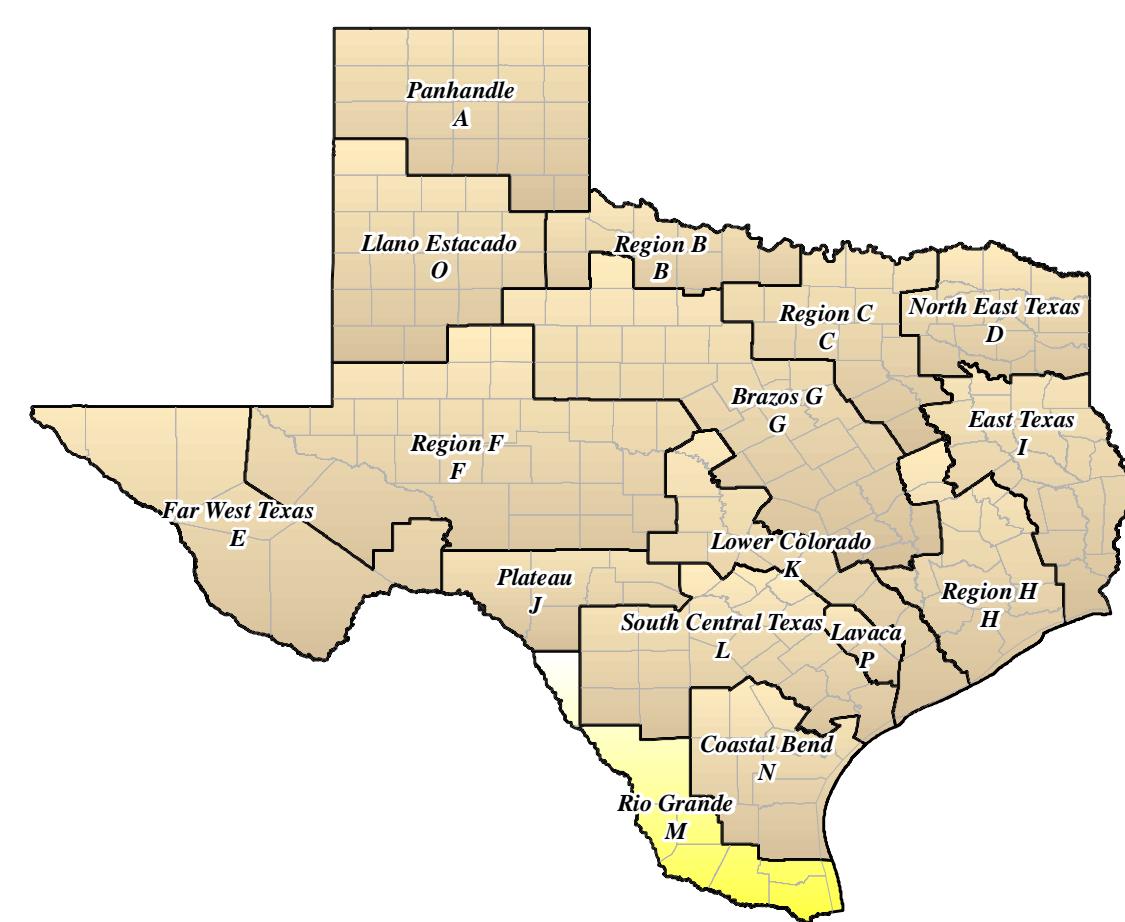
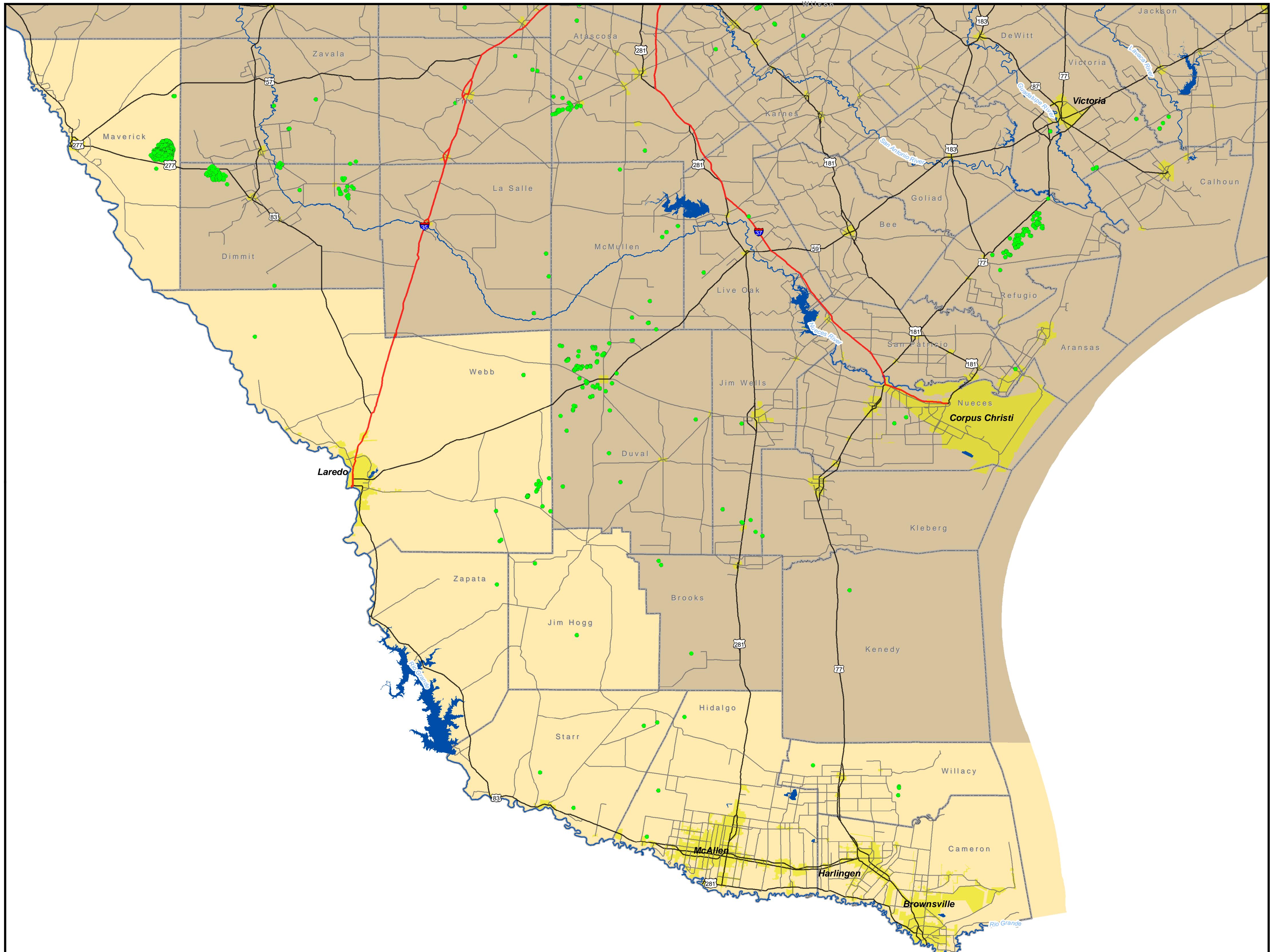


- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



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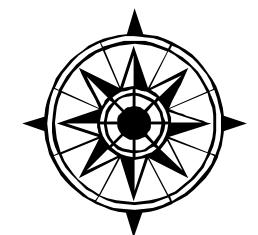


Class II, Type 3 Active Injection Wells

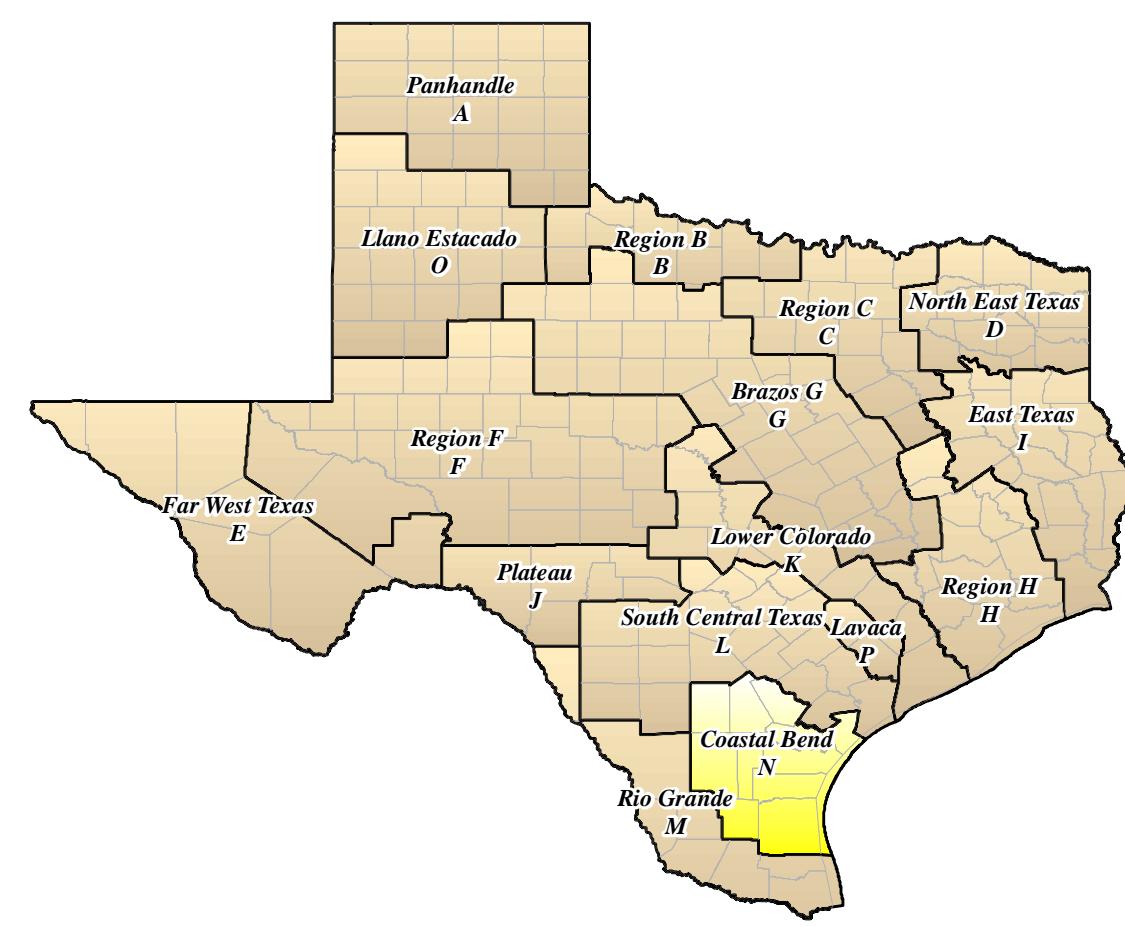
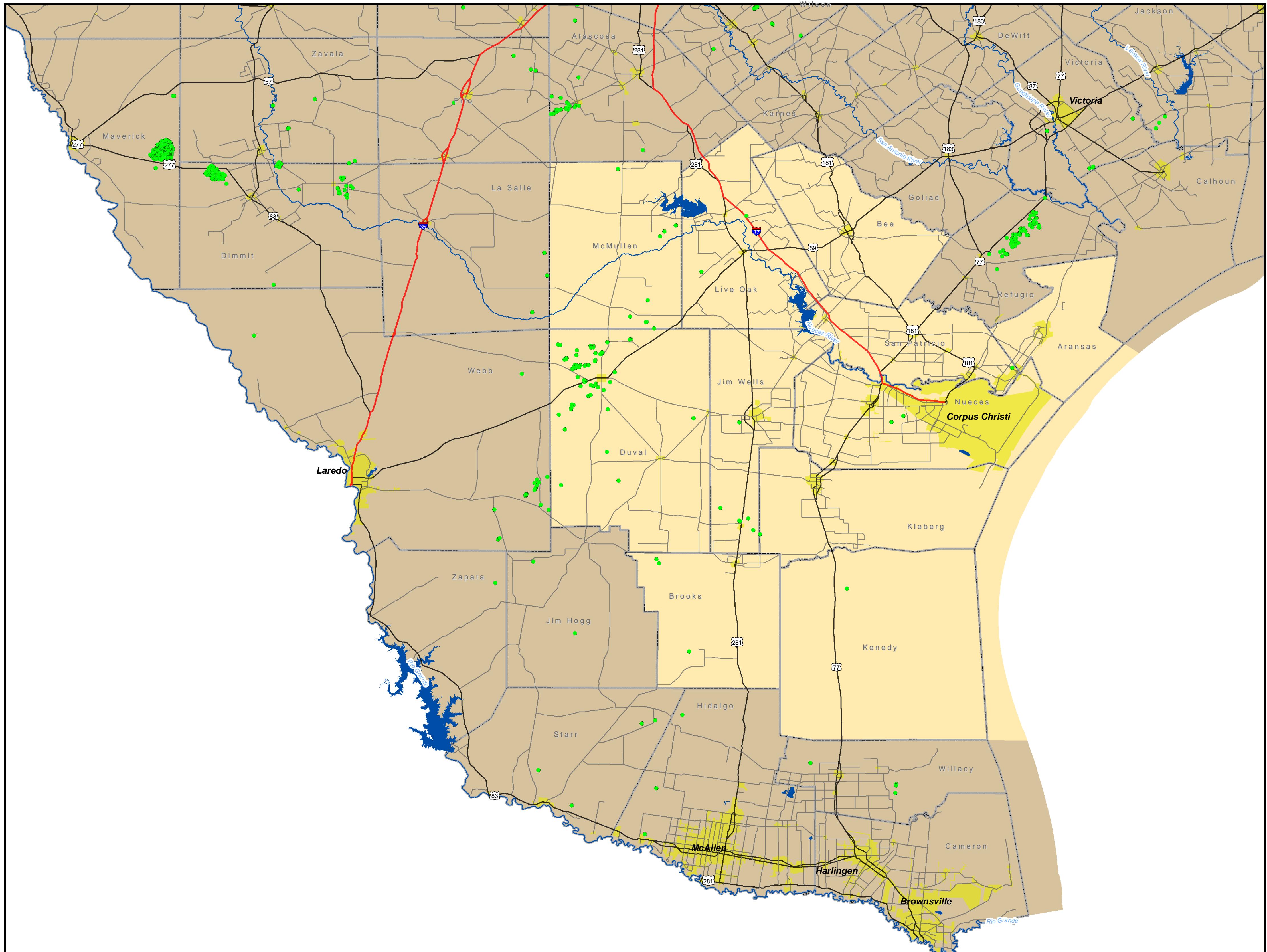
Regional Water Planning Area M:
Rio Grande

- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



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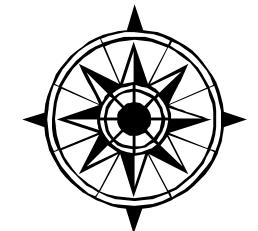


Class II, Type 3 Active Injection Wells

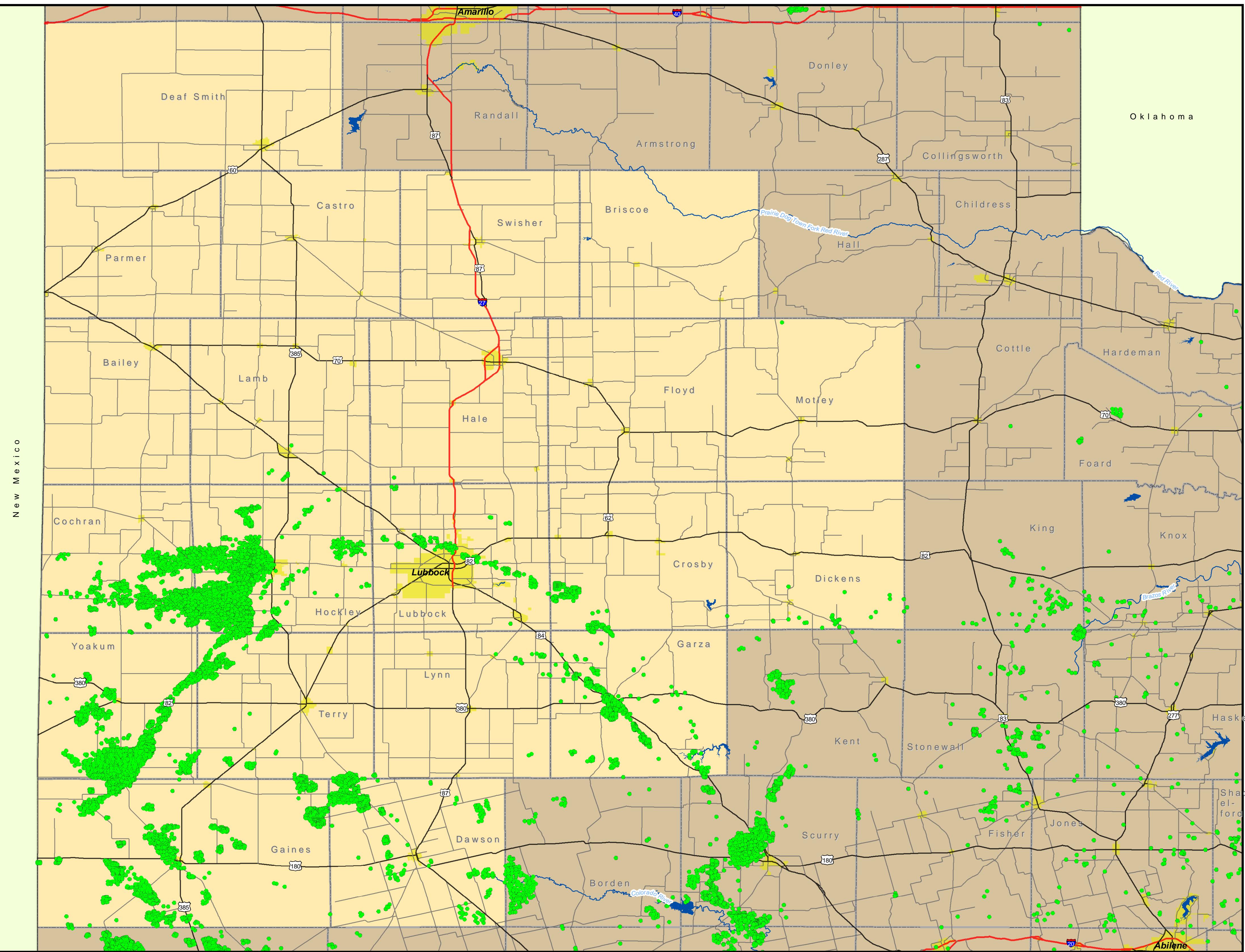
**Regional Water Planning Area N:
Coastal Bend**

- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

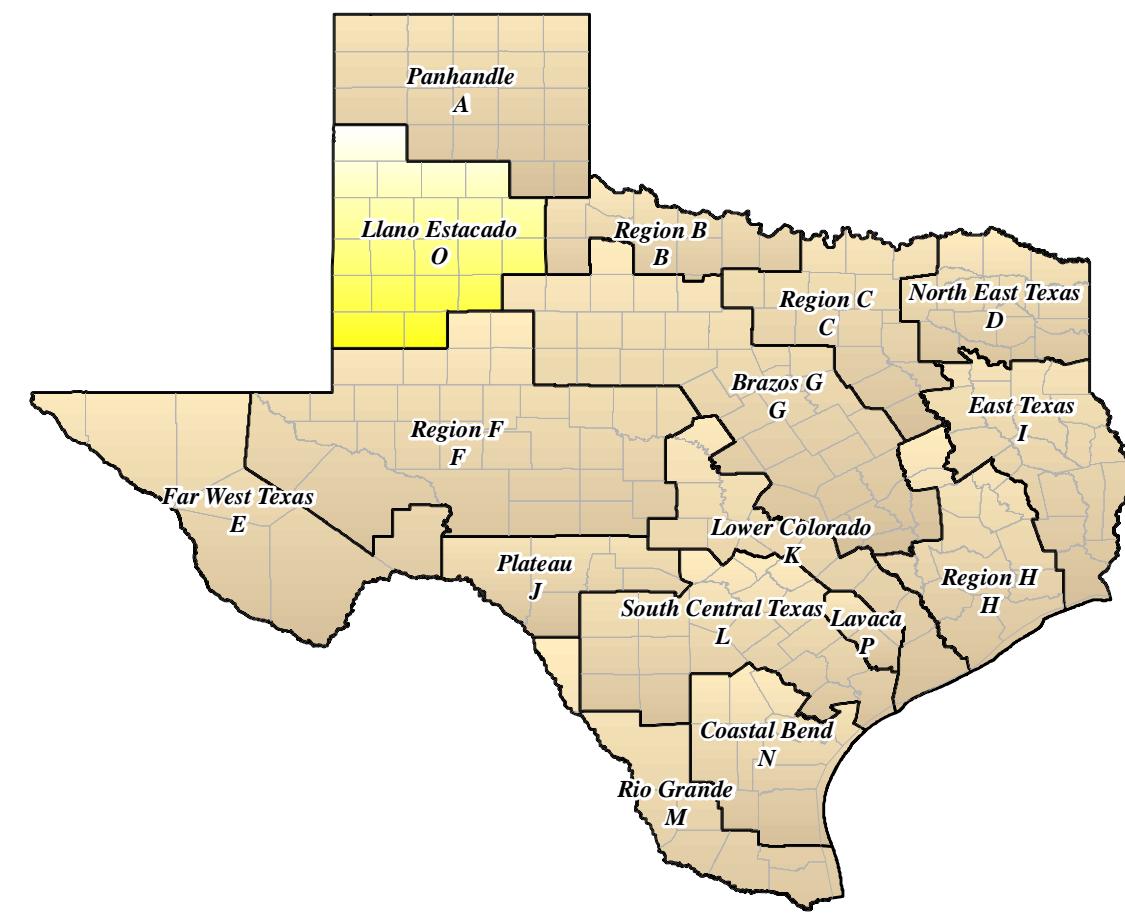


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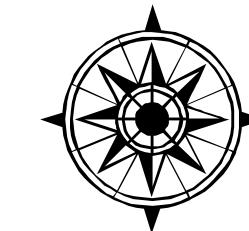
Class II, Type 3 Active Injection Wells

Regional Water Planning Area O:
Llano Estacado

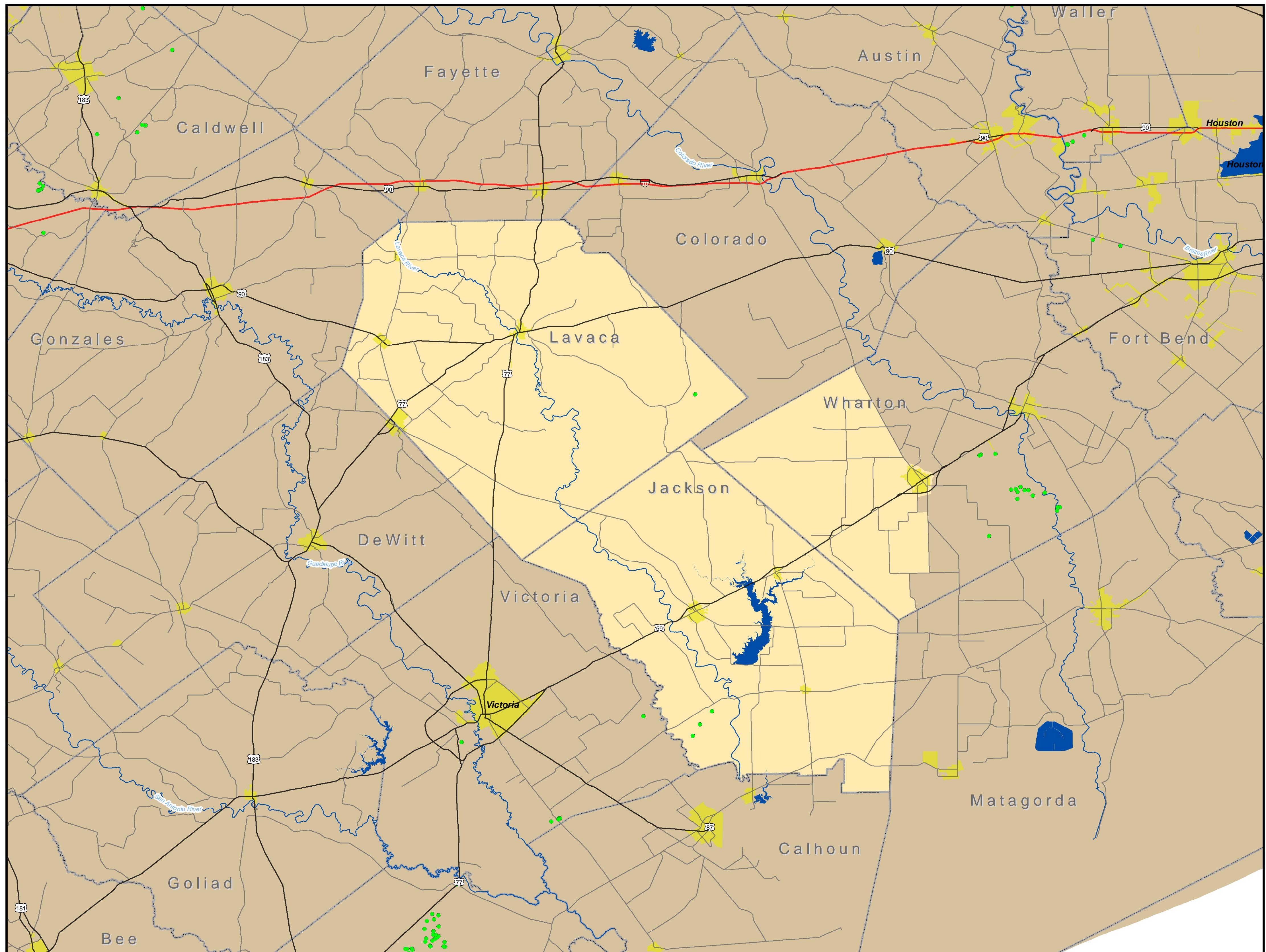


- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.



0 5 10 20 30 40 Miles



Class II, Type 3 Active Injection Wells

Regional Water Planning Area P:
Lavaca



- Active Type 3 Enhanced Recovery

SOURCE: Railroad Commission Underground Injection Control (UIC) and Well Bore Data databases, 2012.

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APPENDIX C

Permitting Roadmap

May 2014

**CDM
Smith**

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Appendices

Appendix C-1 – RRC Permit Amendment Forms and Application Guidelines
Appendix C-2 – TCEQ UIC General Permit

1 Introduction

The Texas Water Development Board (TWDB) contracted with CDM Smith to develop and provide a Manual for Permitting Process which includes a Permitting Roadmap to assist water providers in navigating the regulatory landscape of desalination concentrate management and the selection of proper disposal options. This Permitting Roadmap serves as a guide for water providers seeking regulatory approval to dispose of nonhazardous desalination concentrate from brackish groundwater desalination treatment or other nonhazardous drinking water treatment residuals (DWTR) by injecting the concentrate into properly permitted Class I and Class II wells in Texas. With the passage of House Bill (HB) 2654 in 2007, the Texas Water Code was amended to expedite the permitting process for utilizing Class I and Class II wells for the injection and disposal of nonhazardous desalination concentrate and DWTR. Herein, unless otherwise specified, the terms “desalination concentrate” and “DWTR” refer to nonhazardous concentrate and nonhazardous DWTR materials.

This document outlines the required steps to obtain permit coverage for desalination concentrate and DWTR disposal by injection into Class I, Class II, and Class I-Class II dually permitted wells under the Texas Commission of Environmental Quality (TCEQ) and the Railroad Commission of Texas (RRC) underground injection control (UIC) programs. Dually permitted wells are Class II wells that have applied for and obtained a Class I permit; therefore, these wells are permitted under both the TCEQ and the RRC authority concurrently. **Figure 1-1** illustrates Class I and Class II wells and identifies authorized waste streams for these well types.

To sufficiently depict these TCEQ and RRC permitting processes, graphical process flowcharts that correspond to step-by-step text-based guidance are presented here. This Permitting Roadmap serves to provide detailed supplementary text information to support the description of these permitting flowcharts. The subsequent section presents an outline of the flowcharts, which corresponds to specific sections of this roadmap document.

Of current importance, please note and consider that the RRC has recently proposed draft amendments to its UIC rules, which would likely affect this Permitting Roadmap, especially since these amendments could improve the eligibility of a new Class II well in qualifying for a dual permit. Refer to the end of **Section A.4** of this roadmap document and to the Literature Review (**Appendix E**) of this *Manual for Permitting Process* for more information on the proposed RRC rule changes.

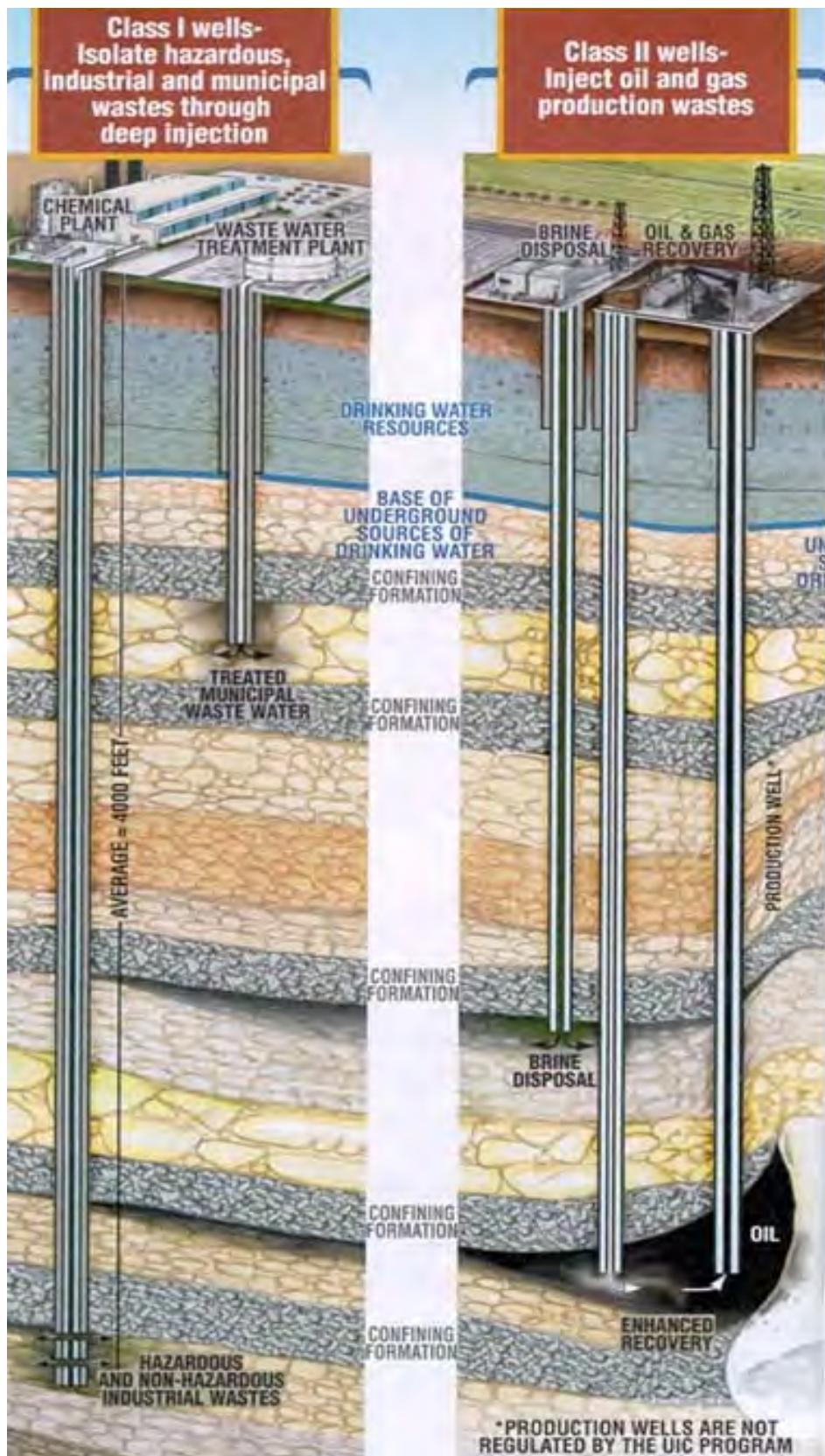


Figure 1-1. Depiction of Class I and Class II Wells (USEPA, 2012a; USEPA, 2012b)

2 Flowchart Outline

This Permitting Roadmap includes four process flowcharts that illustrate the following permit scenarios:

- **Flowchart A - Permitting Roadmap Overview Detail:** This flowchart illustrates which permitting process, through the TCEQ or RRC (**Flowchart B**, **Flowchart C**, and **Flowchart D**), will likely apply to a water provider, depending on the type of existing wells that are available. (Note that steps within this flowchart are subject to change; steps may change depending on interpretation of existing or future rules and proposed amendments to RRC rules for new Class II wells).
- **Flowchart B – RRC Permit Amendment Process Detail:** This flowchart presents the Class II permit amendment steps for utilizing a Class II enhanced recovery well (Type 3). Of the three permitting processes, the permit amendment approach through the RRC requires the least time and expense for approval.
- **Flowchart C – TCEQ General Permit Process Detail:** This flowchart illustrates the requirements of the TCEQ General Permit for Class I and dually permitted wells (i.e. Class II wells that obtain Class I authorization from the TCEQ). The TCEQ UIC General Permit provides an expedited process for authorization to dispose of desalination concentrate and DWTR in a Class I well or a dually permitted Class II well.
- **Flowchart D – TCEQ Individual Permit Process Detail:** This flowchart depicts the requirements of the TCEQ individual permit for Class I and dually permitted Class II wells that do not qualify for the Class I General Permit. This process is the most rigorous and complex of the three permitting processes, and requires more time and expense to obtain a permit.

The subsequent sections describe each permitting process and flowchart in more detail. The step-by-step process outlined below is referenced on the corresponding flowchart components.

3 Flow Chart A – Permitting Roadmap Overview Detail

The Permitting Roadmap Overview Detail flowchart outlines the initial steps of use of the roadmap for a Texas water provider that seeks to dispose of desalination concentrate or DWTR into a Class I well, a Class II enhanced recovery well, or a dually permitted Class I-II well. This overview flowchart intends to assist water providers in quickly assessing their available concentrate waste injection and disposal options and the appropriate permitting avenue to pursue. The overview flowchart presents options for water providers that produce hazardous concentrate and residual as well as nonhazardous concentrate and residual. Additional information on hazardous waste injection is provided in the section below. The following list corresponds with the labeled permitting components in **Flowchart A**, attached at the end of this section.

3.1 Fluid Characterization

The water provider must first characterize the desalination concentrate to understand potential applications for well injection or disposal. Per the provisions of HB 2654, the concentrate must qualify as nonhazardous prior to injection or disposal into a Class I, Class II, or dually permitted Class I-II well. A hazardous substance, waste, or waste constituent is not allowable for disposal

under the TCEQ Class I General Permit or the RRC Class II Permit Amendment, and is defined as:

- any material listed as a hazardous waste by the United States Environmental Protection Agency (USEPA) in accordance with the Resource Conservation and Recovery Act of 1976 and the Solid Waste Disposal Act; or
- any material defined as hazardous by the 40 Code of Federal Regulations (CFR) Part 261 or Part 302.

Figure 2-2 summarizes the permit options based on various waste streams (Note: permit options also depend on the type of well involved and this figure focuses only on the type of waste stream). If a water provider finds that existing treatment processes produce hazardous concentrate or residual, the only type of well available for disposal is a Class I well authorized for hazardous waste disposal which is governed by a TCEQ individual permit. The options include locating an existing Class I well that is permitted to accept hazardous waste from off-site sources or applying for and obtaining a Class I well permit to dispose of hazardous waste. As required by all TCEQ Class I well permits, the permit application must include a detailed technical report for UIC Permits Section staff review, and the applicant must submit a “no harm” letter from the RRC stating that the permitted action would not adversely impact oil and gas resources. TCEQ requires these components, along with other required steps in the individual permit application process, to ensure the proper disposal of hazardous waste in UIC wells.

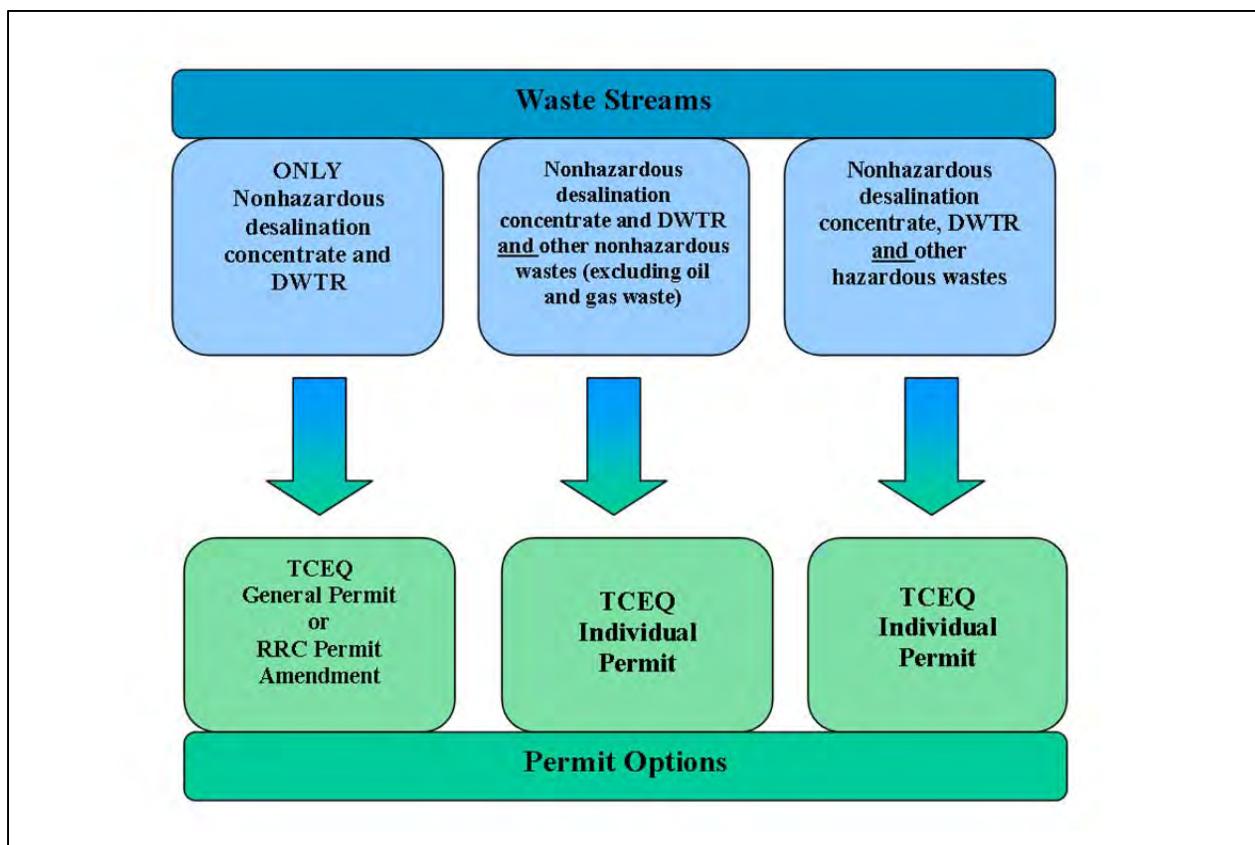


Figure 2-2. Waste Streams and Available Permits

3.2 Survey Existing Wells

Once the water provider characterizes the concentrate as nonhazardous for the disposal of municipal water treatment concentrate, the water provider can survey the surrounding area to see what types of existing state-registered wells are qualified and potentially available. Several maps were developed based on RRC well data to aid water planners and water providers in this process; these maps are presented in **Appendix B** of the *Manual for Permitting Process*. These maps illustrate the locations of existing Class II wells with active permits in Texas by TWDB Regional Water Planning Groups. The focus of this Permitting Roadmap is the use of Class II wells for desalination concentrate and DWTR injection and disposal; therefore the maps only show Class II wells for this purpose (i.e., types 1, 2, and 3). To locate existing Class I wells, the water provider can contact TCEQ for help in this process.

By creating an inventory of Class I and Class II wells, the water provider can evaluate the potential injection and disposal options available. The water provider should only consider wells with active permits. To dually permit a Class I-Class II well through the TCEQ General Permit, the well must contain an active Class II well permit. Similarly to obtain a permit amendment through the RRC, the enhanced recovery well must also have an active permit. A well may have an active permit even though a well is plugged or inactive; consequently, a well's inactive status does not necessarily eliminate the well as a candidate for disposal of desalination concentrate and DWTR under the TCEQ General Permit. Depending on the plugging process, some wells can be unplugged for further use if sufficient volume still remains and the well meets sufficient construction standards.

The following sections summarize the steps for nonhazardous concentrate and DWTR injection and disposal, the primary focus of this Permitting Roadmap.

3.3 Types of Class II Wells

When searching for Class II wells in the area, the water provider must distinguish the type of each Class II well to determine which permitting process applies. The RRC, which is the primary regulating body of Class II wells, classifies Class II wells based on seven UIC program types, as presented below. Although the RRC uses this numbered classification within its computer database, the numbered “types” are not readily referenced and presented online.

- Type 1 - Disposal well into a non-productive zone: This is a well used for waste disposal related to oil and gas operations in an area that is not actively producing oil and gas (a zone is considered non-productive if there is no production of oil and gas within a correlative interval of two miles). The water provider and well operator can potentially use this Type I well for concentrate disposal under the TCEQ General Permit as a dually permitted Class II well. To qualify for authorization under the General Permit, the Class II well must meet the standards of a Class I well under the General Permit and have sufficient documentation of the well's construction and current and/or prior use.
Flowchart C illustrates the process for obtaining a TCEQ Class I General Permit. Class II, Type 1 wells are regulated under Title 16 of the Texas Administrative Code (TAC), under Chapter 3, Rule 9 (16 TAC 3.9).
- Type 2 –Disposal well into a productive zone: This is a well used for waste disposal related to oil and gas operations in an area that is actively producing oil and gas. Although this well is in a productive zone and TCEQ does not regulate oil and gas wells, TCEQ

may still authorize coverage under the Class I General Permit for concentrate and DWTR disposal (**Flowchart C**). As required for a Class II Type 1 well, documentation must be provided that demonstrates the well meets the Class I standards as outlined in the General Permit. Class II, Type 2 wells are regulated per 16 TAC 3.46.

- Type 3 – Enhanced recovery injection well: Also known as a secondary or tertiary recovery well, this well can accept concentrate for use in enhanced recovery (see **Figure 3-3**) through a permit amendment process through the RRC. **Flowchart B** illustrates this process. Under HB 2654, enhanced recovery wells may accept concentrate under authorization of a permit amendment. To achieve a permit amendment without any direct TCEQ involvement, the well owner/operator must obtain an amendment to the existing permit through the RRC Class II, Type 3 wells are regulated by 16 TAC 3.46.
- Type 5 through Type 88: These four well types are comprised of statewide rule (SWR) permitted wells: SWR95 liquid storage (salt formation), SWR96 gas storage (reservoir), and SWR97 gas storage (salt formation), and SWR82 brine mining. These well types are not relevant to the focus of this report as they do not represent wells for concentrate management and disposal. (Type 4 wells are not listed, as they are technically classified as “miscellaneous”).

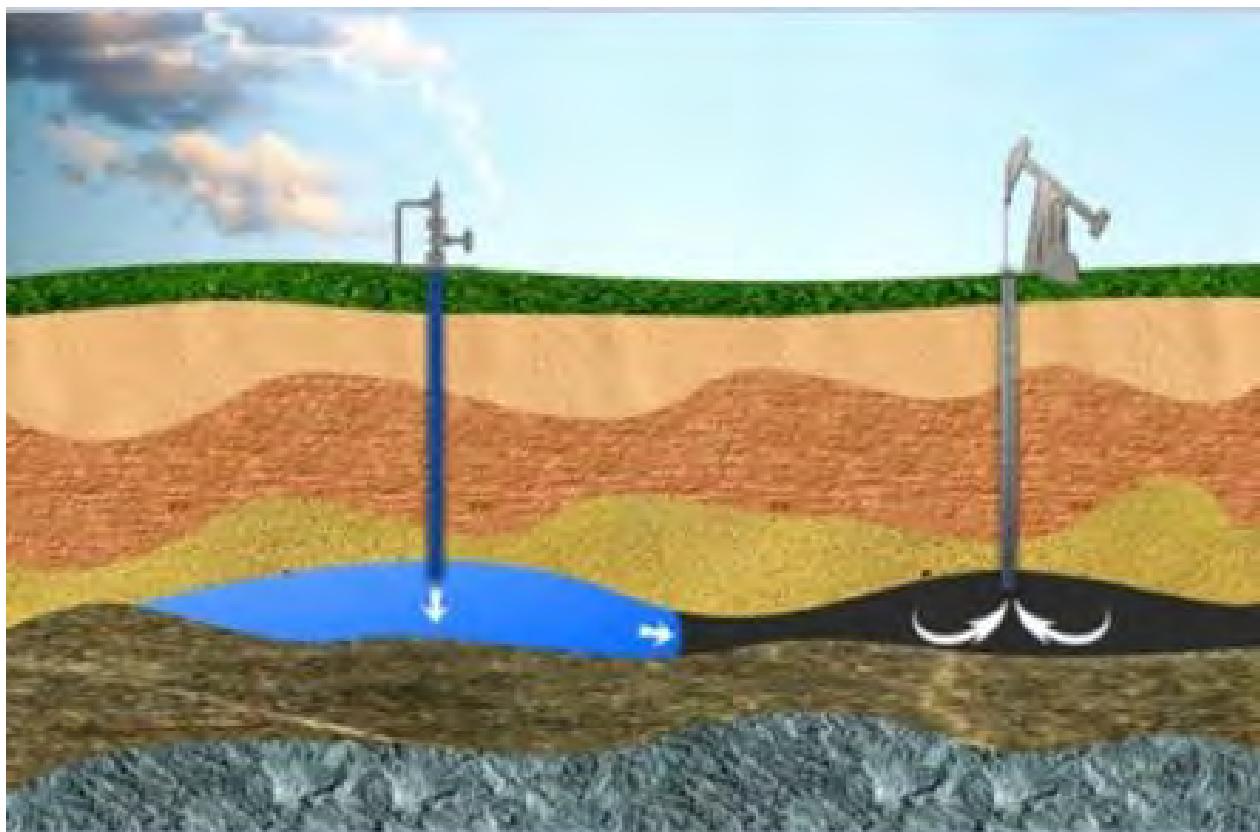


Figure 3-3. Enhanced Recovery Injection Well (Empower Network, 2013).

As mentioned in the previous section, when utilizing the Class II well maps to survey the types of Class II wells available, water planners and providers should understand that some wells shown on the map may no longer be active or hold an active well permit. Specifically, a Type 3 well

cannot be authorized for concentrate injection under a permit amendment if enhanced recovery actions have ceased.

3.3.1 Water Provider and Well Owner Agreement

The following sections describe different permitting options depending on the type of well proposed. For all existing well options, the water provider must contact the existing well owner/permit holder and well operator. A formal written agreement and/or initial contract (subject to permitting outcome) should be made prior to officially beginning any permit application or amendment process. The potential time frame of use and available well capacity should be discussed and carefully considered. The water provider must understand the risks involved with investigating an identified well without having a written agreement with the well owner. Similarly, both parties must understand the risks involved with pursuing the dual permit option under the TCEQ General Permit for an existing Class II well. As discussed in the next section, many Class II wells may not meet Class I well construction standards, and it is important to understand a particular well’s actual potential prior to investing time and money into the permitting process.

3.4 Class II Well Qualification for TCEQ Class I General Permit

For TCEQ to dually permit a Class II well (specifically a Type 1 or 2 well, listed above) as a Class I-Class II well, the Class II well must meet Class I construction, performance, and environmental standards under the General Permit, which only authorizes the disposal of “nonhazardous desalination concentrate” and/or “nonhazardous drinking water treatment residual.”

While general requirements for Class II disposal wells are comparable to Class I requirements under the General Permit, certain requirements differ significantly. Determining whether a Class II well meets current Class I requirements can be a complex task. Consulting with RRC Technical Permitting Section and TCEQ UIC Permits Section staff during this process is highly encouraged to obtain and evaluate available Class II well data. For older wells, constructed many (thirty or more) years ago, there may not be adequate well construction and performance records available. Without these well records, TCEQ cannot authorize an existing Class II well to operate as a Class I well under the General Permit.

The following sections highlight important differences between Class II and Class I requirements.

3.4.1.1 Protection of Underground Waters

Class II Type 1 and Type 2 wells differ in regulation regarding environmental protection standards of underground waters compared to Class I wells. To understand these differences, consider the following groundwater definitions based on the concentration of total dissolved solids (TDS) in parts per million (ppm):

- **Underground Source of Drinking Water (USDW):** An underground water with a concentration \leq 10,000 ppm TDS.
- **Base of Usable Quality Water (BUQW):** The lowest formation containing underground water with a concentration \leq 3,000 ppm TDS.

The protection of USDW formations reflects the 1986 federal amendments to the Safe Drinking Water Act (SDWA) and the federal UIC Program (40 CFR Part 144), while the protection of BUQW formations originates from 1976 Texas oil and gas well regulation. Federal UIC rules require the protection of USDW formations, unless a well receives an “aquifer exemption.” To meet this USDW protection requirement, a well must inject below the lowermost USDW formation; however, under certain conditions a Class II well may not be required to inject to this depth. Specifically Type 2 and 3 wells may inject into or above the lowermost USDW formation if the injection interval contains oil and gas resources (Class II regulations prohibit any harm to BUQW formations, though exemptions to this rule also exist). According to RRC staff, since Class II Type 1 wells do not inject into intervals that produce oil and gas, Class II Type 1 wells must comply with the federal UIC and SDWA regulation without exception and dispose waste to depths beneath the lowermost USDW (of important note the RRC has proposed draft amendments to its rules that would include explicit requirements for new Type 1, 2, and 3 wells to protect USDW formations, in addition to BUQW formations; this is discussed in more detail at the end of this section).

To evaluate whether a Class II well protects USDW formations under Class I standards, one must consider the following rules for Class I wells:

1. *Wells shall be sited in such a fashion that they inject into a formation which is beneath the lowermost formation containing, within one quarter mile of the well bore, a USDW (30 TAC 331.62(b)(1))*
2. *Wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well (30 TAC 331.62(b)(2))*

As noted above, Class II, Type 1 wells built after 1986 (enactment of the SDWA) should meet the first requirement of injecting below the lowermost USDW. Type 2 wells, however, may not meet this requirement if oil and gas resources exist above the USDW.

A second construction standard for Class I wells is that wells must be cased and cemented to prevent the movement of fluids into or between USDWs and must be designed for the life expectancy of the well. Discussions with TCEQ staff suggest that to meet this regulatory requirement, cemented casing may need to extend from the surface to the base of the lowermost USDW to qualify for coverage under the General Permit. Since the TCEQ has not yet dually permitted a Class I well under the General Permit it remains uncertain how TCEQ will interpret the rules listed above. Class II wells are not required to have cement casing from the surface to the lowermost USDW; the RRC only requires cement casing to extend to the base of BUQW formations. Because of this requirement, the amount of Class II wells eligible for the General Permit may be limited.

Even if TCEQ requires cemented casing from the surface to the lowermost USDW, a small portion of Class II wells may still qualify under the General Permit. In particular, although USDW and BUQW formations are defined by different salt concentrations, it is not uncommon for regions in Texas to have the lowermost USDW and BUQW to exist in the same formation and/or

in very close depth proximity. Salt concentrations can increase rapidly in a relatively short distance of groundwater depth.

3.4.1.2 Steps for Evaluating a Class II Well

Due to the significant limitations discussed above, it is strongly recommended that a water provider consult with RRC and TCEQ prior to investing a considerable amount of time and money in the evaluation of a particular Class II well for the dual permit option through the TCEQ. Both agencies are important resources, and their help and advice may save time, money, and effort. Moreover, TCEQ highly encourages. Moreover, all potential permit applicants to schedule a pre-application meeting with UIC Permits Section staff.

The water provider should take the following steps to initially assess the potential of a Class II disposal well to meet Class I standards:

1. Determine if the Class II well has sufficient records, including construction records and geologic logs, available by contacting the RRC and the well owner/operator. Certain well information can be obtained on the RRC website here:
<https://rrcsearch3.neibus.com/>.
2. If the Class II well has adequate records, determine the depth of the well and, request USDW information from the RRC (see next section for more detail on these steps). If the well was not constructed to a depth below the base of the USDW, then the Class II well in its current state would not meet Class I standards and therefore could not be dually permitted through the TCEQ. At the same time, consult with the RRC to determine the well's surface, intermediate, and long string casing depths. Have this information, along with all other well records, ready for discussion with TCEQ UIC Permits Section staff.
3. After finishing the above steps, contact the TCEQ UIC Permits Section to set up a consultation meeting or conference call. With the input of TCEQ staff, the water provider should consider the well's surface, intermediate, and long string casing depths with respect to underground formations, especially near respective BUQW and USDW formations. TCEQ staff should be able to advise the water provider on the potential for obtaining authorization under the General Permit.

After completing these steps, the water provider should assess the risks involved with proceeding with the General Permit application process. Geologic and engineering services may be required to determine whether a well is eligible for coverage under the General Permit.

3.4.1.3 Steps for Determining Lowermost USDW Formation

As discussed in the previous section, USDW information is imperative for understanding whether a Class II well is eligible to obtain authorization under the General Permit. The water provider should take the following steps to determine the lowermost USDW formation:

1. Contact the RRC via phone or email. If information is readily available on file, a RRC representative may be able to assist with this request more expeditiously than submitting an official inquiry form.
2. If the RRC representative directs you to submit an official inquiry form, submit a GW-1 form to the Groundwater Advisory Unit at the RRC, which may be downloaded at:
<http://www.rrc.state.tx.us/forms/forms/og/pdf/GW-1FINAL.pdf>. At the bottom of this

form, the requester will need to select the “Purpose” as H-1 (for Type 2 wells) or W-14 (for Type 1 wells). There is no charge for submitting a GW-1 form to request the depth to the base of the USDW. If USDW information is not on file, an RRC geologist would then examine geophysical log data to make an official determination. Additional instructions for completing a GW-1 are available at:

<http://www.rrc.state.tx.us/environmental/environsupport/gau/GW-1-Instructions.pdf>

3. An online tool may be used, prior to or in conjunction with the above steps. For certain parts of the state, the RRC, in cooperation with the Bureau of Economic Geology at the University of Texas at Austin has developed an online tool that can be used to get an initial, preliminary assessment of the base of USDWs in the area of a Class II well. This tool, however, has only been developed for 49 of 254 counties in Texas to date. The tool is available at: <http://www.beg.utexas.edu/sce/index.html>

After determining the lowermost USDW formation, continue to follow the steps listed in the previous section for evaluating a Class II well.

3.4.1.4 Proposed Draft RRC UIC Rule Amendments

As mentioned in the Introduction of this Permitting Roadmap, the RRC has proposed draft amendments to its UIC rules for Class II wells that may affect the steps of this Roadmap. First, the proposed changes would explicitly require the protection of USDW formations for new Class II disposal and injection wells. Refer to **Appendix E** of the *Manual for Permitting Process* document for further information on this subject. The following briefly summarizes the proposed related requirements for Class II - Type 1, 2, and 3 wells (RRC, 2013):

- For all types of Class II wells: all usable quality water formations would have to be isolated and sealed to prevent any migration of injected fluids;
- For all types of Class II wells: injection of fluids must not endanger USDWs or human health and safety.
- For Type 1 disposal wells: casing and cementing must adequately ensure that injected fluids will not endanger formations that contain USDW. Disposal wells must inject below the deepest USDW.
- For Type 2 and 3 wells: casing and cementing must adequately ensure that injected fluids will not endanger formations that contain USDW not productive of oil, gas, or geothermal resources.
- For injection wells, injection into a productive zone above the base of the USDW would be limited to fluids produced from that zone.

These proposed regulatory changes reflect language from the federal UIC program which requires all wells to adequately protect USDW formations. Such proposed draft amendments may have profound benefits for the ability to dually permit future Class II wells. The proposed language is similar to that of 30 TAC 331.62(b), and would require Class II wells to follow stricter casing and cementing requirements. The proposed geologic separation requirements would require the majority of Class II wells to inject into formations below the lowermost USDW. This requirement, along with stricter casing and cementing requirements, may provide the necessary technical requirements for most new Class II wells to qualify for eligibility under the TCEQ Class I General Permit.

Again, this discussion refers to drafted amendments that have not been finalized. The RRC is currently reviewing comments from other state agencies for internal review. At the present time, the timeframe for finalizing these draft rule amendments is unknown.

3.5 Class I Wells

If the water provider finds an existing Class I well in the area, the water provider may seek to dispose of concentrate or DWTR under the authorization of a TCEQ General Permit (**Flowchart C**). However, the water provider must first develop a legal contract with the existing well owner to either lease the well or obtain well ownership. Depending on the circumstances, utilizing the well may require a permit amendment or a new authorization under the General Permit. It is important to note that a well cannot be permitted under an individual permit and the General Permit at the same time. If an existing Class I well has an individual permit in place, this permit authorization would need to be terminated in order to obtain authorization under the General Permit. Contacting TCEQ UIC Permits Section staff for a consultation meeting can greatly help in this process.

3.6 New Class I Well

If no qualified wells exist, then the water provider may consider drilling a new Class I well. For nonhazardous concentrate disposal, drilling a new Class I well requires coverage under the TCEQ General Permit or an individual UIC permit. However, the Class I well drilling process can prove much more costly than using an existing well. The *Manual for Permitting Process* presents a cost evaluation based on the recent San Antonio Water System (SAWS) brackish groundwater desalination project which involved drilling a new Class I well instead of using an existing Class II well. SAWS represents a project participant in this Permitting Roadmap study. Well construction costs, mechanical integrity, construction materials, and hydraulic data are quantified in **Appendix D**, as part of this study.

This Permitting Roadmap presents **Flowcharts B-D** in the general order of permit process difficulty in terms of time and expense to a water provider. The RRC Class II permit amendment option (**Flowchart B**) is generally the least complex path, while the TCEQ Class I individual permit option (**Flowchart D**) is the most complex. Therefore the water provider may first want to prioritize the location and use of an enhanced recovery well so that the water provider and well owner/operator may apply for a RRC permit amendment. However, the water provider must also consider many different factors when deciding which type of well to use. For example, the transportation of the waste to the existing Class II well would need to be considered, as well as the volumetric capacity in an existing well. In every situation the water provider must consider the relationship with the well owner or operator and their role in the well permit application or permit amendment process.

To conclude, **Table 3-1** summarizes the options for nonhazardous concentrate disposal, and the regulating body that would permit the well.

Table 3-1. Summary of Options for the Disposal/Injection of Nonhazardous Desalination Concentrate and DWTR into Class I and Class II Wells in Texas

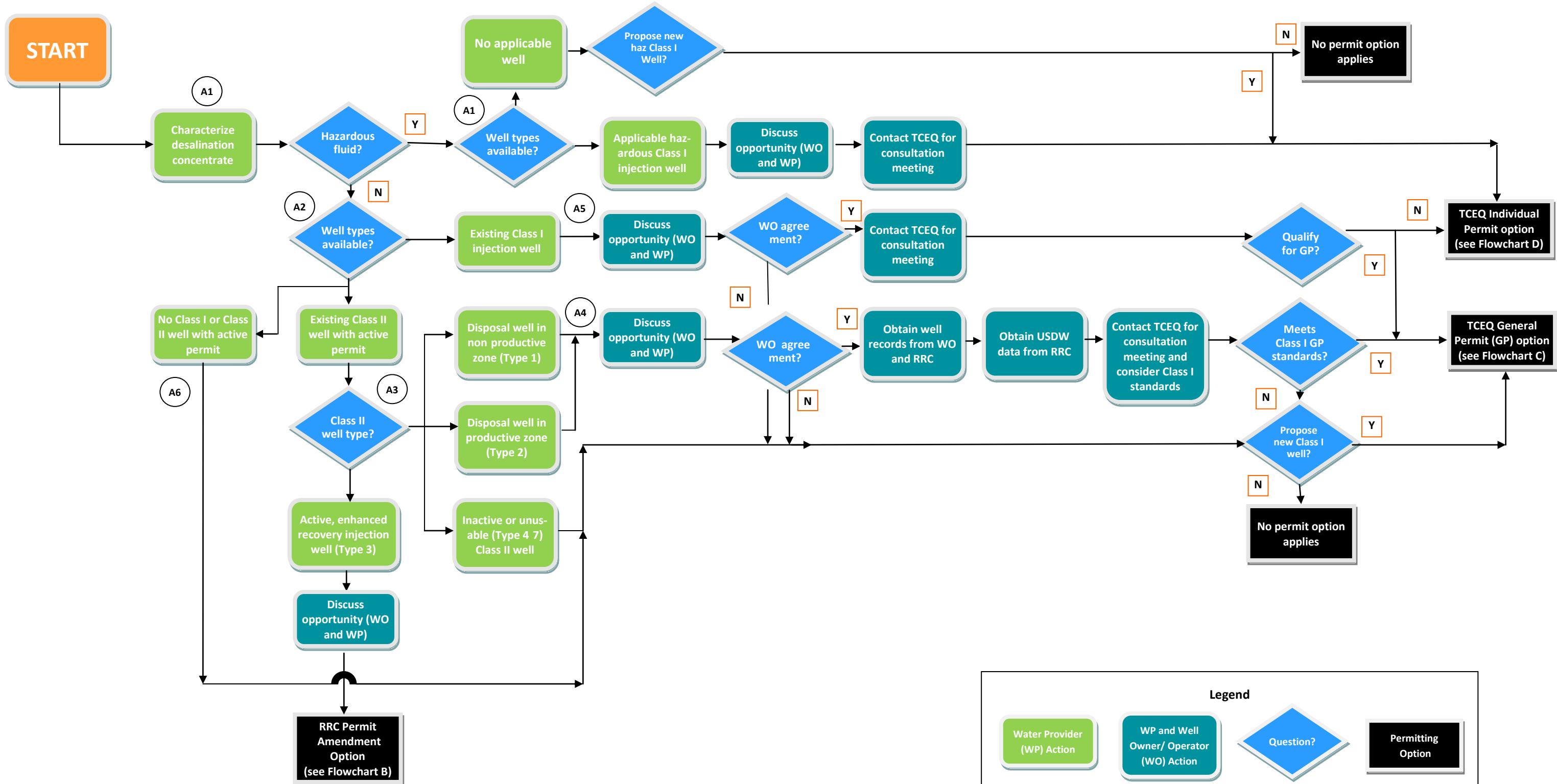
Well Type	Class I	Class II, Type 1	Class II, Type 2	Class II, Type 3
Definition	Industrial or municipal waste disposal well	Oil and gas waste disposal well in a non-productive zone	Oil and gas waste disposal well in a productive zone	Enhanced recovery injection well
Regulator	TCEQ	RRC	RRC	RRC
Regulation	30 TAC 331.62(b)	16 TAC 3.9, 3.13	16 TAC 3.46, 3.13	16 TAC 3.46, 3.13
Injection Depth Requirement	Beneath the lowermost USDW	Beneath the lowermost USDW	Beneath the lowermost base of usable quality water (BUQW) formation ^(a)	Beneath the lowermost base of usable quality water (BUQW) formation ^(a)
Casing and Cement Requirement	Prohibit any movement of fluids into or between USDW formations	Protect all usable quality water strata	Protect all usable quality water strata	Protect all usable quality water strata
Permit Option	TCEQ General Permit or individual permit	TCEQ General Permit or individual permit depending on waste streams – Dually permitted if well meets Class I standards	TCEQ General Permit or individual permit depending on waste streams – Dually permitted if well meets Class I standards	RRC Permit Amendment
Regulator of Permit Option	TCEQ	TCEQ regulates desalination waste streams; RRC regulates oil and gas activities	TCEQ regulates desalination waste streams; RRC regulates oil and gas activities	RRC
Permit Option Regulation	30 TAC 331.62(b)	30 TAC 331.62(b); 30 TAC 305	30 TAC 331.62(b); 30 TAC 305	16 TAC 3.46, 3.13
Potential Issues with Existing Well and New Permit Requirements	- Minimal issues	- Not required to have surface/intermediate casing from surface to USDW ^(c) - Not required to have long string casing from shoe to surface ^(c)	- May not have been required to inject below USDW ^(b) - Not required to have surface /intermediate casing from surface to USDW ^(c) - Not required to have long string casing from shoe to surface ^(c)	- Minimal issues
Permit Application Cost	\$100 for General Permit; \$100 - \$2,000 for individual	\$100 for General Permit; \$100 - \$2,000 for individual permit	\$100 for General Permit; \$100 - \$2,000 for individual permit	\$500

Well Type	Class I	Class II, Type 1	Class II, Type 2	Class II, Type 3
Permit Application Timeline	permit 90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	45 days from receipt of form to permit amendment

- (a) There are exceptions where Class II wells may inject above the BUQW formation if oil and gas reserves exist above such formations; (this exception may be affected by proposed changes to RRC rules).
- (b) Injecting below the lowermost USDW is an explicit requirement of the General Permit rules - 30 TAC 331.62(b)(1)
- (c) This is not an explicit requirement under the General Permit rules - 30 TAC 331.62(b)(1). This may be required depending on TCEQ's interpretation of the rules requirement to prevent the movement of fluids into or between USDWs. (Current Class II well requirements may be revised by proposed changes to RRC rules).

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Flowchart A: Permitting Roadmap Overview Detail



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5 Flow Chart B – RRC Permit Amendment Process Detail

This section describes the permit amendment process under the RRC for the injection of nonhazardous desalination concentrate and DWTR into existing Class II enhanced recovery wells (Type 3). According to RRC staff, no party has yet obtained a permit amendment for the injection of nonhazardous concentrate into an enhanced recovery well by applicants from outside of the oil and gas industry. The following list corresponds with labeled components of **Flowchart B – RRC Permit Amendment Process Detail**.

5.1 Well Selection

As described previously, the water provider must identify all applicable and nearby Class II enhanced recovery wells. The water provider can then discuss with each owner/operator of the enhanced recovery wells the opportunity to use concentrate from the water provider for oil extraction. An enhanced recovery well operation may use fresh water for enhanced recovery if no other economically or technically feasible fluid exists for injection. Therefore, the water provider should first identify any applicable enhanced recovery operations that utilize fresh water.

To move forward, the water provider and a well owner will need to create a legal contract for the use of desalination concentrate for enhanced recovery processes. Depending on the situation, this may also involve a monetary agreement. In some cases, the water provider may compensate the operator to accept and dispose of the concentrate; while in other cases the operator may compensate the water provider to use the concentrate. The two parties must develop a plan for amending the well's existing permit. It is important to note that the well owner must apply for a permit amendment. As a result, the water provider may need to provide significant financial, technical or administrative assistance during the permitting amendment process.

5.2 Contact the Railroad Commission

To date, the RRC has not issued any permit amendments for the injection of concentrate (or residuals from desalination or drinking water treatment) into an enhanced recovery well by a water provider. Since this involves a new permitting process, it is recommended that the applicant (the well owner/operator with assistance from the water provider) contact and notify the RRC in advance of submittal of the proposed permit amendment application.

The applicant can contact the RRC Technical Permitting Division by phone at 512-463-6792, or fax (512-463-6780). The applicant may also contact a representative from at the local RRC district office (one of twelve Oil and Gas Division locations). Contacts may be found at: <http://www.rrc.state.tx.us/contact/index.php>.

5.3 Permit Amendment Application Files

To obtain a permit amendment for an injection well in a productive zone, the RRC requires that the applicant submit forms H-1 and H-1A (found in **Appendix C-1** along with application procedures) with a \$500 filing fee for each individual well. This filing fee was previously \$200, but a recent surcharge, implemented in 2012 by the RRC, increased the filing fee for H-1 applications.

Depending on the type of process change, the applicant must also submit attachments and perform additional specific permitting steps. The RRC provides a checklist on its website, “Guidelines for

Permit Amendments,” which is available in **Appendix C-1** and online at <http://www.rrc.state.tx.us/forms/publications/HTML/r46-amnd.php> that lists the documents required for each type of process change (RRC, 2001). Potential applicable changes include amending the injection fluid type, volume, or pressure. Each of these listed changes requires that the applicant perform the following tasks.

- Notify the owner of the surface property tract of land where the well is located. The owner is the person listed on appraisal deed and tax records.
- Conduct an ownership survey map that shows well locations, well owners and well operators within a one-half mile radius of the proposed well location.
- Notify well operators within a one-half mile radius of the proposed well.

A notification involves mailing or delivering a copy of the application to the specified party. For a change in injection volume, no other steps are required. For a change in fluid type, the applicant must make the following notifications:

- Notify the county clerk of the county the well is located in.
- Notify the city clerk if the well is located within city limits.

For a change in pressure that results in the pressure exceeding one-half (1/2) pound per square inch per foot (psi/ft), the RRC requires that the applicant conduct a fracture pressure step-rate test to show that the injection interval can withstand a higher pressure. A pressure step-rate test involves injecting into the interval at increasing rates and recording the stabilized injection pressure at each rate. Plotting the injection pressure versus the injection rate then shows the fracture pressure. The RRC provides “Step Rate Test Guidelines” on its website that outlines required and recommended procedures (RRC, 2012). If the step-rate test shows that the formation cannot withstand the pressure increase, then the RRC cannot permit the proposed pressure change. For wells located in sensitive areas prone to fracture (Gulf Coast) or wells that demonstrate pressure buildup (Barnet Shale area), the RRC further limits the pressure to one-fourth (1/4) psi/ft.

Applying for a RRC permit amendment is much simpler than applying for a new well permit. New permits require additional steps such as completing an electric well log test (injection zone and overlying formations), obtaining a RRC Groundwater Advisory Unit groundwater depth letter (formerly issued by TCEQ) to ensure groundwater protection, conducting an area of review (AOR) (map and table of wells), and publishing a public notice for the proposed well.

5.4 Application Submittal and Review

After completing the permit amendment application, the well operator must submit the original documents to the RRC Technical Permitting section in Austin and submit a copy of each document to the local RRC Oil and Gas Division district office discussed below:

Technical Permitting
Railroad Commission of Texas (RRC)
P.O. Box 129671701 N. Congress
Austin, Texas 78711

District office addresses and their district territory may be found at:

<http://www.rrc.state.tx.us/contact/index.php>. Once the RRC receives the permit application, a 30-day period commences for the RRC to perform an administrative and technical review. For a permit amendment process, the RRC has to first verify that it already has a current organization report and Certificate of Compliance for the well operation on file. The review involves ensuring that the application is complete and that the proposed well operation meets technical standards.

5.5 Application Complete

If the RRC determines that the application meets technical standards and is declared administratively complete, then the RRC notifies the applicant of a complete permit application. The RRC has 15 days to process and officially issue the amended permit.

5.6 Application Incomplete

If RRC determines an application to be incomplete, they will send a request for additional information. If the applicant does not submit the required information within 30 days, the RRC will send a second request for additional information. Alternately, if the applicant does resubmit information and the application is still incomplete, then the RRC will send a follow up request for additional information. The RRC Practice and Procedure Code limits incomplete application filings to two subsequent filings for additional data. Thus, an applicant with an incomplete application can only receive two requests for additional information. After the second request, if the applicant does not resubmit any data, the RRC will return the incomplete application to the applicant and deny permit issuance. Each time the applicant does resubmit data for review, the RRC has 30 days to evaluate the additional material.

5.7 Administrative Permit Amendment Denial

If an application does not meet technical standards, RRC will administratively deny the permit amendment.

5.8 Protest of Application

An affected person or member of the local government may file a protest comment to the permit amendment application. The RRC summary of standards and procedures for injection and disposal well permitting defines an affected person as “a person who has suffered or will suffer actual injury or economic damage other than as a member of the general public, and includes surface owners of record of property on which the well is located and adjoining offset operators” (RRC, 2012). The RRC must allow a minimum of 15 days for a person to file a protest, and a protest can occur anytime during the application process before the issuance of the permit amendment.

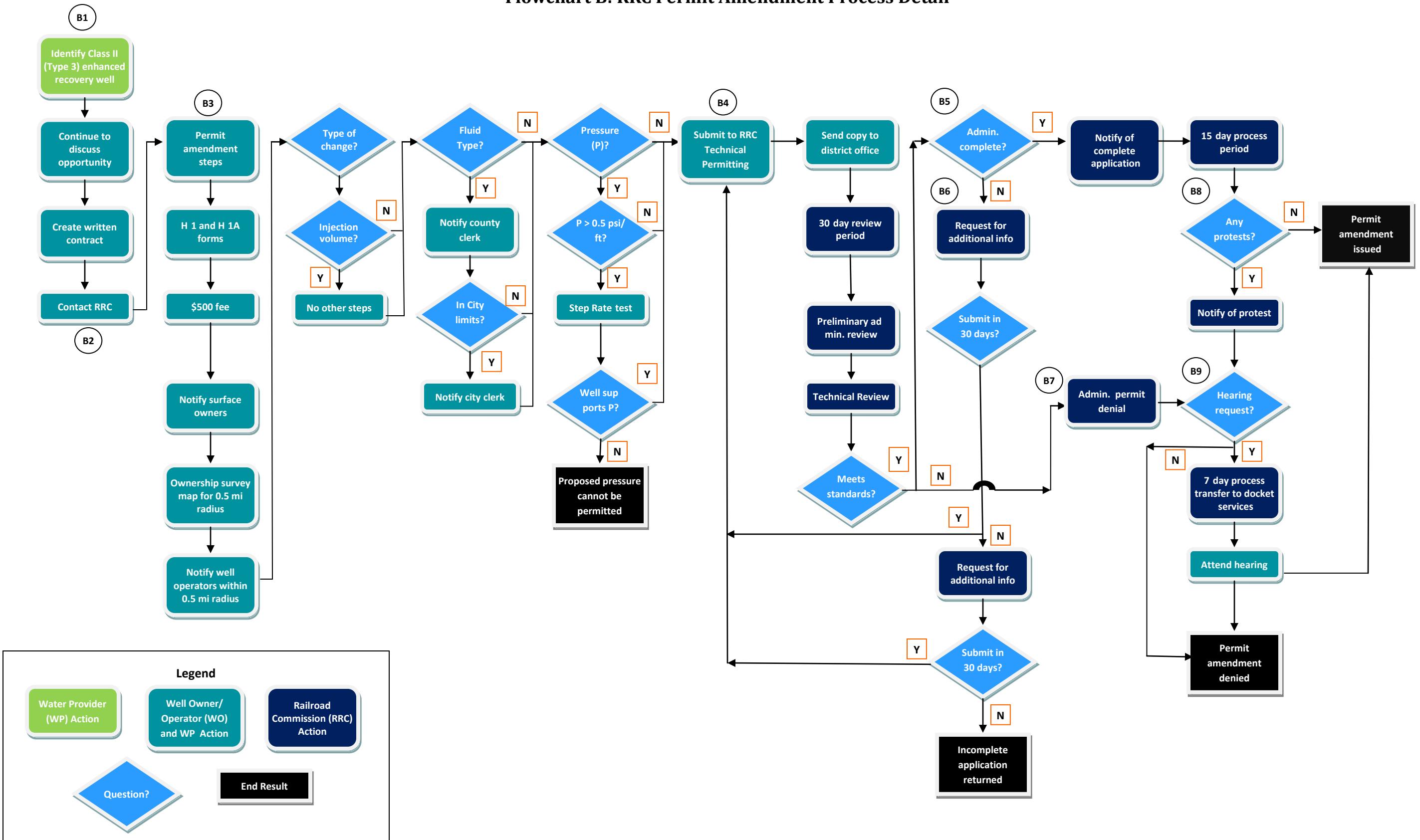
5.9 Hearing Process

An applicant may request a hearing after an administrative permit denial or in response to a filed protest. If the applicant does not request a hearing after either of these events, then the RRC will officially deny the permit. If the application is declared administratively complete, then within seven days, the permitting division will transfer the case to docket services to set and administer

the hearing. A hearing may result in two outcomes: permit amendment denial, or permit amendment issuance.

A permit amendment does not typically involve additional filing requests, protests, and hearings since the applicant already holds a permit and operates the existing well. Still, the RRC will carry through these types of actions as determined necessary.

Flowchart B: RRC Permit Amendment Process Detail



Reference: Railroad Commission of Texas. Injection/Disposal Permit Application Processing Flowchart. 19 October 2001. Accessed 27 August 2012. <<http://www.rrc.state.tx.us/forms/publications/HTML/pflowcht.php>>

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6 Flow Chart C – TCEQ General Permit Process Detail

Operators of Class I wells (and dually permitted Class I-II wells) may obtain authorization from the TCEQ to inject nonhazardous concentrate by seeking coverage under the statewide General Permit. The General Permit covers all Class I and dually permitted wells (i.e. a Class II well dually permitted as a Class I-II well) that meet the permit's performance standards for injection of nonhazardous concentrate, and expedites the permitting process of authorizations for wells used for these purposes. The General Permit contains requirements applicable to all Class I and dually permitted wells that are eligible for coverage under this General Permit. Safeguards are included in the permit to protect groundwater and surface water.

Injection into a Class I well must meet the technical standards and requirements specified in 30 TAC Chapter 331 and the Texas Water Code (TWC) Chapter 27. These technical standards are described in detail in Part III of the General Permit, and include, but are not limited to, construction, operation and closure standards; drilling and completion standards; and corrective action requirements. Standard permit conditions are included in Part IV of the General Permit (**Appendix C-2**) and additional guidance is provided in the form of guidance documents on the TCEQ UIC Permits Program website:

https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html.

Only nonhazardous concentrate and DWTR qualifies for disposal into a Class I or dually permitted Class II well under the General Permit (30 TAC Chapter 331, Subchapter L). Part II, Section B of the General Permit discusses in detail the waste streams prohibited from injection under the General Permit (**Appendix C-2**).

This section of the Permitting Roadmap describes the process for obtaining authorization from the TCEQ under the statewide General Permit to inject nonhazardous desalination concentrate or nonhazardous DWTR into a new or existing Class I or dually permitted Class I-II well. The following list corresponds with labeled permitting components of **Flowchart C**.

6.1 Well Selection

First, the water provider should identify all applicable and nearby Class I commercial or Class II wells. A discussion should follow between the water provider and the well owner or well operator regarding the opportunity to dispose of concentrate from the water provider into the Class I or dually permitted Class I-II well. If the operator of the well is not the owner, then the operator will be the applicant for a permit.

Authorization for use of an injection well under the General Permit may require legal agreements between the owner, operator, and water provider regarding the waste disposal and use of the well. If the water provider is not the owner of the well, the water provider may consider entering into a contract with the owner and/or operator to ensure sufficient access to the well to dispose of concentrate on-demand and over a time period that meets the water provider's needs. A water provider may want to seek legal counsel to provide guidance on the best course of action to ensure access to and use of the well meets the disposal needs of the water provider. These issues of contracts or agreements regarding waste disposal are outside of the scope of the General Permit.

If existing wells are not available, the water provider may consider locations for drilling a new Class I well under the General Permit to meet future concentrate disposal needs.

6.2 Contact TCEQ Underground Injection Control (UIC) Permits Section

TCEQ staff encourages potential applicants seeking a new permit or modifying an existing permit to contact the UIC Permits Section staff and arrange a meeting or conference call prior to filing a Notice of Intent (NOI). The UIC Permits Section is within the Radioactive Materials Division of the TCEQ Office of Waste, and can be contacted via email at uic@tceq.texas.gov or telephone at (512) 239-6466. More information on the UIC Permits program can be found on their website: http://www.tceq.texas.gov/permitting/waste_permits/UIC_contact.html

6.3 Submit a Notice of Intent (NOI) to TCEQ

All applicants seeking authorization to inject nonhazardous concentrate and DWTR under the General Permit are required to submit an NOI and a \$100 filing fee for each well that requires permit coverage. Submitting an NOI certifies that the conditions of the General Permit are applicable to the proposed waste injection, and that the applicant agrees to comply with the conditions of the permit.

NOIs for more than one well at the same site may combine this information into one document. The water provider must prepare a separate Part I of the NOI for each well (e.g., unique identification number; well location) and the multiple wells are then placed at the beginning of the document. The remainder of the NOI, consisting of a technical report, may apply to all wells.

The applicant must submit a completed NOI on the approved form, which is found on the TCEQ UIC Permits Program website:

https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html.

Minimum requirements of the NOI are detailed in Part II, Section C.3 of the General Permit (**Appendix C-2**). The NOI must include at a minimum:

- Legal name and contact information for the owner/operator of the well
- Location and coordinates of the injection well
- Ownership status, size and description of the facility
- Type of well (e.g. industrial, municipal) and whether it is a new or existing (conversion) well
- For existing wells, the authorization status of the well (e.g. active, inactive, terminated permit)
- If facility is located on Indian lands
- TCEQ Solid Waste Registration Number
- A listing of all existing, pending, interim status, or state and/or federal permits, licenses, or construction approvals which pertain to pollution control or industrial solid waste management activities at the facility
- Public interest demonstration, include a compliance history
- RRC Letter stating that the drilling of a disposal well and the injection of the waste will not endanger or injure any oil or gas formation

- Signature page
- Certification statement
- Technical report, which must include the following elements:
 - A topographic map extending one-mile beyond the property boundary of the well depicting the facility and any water management facilities
 - AOR (Area of Review)
 - Corrective action plan and well data
 - Maps and cross sections of USDW
 - Maps and cross sections of the geologic structure of the area
 - Well design and construction procedures
 - Formation testing and stimulation program
 - Injection procedures and operating data (injection rate, volume, pressure, annulus fluids, etc.)
 - Chemical, physical, radiological, and biological characteristics of the waste
 - Contingency procedures for well failures and shut-ins
 - Monitoring program (mechanical integrity testing, monitoring, and recording devices, sampling frequency, parameters measured, etc.)
 - Plugging and abandonment plan for the well including a closure cost estimate [30 TAC Section 305.49(a)(4) and Section 331.143]
 - Pre-injection units

Financial assurance must be submitted along with the NOI for new or existing wells. New wells must include the proposed financial mechanism along with the NOI, and will be required to file financial assurance paperwork once authorization under the General Permit is granted.

Technical information submitted in the NOI must demonstrate that the project will prevent the movement of fluids that could result in the pollution of an USDW and it must further establish that the applicant's plans and specifications meet all applicable standards, rules, and requirements of the General Permit. Research must be completed for all artificial penetrations of the projected injection zone. Research should include a search of RRC records on the locations of all non-freshwater artificial penetrations within the Area of Interest and the plugging records for these wells. This information is needed to verify that these wells were constructed and plugged to prevent movement of fluids into or between USDWs. This information is then compared to the increased pressure in the injection zone.

Technical reports must be signed and sealed by a licensed Texas professional engineer and/or licensed Texas professional geoscientist as appropriate. In addition, the technical report must include plans for design, construction, completion, operation, waste analysis, testing and closure of the Class I injection well to prevent the movement of fluids that could migrate and pollute an USDW. Specific individuals responsible for development, implementation, operation, maintenance, inspections, recordkeeping, and revision of the technical report must be identified in the NOI.

For existing Class II wells to be dually permitted the NOI must demonstrate that the Class II well meets the standards for a Class I well outlined in 30 TAC Chapter 331, Subchapter D and the

TWC Chapter 27. In circumstances where all required logs are not available for the existing well, the TCEQ may consider information available for other wells in the vicinity of the existing well seeking coverage under the General Permit. The applicant must justify how the available data is representative of the existing well.

6.4 Administrative Review Process

The TCEQ will conduct an administrative review of the NOI to determine if all required information is provided and that it demonstrates the proposed injection will not result in pollution of an USDW. TCEQ will review compliance history. The RRC letter included in the NOI will serve to demonstrate that the proposed waste injection will not result in any harm to oil and gas resources. The TCEQ will find no impairment of oil and gas resources if the RRC has issued a letter concluding that drilling and operation of a disposal well will not endanger or impair oil and gas resources.

Applicants seeking authorization under the General Permit for existing (or dually permitted) wells are required to submit financial assurance along with the NOI. Financial assurance must be estimated by the applicant to cover the cost of closing the well should the owner or operator be unwilling or unable to do so. Applicants can refer to 30 TAC Chapter 37, Subchapter Q, which establishes the requirements and mechanisms to demonstrate financial assurance for well plugging and abandonment and post closure activities. The cost estimate must cover the cost of plugging the well in accordance with the plugging and abandonment plan in accordance with this regulation.

If TCEQ determines the NOI is incomplete or that additional information is necessary for a complete NOI, then UIC Permits Section staff will send the applicant a request for additional information, otherwise known as a Notice of Deficiency (NOD) letter.

6.5 Authorization or Denial under the General Permit

Once all required information is received and the application is declared administratively complete, the applicant will receive a letter from the TCEQ acknowledging authorization under the General Permit and a unique identification number will be assigned for each authorized well.

If the application is not declared administratively complete and authorization under the General Permit is denied, the TCEQ Executive Director will provide written notice to the applicant, including the basis for the decision to deny coverage. Applicants denied coverage under the General Permit may seek coverage under an individual permit (discussed in more detail in **Section D** of this Permitting Roadmap). General Permit denial criteria are detailed in 30 TAC Section 331.203(c). If an application is declared administratively complete, authorization under the General Permit will not be denied.

6.6 Final Steps for New Wells Authorized Under the General Permit

New wells seeking coverage under the General Permit must submit financial assurance to the TCEQ at least 60 days before drilling begins. Financial assurance is a financial instrument provided to ensure that funds are available to plug the well should an owner or operator be unable or unwilling to do so. Applicants may refer to 30 TAC Chapter 37, Subchapter Q, which establishes requirements and mechanisms for demonstrating financial assurance for well plugging

and abandonment and the post closure activities. The amount of financial assurance required is determined by the applicant’s cost estimate to close the well.

Injection into a new Class I well cannot begin until well construction is completed, required documents are submitted, and TCEQ has an opportunity to inspect the well or review the well completion report. The TCEQ Executive Director has the authority to approve or disapprove the construction and completion of an injection well.

Within 90 days after the completion of the new Class I well, the permittee must submit a Completion Report to TCEQ UIC Permits Section staff. The Completion Report may serve as the Notice of Completion of Construction. The content of the Completion Report is listed in detail in Part II, Section F.2 of the General Permit and in 30 TAC Chapter 331.45(2). TCEQ requires the Completion Report to include:

- all available logging and testing program data on the well;
- a demonstration of mechanical integrity;
- the anticipated maximum pressure and flow rate;
 - Note that in order to demonstrate the anticipated maximum pressure and flow rate. The applicant must submit the results of the formation pressure buildup model. Information from actual testing will supersede information from an original pressure build up model included with the NOI.
- the results of the formation testing program;
- the actual injection procedure;
- the compatibility of injected waste with fluids in the injection zone and minerals in both the injection zone and the confining zone; and
- the status of corrective action on defective wells in the AOR.AOR

After TCEQ staff receives the permittee’s Notice of Completion of Construction or the Completion Report, the TCEQ Executive Director has 13 days to notify the permittee of his intent to inspect or review the new injection well. If the applicant does not receive notice from the TCEQ Executive Director within 13 days of the date of the filed Notice of Completion of Construction, then inspection or review is waived and the permittee may begin injection.

Alternatively, if the Executive Director notifies the permittee of intent to inspect or review the new injection well, then the permittee must wait until the inspection is complete before injection may begin. The Executive Director’s notification will include a reasonable time frame in which the inspection or review will be conducted. If during the inspection or review, it is determined that the well does not meet permit requirements, the process forward would be handled on a case-by-case basis. Outcomes may include a requirement for a Notice of Change to the NOI. The permittee is responsible for proper closure and post-closure monitoring of the well(s). Procedures for closure and post-closure are addressed in the NOI and the General Permit.

6.7 Final Steps for Existing Wells Authorized Under the General Permit

Within 90 days after the conversion of an existing Class II well (to a dually permitted well), the permittee must submit a Completion Report to TCEQ UIC Permits Section staff. The content of the Completion Report is listed in detail in Part II, Section F.2 of the General Permit (**Appendix**

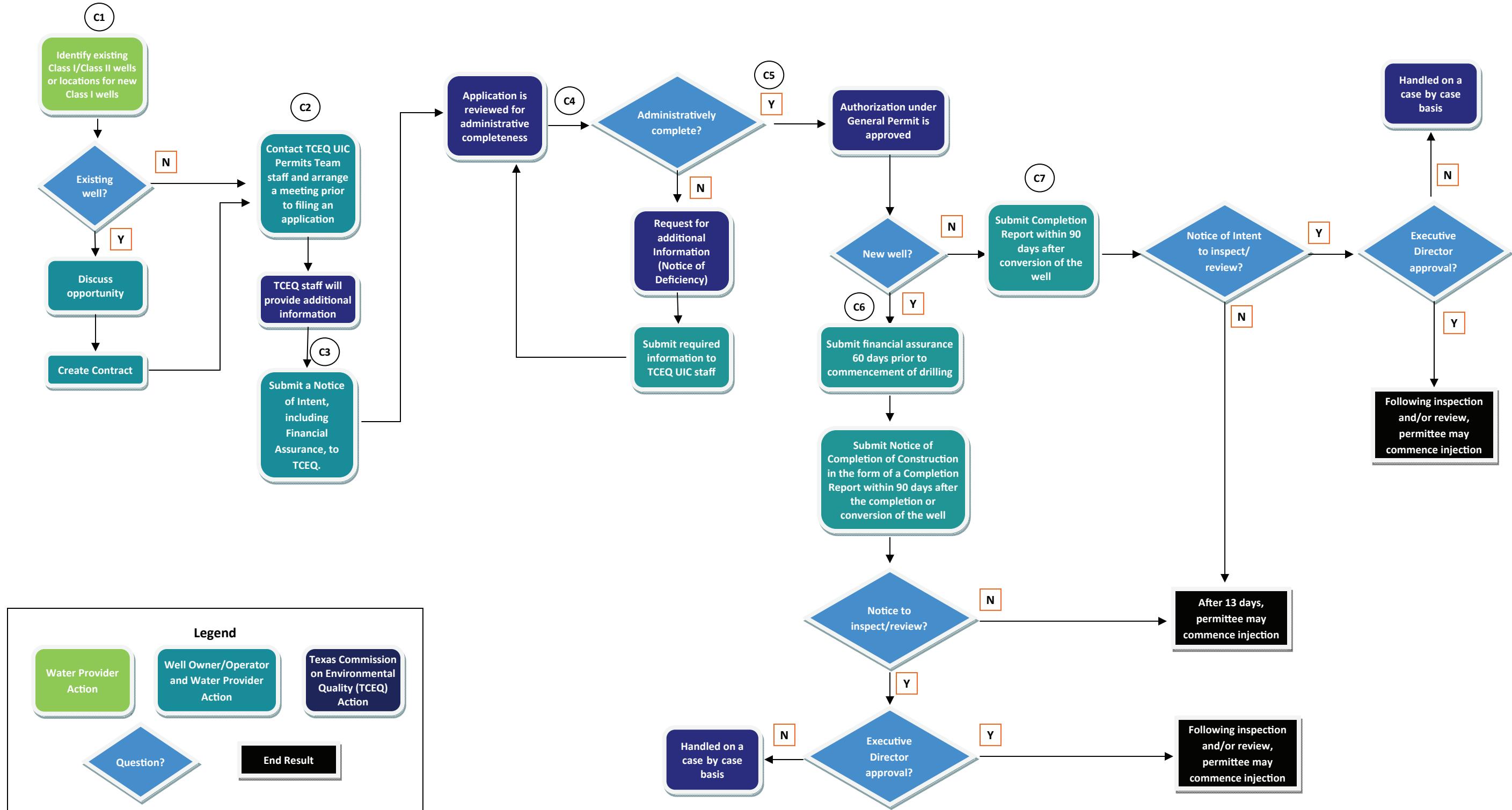
C-2) and in 30 TAC Section 331.45(2). TCEQ requires the Completion Report to include the “bulleted” items presented in **Section 6.6** above.

Following the submittal of the Completion Report, the Executive Director may notify the permittee of the TCEQ’s intent to inspect or review the existing well. If the applicant does not receive a notice from the Executive Director within 13 days of submitting the Completion Report, then prior inspection or review is waived and the permittee may commence authorized well injection.

Alternatively, if the Executive Director notifies the permittee of intent to inspect or review the new injection well, then the permittee must wait until the inspection is complete before well injection may begin. The Executive Director’s notification will include a reasonable time frame for the inspection or review to be conducted. If during the inspection or review, it is determined that the well does not meet permit requirements, the process forward would be handled on a case-by-case basis. Outcomes may range from a minor permit amendment to additional reporting to a major permit amendment.

Class I wells covered under the General Permit must pay an annual facility fee and waste management fees according to requirements in 30 TAC Section 335.324. As indicated by 30 TAC Section 331.206, the fees that apply to industrial solid waste in 30 TAC Section 335.324 also apply to wells permitted under the General Permit. The permittee is responsible for proper closure and post-closure monitoring of the well(s). Requirements for closure and post-closure are addressed in the NOI and the General Permit.

Flowchart C: TCEQ General Permit Process Detail



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7 Flow Chart D – TCEQ Individual Permit Process Detail

Authorization from the TCEQ to inject desalination concentrate can be obtained under the General Permit or by seeking coverage under an individual Class I permit. If a water provider has the need to dispose of any waste other than nonhazardous desalination concentrate or nonhazardous DWTR, including hazardous waste, an individual permit would be necessary and required to authorize disposal of those additional waste streams.

Injection into a Class I well must meet the standards established in 30 TAC Chapter 331, Chapter 305 and the TWC Chapter 27. Standards are also outlined in the UIC Permit Application Form: (http://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.htmlhtml). These technical standards include, but are not limited to: construction, operation and closure standards; public interest and siting requirements; drilling and completion standards; and corrective action requirements. For existing Class II wells to be dually permitted, the applicant must demonstrate that the Class II well meets the standards for a Class I well. In cases where all required logs are not available for the existing well, then TCEQ may consider information available for other wells in the immediate area of the existing well that seeks coverage under an individual permit. In this circumstance, the burden of the applicant is to justify how the available well data is considered representative of the existing well.

Authorization under an individual permit requires the permittee to comply with standard permit conditions outlined in 30 TAC Section 305.125 as well as any additional requirements included in the permit. This section describes the individual permit process under the TCEQ for the injection of desalination concentrate and DWTR into existing Class I injection wells or dually permitted Class II wells. The following step-by-step instructions correspond with labeled permitting components shown on **Flowchart D**, which outlines the individual permit process. Additional guidance documents are available through the UIC Permits Program website:

https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html.

7.1 Well Selection

The water provider should first identify all applicable and nearby Class I or Class II wells. A meeting should follow between the water provider and the well owner/operator to discuss the possibility of disposing of concentrate from the water provider into the well. If the operator of the well is not the owner, then the operator will be the permittee.

Authorization for the use of an injection well under an individual permit does not grant a vested right. Agreements between the owner, operator, and water provider regarding waste disposal and use of the well conditions are outside of the scope of an individual permit. A water provider may want to seek legal counsel for assistance to ensure access to and use of the well that meets their disposal needs. If the water provider is not the owner of the well, they may consider entering into a contract with the well owner and/or operator to ensure sufficient access to dispose of concentrate over a time period that meets the water provider's needs. In addition, depending on whether an existing Class I well is classified as commercial or noncommercial disposal well and the waste streams authorized for injection, the permittee of an existing Class I well may need to seek a permit amendment to authorize disposal of desalination concentrate or DWTR. Refer to 30 TAC Section 331.2(26) and (73) for definitions of commercial and noncommercial wells, respectively.

If suitable existing wells are not available in reasonably close proximity, the water provider may consider locations for drilling a new Class I well.

7.2 Contact TCEQ Underground Injection Control (UIC) Permits Section

TCEQ staff encourages potential applicants seeking a new permit or modifying an existing permit to contact the UIC Permits Section staff and arrange a meeting or conference call prior to filing a permit application. The UIC Permits Section is within the Radioactive Materials Division of the TCEQ Office of Waste, and can be contacted via email at uic@tceq.texas.gov or telephone at (512) 239-6466. More information on the UIC Permits Program can be found on their website: https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html

Submit the Appropriate Forms to TCEQ

The application for an individual Class I permit must be submitted on the required forms and must include the information outlined in 30 TAC Section 305.45 and Chapter 331. The Class I UIC application form and instructions provide a detailed list of information required with the application. The application form and instructions can be found on the UIC Permits Program website:

https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html

Below is a summary of the information each permit application must include (Note: for a complete list of information to be included, refer to the Class I Injection Well Application Form on the TCEQ UIC Permits Program website):

- General information (e.g. application type, waste type, facility type, source of waste)
- Contact information, location of the facility, and depths of injection zone and injection interval;
- For amendment, modification, transfer or endorsement applications:
 - Describe all requested changes to the permit and to the application contents and the reasons for the changes,
 - History of permit actions and application revisions (see the application form for more information);
- Applicant compliance history;
- Public interest demonstration, including, but not limited to, the following:
 - The use or installation of the injection well is in the public interest;
 - No existing rights, including, but not limited to, mineral rights will be impaired;
 - With proper safeguards, both ground and surface water can be adequately protected from pollution;
 - There is no practical, economic, and feasible alternative to an injection well reasonably available;
 - For hazardous waste injection wells, public interest demonstration must also show:

- That if the well is not located in an area of industrial land use, the applicant has made an effort to ensure that the burden, if any, imposed by the proposed well on local law enforcement and other local services, will be reasonably minimized or mitigated;
- The applicant owns or has made a good faith claim to, or has the consent of the owner to utilize, or has an option to acquire, or has the authority to acquire through eminent domain, the property or portions of the property where the hazardous waste injection well will be constructed;
- The applicant will maintain sufficient public liability insurance or will demonstrate financial responsibility in lieu of this insurance;
- For on-site generated waste, provide certification by the owner/operator that 1) the generator of the hazardous waste has a program to reduce the volume or quantity and toxicity of the waste and 2) injection of the waste is that practicable method of disposal currently available to the generator which minimizes the present and future threat to human health and the environment;
- Pre-injection units authorization and method used for authorization;
- Location information, including the following:
 - Whether the facility is located in an area which the governing body has prohibited the processing or disposal of municipal hazardous waste or industrial solid waste;
 - topographic map of the facility and area extending beyond one mile beyond the facility boundaries which identifies the location of all injection wells, facility boundaries, surface intake and discharge structures, wells, springs and other surface water bodies, and mineral rights holders underlying or adjacent to the facility;
- Information required for public notice (e.g. mailing list of adjacent landowners and all mineral rights holders underlying or adjacent to the well tract, bilingual notice if applicable, contact information for local authorities)
- Letter from the RRC stating that drilling the well and injecting waste will not endanger or injure any known oil or gas resources;
- Demonstrate compliance with the financial assurance and liability requirements in 30 TAC Chapter 37;
- **Geology Report:** This report and all associated documents must be prepared, sealed, signed and dated by a Texas Professional Geoscientist (P.G.). Below is a summary of the information required (Note: a complete list of the required information is outlined in Section V of the UIC permit application form):
 - **Regional Geology and Hydrogeology:** Describe regional stratigraphic and structural geology, lithology, and hydrogeology pertinent to the proposed injection program. This information should include, but is not limited to, the following:
 - Regional stratigraphy, including a stratigraphic column;
 - Regional hydrostratigraphy, emphasizing major aquifers and the lower USDW;
 - Definition and description of the confining zone and the injection zone, including structural and isopach maps;
 - Regional cross-sections from the surface through the confining strata below the injection zone; or to as deep as necessary to define the structure;

- Discuss the regional structural geology as it relates to the injection well site;
- Regional seismic activity;
- Discussion of regional groundwater flow in the injection zone;
- Local Geology and Hydrogeology (within the AOR): Describe local stratigraphic and structural geology, lithology, and hydrogeology pertinent to the proposed injection program. Maps must cover the AOR, which is a two-mile radius from the injection well, or the area of the cone of influence, whichever is greater. This information should include, but is not limited to, the following:
 - In areas that lack sufficient well control, where the well geology is complicated or there are questions or disputes regarding faulting, the procurement and interpretation of seismic reflection data may be necessary;
 - Stratigraphy, including a stratigraphic column;
 - Hydrostratigraphy, emphasizing major aquifers and USDWs within them;
 - Definition and description, including but not limited to the lithology and rock properties, of the following:
 - Lowest USDW – describe the configuration of the USDW base and method of its determination;
 - Confining zone – include structure and isopach maps and justification of its capability to act as a confining layer;
 - Injection zone – include structure and isopach maps and justification of its capability to accept and contain the waste, including documentation that the injection zone has sufficient permeability, porosity, thickness and areal extent to prevent migration of fluids into USDWs or freshwater aquifers;
 - Injection interval – include structural and isopach maps and discussion of existing, abandoned and anticipated completion intervals;
 - Confining strata beneath the injection zone;
 - Structural cross-sections, intersecting the proposed injection well location;
 - Discussion of structural geology (including analysis of faults, fractures and any surface lineations);
 - Delineation of faults within the AOR. Permits cannot be issued for wells that have a fault in the injection zone or within the AOR unless the applicant demonstrates that each fault is not sufficiently transmissive or vertically extensive to allow migration of hazardous constituents from the injection zone;
 - Demonstration that the confining zone is laterally continuous and free of transecting, transmissive faults or fractures over an area sufficient to prevent movement of fluids into a USDW or freshwater aquifer;
 - Demonstration that the confining zone contains at least one formation of sufficient thickness and with lithologic and stress characteristics capable of preventing initiation and/or propagation of fractures;

- Demonstration that the confining zone is separated from the base of the lowermost USDW by at least one sequence of permeable and less permeable strata that will provide protection for the USDW;
- Demonstration that within the AOR, the potentiometric surface of the injection zone is less than the potentiometric surface of the lowermost USDW;
- Demonstration that no USDW is present;
- Description of the seismic history of the area;
- Description of the surface geology.
- **Injection Well Engineering Report:** this report and all associated engineering documents must be prepared, sealed, signed, and dated by a Texas professional engineer (P.E.).
 - Provide the following information on well design and construction (also refer to 30 TAC Section 331.62(a) for construction standards and to the Class I Injection Well Construction Guidance available on the TCEQ UIC Permits Program website [https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html/#General]):
 - Engineering drawing of the proposed well construction;
 - Total depth of the well;
 - Detailed information for each casing and tubing string
 - Proposed completion interval(s) and completion;
 - Cementing procedures, types of cement, cementing equipment, and for conversion wells provide information on the location of cement in the well.
 - Plans for logging, coring and testing wells;
 - Proposed well stimulation program, acidizing, etc., where applicable;
 - Description of injectivity/fall-off test for determination of well capacity and reservoir characteristics and description of proposed surveys to establish preferred injection intervals;
 - Engineering drawings of wellhead configuration and annulus monitoring systems;
 - Demonstration that all well materials, including the wellhead, tubing, packer, long string casing and cement, are compatible with the injection fluids and formation fluids the materials are expected to contact;
 - Plans for notification of well construction and submittal of pre-operations reports in accordance with 30 TAC Sections 331.62(a)(10), 331.65(b), 331.45 and the two-year construction time limit required in 30 TAC Section 305.149 for commercial hazardous waste wells;
- **Existing Well Design and Condition:** Provide the following information on well design and condition of existing injection wells:
 - Engineering drawing of the existing well construction, with appropriate information on type, size, weight, grade and setting depths of tubing, casings, liners, packers, cement types and location behind casings, annulus fluids, completion details, sidetracks, plugbacks, etc. (30 TAC Section 331.121(a)(2)(K);

- Detailed discussion of the well history including construction, workovers, stimulations, design and/or operational problems, concerns, and recommendations for improvements;
 - Results of quarterly corrosion monitoring and annual mechanical integrity testing and an assessment of the present condition of the tubing, casing, liner, packer and interior of the wellhead;
 - Engineering drawings of wellhead configuration and annulus monitoring system.
- **Well Operation, Monitoring, and Maintenance:** Provide the following information for all proposed new wells and existing wells:
 - Maximum instantaneous rate of injection (gallons per minute) requested for the permit;
 - Average rate of injection per month and the total monthly and annual volumes requested for the permit;
 - An estimate of the average and maximum daily injection rate and the volume of fluid or waste to be injected over the anticipated life of the injection well and detailed information regarding patterns of injection;
 - Average surface injection pressure and the maximum surface injection pressure requested for the permit;
 - Operation and injection procedures that demonstrate compliance with the operating requirements;
 - Detailed monitoring plans with engineering diagrams, if applicable, for meeting the following requirements:
 - Pressure gauges installed and maintained, at the wellhead, in proper operating conditions in accordance with the requirements of 30 TAC Section 331.64(c);
 - Continuous recording devices installed, used and maintained in proper operating condition, and automatic alarm, shutoff, response and notification systems designed as required by 30 TAC Section 331.64(d);
 - Annual mechanical integrity testing conducted in accordance with 30 TAC Section 331.64(e);
 - Quarterly corrosion monitoring for all well component materials that may be in contact with the waste stream conducted in accordance with requirements of 30 TAC Section 331.64(g);
 - Annual pressure buildup monitoring in the injection zone, including at a minimum, a shutdown of the well for a time sufficient to conduct a valid observation of the pressure fall-off curve in accordance with 30 TAC Section 331.64(h)(2);
 - Demonstration that the base of the wellhead will be enclosed by a diked, impermeable pad or sump to protect the ground surface from spills and releases and that any liquid collected will be disposed of in an appropriate manner;
 - Contingency plans (based on worst case scenarios) to cope with all shut-ins or well failures and/or 100 year rainfall events and descriptions of emergency storage/alternative disposal facilities;
- Well Closure, Post-Closure Care and Cost Estimates: including, but not limited to:

- Submit a step-by-step well closure plan describing how compliance with the plugging and abandonment requirements of 30 TAC Section 331.46 and 331.144 is attained;
 - Submit a detailed cost-estimate for closure of the well assuming closure activities will be conducted by a third party with no operable on-site equipment;
 - For hazardous waste wells, submit a post-closure plan describing the manner in which compliance with post-closure care requirements of 30 TAC Section 331.68 will be attained;
 - If applicable, submit a detailed cost estimate, for all proposed post-closure care activities, including corrective action and groundwater monitoring.
- **Reservoir Mechanics Report:** the report and all documents associated with it must be prepared, signed, and dated by a Texas P.E. or P.G., as appropriate.
 - Discuss reservoir mechanics/hydrology of the injection reservoir, including but not limited to the following information:
 - Summary of the stratigraphy and lithology of the injection zone to address the relationship of the injection reservoir to the injection interval and to the part of the injection zone above the injection interval;
 - Injection reservoir stratigraphy, lithology, porosity, effective porosity, permeability, thickness and temperature;
 - Salinity, density, viscosity, and pH of the injection reservoir fluid;
 - Initial and current static reservoir pressures at the top of the injection reservoir;
 - Estimation of pressure necessary to extend existing fractures at the top of the injection reservoir;
 - The maximum allowable surface injection pressure requested for the permit;
 - Predictions of increase in reservoir pressure due to injection within the AOR;
 - Determination of the cone of influence;
 - For permit renewals or permitting additional wells at a facility, an historical analysis of the pressure effects of existing injection well(s) upon the injection reservoir using data from annual pressure buildup monitoring and other testing. For an additional injection well, discuss potential effects of the new well as related to the existing injection operations;
 - A potentiometric surface map of the injection zone under static conditions, or if data is unavailable, expected static fluid level and regional gradient;
 - A justification for the anticipated geometry of the waste plume;
 - Extent of the waste plume as it presently exists, projected 10 years from present, and over the anticipated operational lifetime of the well;
 - Discuss other subsurface disposal operations in the AOR. Include operator names, distance from the applicant's well, and the injection reservoir depths. Describe whether any are in the same injection reservoir as the applicant's injection well(s) and whether there is pressure interference between the injection wells or mingling of the waste plumes.
- **Area of Review (AOR) Report:** report and associated documents must be prepared, sealed, signed and dated by a Texas P.E. or P.G., as appropriate and include the following:

- Map showing the location, name, number and depth of the existing and/or proposed injection wells and all other wells within the AOR;
 - Identify, locate and ascertain the condition of all wells within the AOR which penetrate the injection zone and/or confining zone;
 - Submit a tabulation of data on all wells in the AOR that penetrate the injection zone and/or confining zone. Submit completion and plugging records for each well, including information regarding casing size, setting depth, and surface, intermediate, and long string casing/liner cementing records;
 - Submit schematics of all wells within the cone of influence;
 - Determine the wells that are improperly constructed or abandoned, i.e., wells that would allow the movement of fluids into or between USDWs due to pressures in the injection zone (see Section VIII.E of the UIC Class I permit application);
 - Propose a corrective action plan and schedule for any inadequately constructed or abandoned wells in accordance with the requirements of 30 TAC Section 331.44, or request a lower injection rate if that will result in a pressure increase that is sufficiently low to prevent endangerment of USDWs;
 - If ambient monitoring is needed to assess or monitor the potential for fluid movement from the well or the injection zone, propose a monitoring plan in accordance with 30 TAC Section 331.64(f) and (h)(1)
- **Well diagram:** showing casing sizes, depths, cement tops, plugs, perforations, USDW, and tops of injection interval and injection zone;
 - Wastes and Waste Management:
 - Analysis of the chemical and physical characteristics of each waste stream proposed to be injected along with a Waste Analysis Plan (see Section IX.A.5 of the UIC Class I permit application).
 - If applying for a hazardous waste injection permit the following information is required for each active Class I hazardous waste injection well:
 - Dates well was operated
 - Specification of all wastes that have been injected in the well, if available;
 - All available information pertaining to any release of hazardous waste or constituents from any active hazardous waste injection well at the facility; and
 - Results of preliminary site investigations required by 30 TAC Section 331.121(e)(3) as necessary to determine whether a release is occurring, has occurred, or is likely to have occurred.
- **Pre-Injection Unit Engineering Report:** Pre-injection units for Class I nonhazardous, noncommercial injection wells must be authorized by a permit issued by the Commission or registered in accordance with 30 TAC §331.17. The technical standards and application requirements are the same for either option. Design, construction, operation, maintenance, monitoring and closure of the pre-injection units must meet the requirements of 30 TAC §331.5(c) and the applicable technical standards specified in 30 TAC Chapter 217 and §331.47. A complete list of the information to be included in this report is provided in Section XII of the UIC Class I permit application

(https://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html/#General).

Application forms, along with guidance documents and other reference materials, are provided on the UIC Permits Program website:

http://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html.

Application fees are required with the application documents; the fee schedule is outlined in 30 TAC Section 305.53. Permit applications for wells that will only receive nonhazardous waste require a \$100 filing fee while those for hazardous waste disposal require a \$2,000 filing fee.

Table 7-1 below outlines fees for each type of application for an individual Class I permit.

Financial assurance must be estimated by the applicant to cover the cost of closing the well should the owner or operator be unable or unwilling to do so. Owners or operators of hazardous and nonhazardous Class I and dually permitted wells must demonstrate financial assurance for plugging and abandonment, and post closure activities (post closure activities apply only to wells that accept hazardous waste). Applicants can refer to 30 TAC Chapter 37, Subchapter Q, which establishes requirements and mechanisms for demonstrating financial assurance.

Table 7-1. Fees for Individual Class I Permit Applications

Type of Application	Application Fee ¹	Rule Citation	Notice Fee
		30 TAC	30 TAC §305.53(b)
New Class I Nonhazardous	\$100 per well	§305.53(a)(1)	\$50 per application
New Class I Hazardous	\$2000 per well	§305.53(a)(1)	\$50 per application
Amendment Class I Nonhazardous	\$100 per well	§305.53(a)(1)	\$50 per application
Amendment Class I Hazardous	\$2000 per well	§305.53(a)(1)	\$50 per application
Renewal Class I Nonhazardous	\$100 per well	§305.53(a)(1)	\$50 + \$15 per application
Renewal Class I Hazardous	\$2000 per well	§305.53(a)(1)	\$50 + \$15 per application
Transfer of Permit ²	\$100 per well	§305.64(b)(4)	\$50 per application
Minor Modification	\$100 per well	§305.53(a)	None [§305.72(b)]
Endorsement ³	\$100 per well	§305.53(a)	None [§50.145(a)]

7.3 Administrative Review Process

The first step once the permit application is received by the TCEQ UIC Permits Section staff is to conduct an administrative review within ten working days of receipt of the application. TCEQ staff review the application materials to determine if required information on the applicant, affected property owners and each of the technical sections is included. If TCEQ staff determines information is missing, a Notice of Deficiency (NOD) letter will be sent to the applicant. The applicant is required to respond to the NOD letter by providing all information necessary for the application to be declared administratively complete. After the application has been declared administratively complete, technical review of the application begins. At this time the TCEQ will also provide instructions regarding public notice to the applicant.

The RRC letter included in the application will serve to demonstrate that the proposed well injection will not result in any harm to oil and gas resources. The TCEQ will find no impairment of oil and gas resources if the RRC has issued a letter concluding that drilling and operation of a disposal well will not endanger or injure oil and gas resources. The Notice of Receipt of Application and Intent to Obtain a Permit must be published within 30 days of the application being declared administratively complete. The public notice process is described in more detail in step 7 below.

7.4 Technical Review Process

Once the permit application is determined to be administratively complete, TCEQ staff conducts a technical review of the application. During a technical review, TCEQ staff reviews the geohydrologic and engineering details, in addition to operational procedures for the proposed Class I well or existing Class II well seeking a Class I permit. The applicant may receive a request for additional information during the technical review process; this request comes in the form of an NOD. If an NOD letter is received, the applicant must submit all of the required information to the TCEQ UIC Permits Section in order for the technical review to proceed.

7.5 Draft Permit Issued

For applications determined technically complete, TCEQ staff will prepare and email to the applicant an initial draft permit. To encourage public participation in the permit process, the TCEQ Executive Director will prepare and the Chief Clerk's Office will mail a Notice of Receipt of Application and Intent to Obtain a Permit and a Notice of Application and Preliminary Decision to the applicant. The applicant is required to publish the notices in the appropriate news media, and to determine if the notice must be published in an alternate language. The TCEQ UIC Permits Section staff will provide instructions on public notice requirements to an applicant once the application has been declared administratively complete. Detailed procedures on the public notice process are provided in 30 TAC Chapter 39. Templates for preparing UIC Notices in Spanish are available online:

http://www.tceq.texas.gov/permitting/waste_permits/uic_permits/uic_anl_page.html

7.6 Required Public Notice Process

The public notice process is detailed in 30 TAC Chapter 39, Subchapter L and outlined on **Figure 7-1**. The applicant must publish notice in the newspaper of largest general circulation in the county where the facility is located or is proposed to be located. The Notice of Receipt of Application

and Intent to Obtain a Permit must be published within 30 days of the application being declared administratively complete. The Notice of Application and Preliminary Decision must be published within 45 days of the notice being mailed by the TCEQ Chief Clerk's Office to the applicant. The applicant must provide evidence of the published notice (i.e. publisher's affidavit) to the Chief Clerk's Office demonstrating compliance with the public notice availability requirement. The deadline to file a copy of the published newspaper notice is ten business days after the last publication date, and the publisher's affidavit must be filed within 30 calendar days of the last date of publication for each notice period.

During public notice, the applicant must make a copy of the permit application available for review and copying at a designated public place in the county where the facility is located or proposed to be located. Materials available for review must include:

1. A copy of the administratively complete application beginning on the first day of newspaper publication of the Notice of Receipt of Application and Intent to Obtain a Permit, and must remain available for the full comment period; and
2. A copy of the completed application (including any revisions) and the Executive Director's preliminary decision must be available for review beginning on the first day of the publication. The documents must remain available until the TCEQ has taken action on the application or the TCEQ refers a contested case to the State Office of Administrative Hearings (SOAH) for resolution.

Following each public notice, the TCEQ Executive Director receives and responds to all significant public comments. At this point, individuals that may potentially be affected by the injection well may request a public meeting or public hearing prior to a final decision being made on a permit application. **Table 7-2** summarizes the public notice requirements of the TCEQ individual permit.

Class I wells covered under an individual permit must pay an annual facility fee and waste management fees according to requirements in 30 TAC Section 335.324. Determination on Issuing an Individual Permit

Class I wells disposing of only nonhazardous desalination concentrate or DWTR are not eligible for a contested case hearing; therefore this step does not apply in those circumstances. If a water provider is disposing of additional waste streams, then a contested case hearing is possible. For permit applications that are uncontested, once the public notice process is complete the TCEQ Executive Director determines if the permit should be issued. The Executive Director's decision may be appealed to the TCEQ Chairman and Commissioners for resolution if public opposition is significant.

For permit applications that are contested, the TCEQ Commission must determine if the permit application should be referred to the SOAH for a public hearing. If the TCEQ Commission determines a permit may be issued, the applicant will receive a copy of the individual permit.

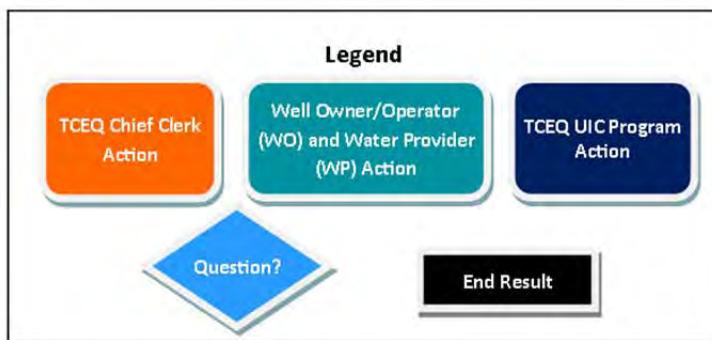
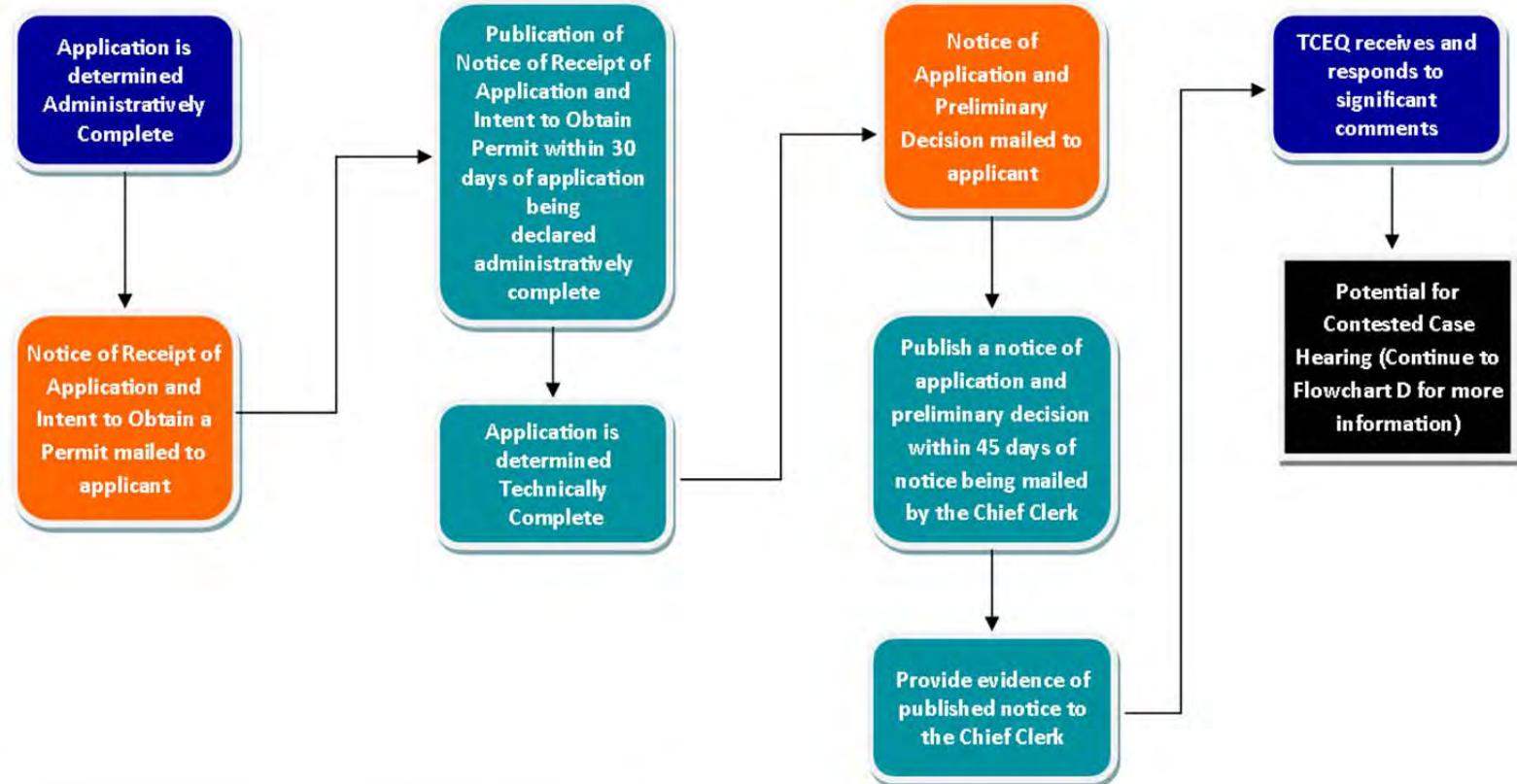


Figure 7-1. Public Notice Process

Table 7-2. Summary of Public Notices and Deadlines

Public Notices	Publication Deadline	Deadline to File Documents with the Chief Clerk's Office⁽¹⁾
Notice of Receipt of Application and Intent to Obtain Permit	Publish within 30 days of application being declared administratively complete	Published notice filed within 10 business days of last publication date
Notice of Application and Preliminary Decision	Publish within 45 days of the notice being mailed by the TCEQ Chief Clerk's Office	Publisher's affidavit filed within 30 days of last publication date

(1) Deadlines to file documents with the Chief Clerks' Office apply to both public notices

7.7 Final Steps for Wells Authorized Under the Individual Permit

The permittee is required to submit a Completion Report to the TCEQ Executive Director within 90 days of the completion or conversion of the well. The completion report must include:

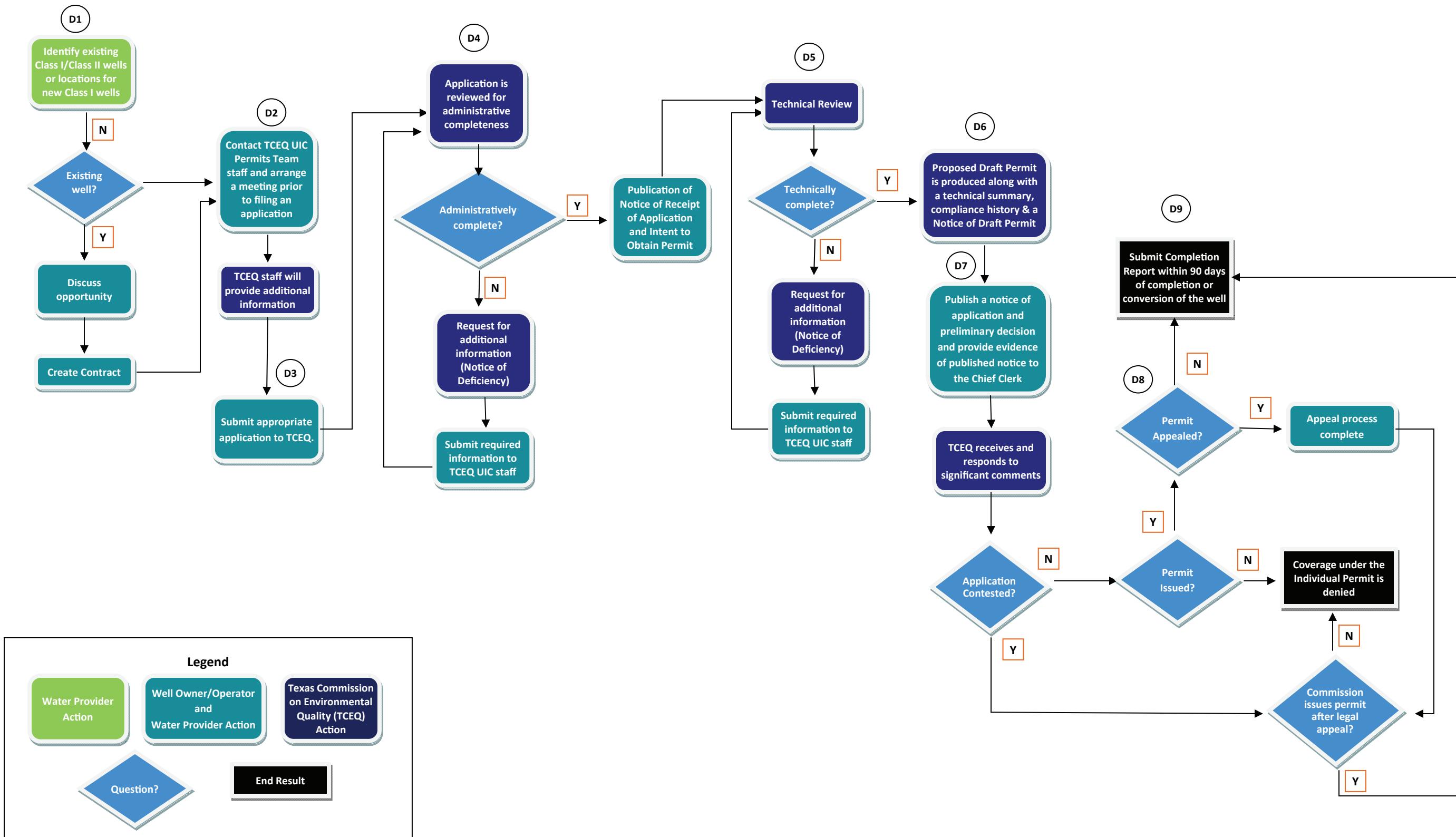
- A surveyor's plat showing the exact location of the well, including the latitude and longitude of the well;
- A certification that a notation on the deed to the facility property or on some other instrument which is normally examined during property title search has been made stating the surveyed location of the well, the TCEQ well permit number, and the permitted waste streams.

Under an individual permit, hazardous waste may be injected into a Class I well (if it is authorized to accept hazardous waste), and in those instances, the facility fees that apply to hazardous waste in 30 TAC Section 335.324 would be required by the permittee.

The permittee is responsible for proper closure and post-closure care (for wells disposing of hazardous waste) of the well(s). Detailed closure and post-closure plans are included in the Technical Report submitted with the Class I well permit application in accordance with 30 TAC Section 305.45(a) (8).

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Flowchart D: TCEQ Individual Permit Process Details



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8 References

All websites accessed in April 2014

Empower Network, 2013, Oil and Gas Recovery. <http://energy-talk.empowernetwork.com/blog/oil-and-gas-recovery>

Railroad Commission of Texas (RRC), 2013, 16 TAC Chapter 3 – Oil and Gas Division Draft for Informal Comment: Railroad Commission of Texas, 1-65 p.
<http://www.rrc.state.tx.us/rules/2013-08-12-SWR9-36-46-Proposed-wording-Informal-Comment.pdf>

RRC, 20144, Step Rate Test Guidelines: Injection/Disposal Well Permit Testing and Monitoring Seminar Manual. <http://www.rrc.state.tx.us/forms/publications/HTML/fsrt.php>.

RRC, 2012, Injection/Disposal Well Permit Applications Summary of Standards and Procedures: Injection/Disposal Well Permit Testing and Monitoring Seminar Manual.
<http://www.rrc.state.tx.us/forms/publications/HTML/pmt-outl.php#amend>.

RRC, 20144, Saltwater Disposal Wells Frequently Asked Questions (FAQs).
<http://www.rrc.state.tx.us/about/faqs/saltwaterwells.php>

RRC, 2001, Guidelines for Permit Amendments - Disposal Into Productive Formations: Injection/Disposal Well Permit Testing and Monitoring Seminar Manual.
<http://www.rrc.state.tx.us/forms/publications/HTML/r46-amnd.php>.

Texas Administrative Code, 20144. [http://info.sos.state.tx.us/pls/pub/readtac\\$ext.viewtac](http://info.sos.state.tx.us/pls/pub/readtac$ext.viewtac)

Texas Commission on Environmental Quality (TCEQ), 20144, Class I Injection Wells Regulated by the TCEQ.
http://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html

TCEQ, 2009, General Permit to Dispose of Nonhazardous Brine from a Desalination Operation or Nonhazardous Drinking Water Treatment Residuals into a Class I Well.

United States Environmental Protection Agency (USEPA), 2012a, Industrial & Municipal Waste Disposal Wells (Class I). http://water.epa.gov/type/groundwater/uic/wells_class1.cfm.

USEPA, 2012b, Class II Wells – Oil and Gas Related Injection Wells (Class II).
<http://water.epa.gov/type/groundwater/uic/class2/index.cfm>.

USEPA, 2012c, Industrial and Municipal Waste Disposal Wells (Class I).
http://water.epa.gov/type/groundwater/uic/wells_class1.cfm.

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APPENDIX C-1

RRC Documents

May 2014

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Injection/Disposal Well Permit Testing and Monitoring Seminar Manual

Guidelines for Permit Amendments-Disposal Into Productive Formations Texas Railroad Commission Statewide Rule 46

FILING REQUIREMENTS	To Amend Injection Interval	To Amend Injection Pressure	To Amend Injection Fluid Type	To Amend Fresh Water Volume	To Amend Injection Volume	To Amend to Commercial
Filing Fee: \$200 per well	Yes	Yes	Yes	Yes	Yes	Yes
Application Form: (Forms H-1 and H-1A)	Yes	Yes	Yes	Yes	Yes	Yes
Electric Log	Yes, unless previously filed	No	No	No	No	No
TCEQ Water Protection Depth Letter	Yes, unless previously filed	No	No	No	No	No
Area of Review: Map of Wells	Yes, if current permit issued before 4/1/82 or change is uphole	No	No	No	No	No
Area of Review: Table of Wells	Yes, if current permit issued before 4/1/82 or change is uphole	No	No	No	No	No
Step-Rate Test	No	Yes, If pressure > 0.5 psi/ft.	No	No	No	No
Fresh Water Data Form (Form H-7)	No	No	Yes, if Fresh Water	Yes, if different freshwater source	No	No
Fresh Water Questionnaire	No	No	Yes, if Fresh Water	Yes	No	No
Ownership Survey Map to show wells/operators within one-half mile radius	Yes	Yes	Yes	Yes	Yes	Yes
Notify: Operators of wells within one-half mile radius	Yes	Yes	Yes	Yes	Yes	Yes
Notify: Surface Owners	Yes	Yes	Yes	Yes	Yes	Yes
Notify: Adjacent Surface Owners	No	No	No	No	No	Yes
Notify: County Clerk	Yes	No	Yes	Yes	No	Yes

Notify: City Clerk	Yes, if within city limits	No	Yes, if within city limits	Yes, if within city limits	No	Yes, if within city limits
Notify: Publication	Yes	No	No	No	No	Yes, specify "Commercial Well"

Last modified on: November 6, 2001

Please direct questions or comments to: Technical Permitting, (512) 463-6792

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Injection/Disposal Well Permit Testing and Monitoring Seminar Manual

INJECTION/DISPOSAL WELL PERMIT APPLICATIONS SUMMARY OF STANDARDS AND PROCEDURES

Updated: March 15, 2012

TOPICS

[Administrative Review](#)

Discusses administrative check that verifies that all filing requirements are satisfied

[Attachments for new wells](#)

Discusses the required attachments for injection permit applications

[Transfer and Amendments](#)

Discusses the transfer of permits and subsequent changes to permit conditions

[Technical Review](#)

Discusses the review of the proposed injection well for compliance with well construction, operation, and injected fluid confinement requirements

[Permit Processing](#)

Discusses the various stages of processing the permit application

[Protested Applications](#)

Discusses the processing of applications that are protested by an affected party

[Post Permitting](#)

Discusses filing, testing, and monitoring requirements after the injection permit is issued

I. ADMINISTRATIVE REVIEW - BASIC FILING REQUIREMENTS

This part of the permit review verifies that all rule and statutory requirements have been met for a permit to be issued.

[Administrative Staff contact information](#)

1. Application Forms.

- Forms [H-1](#), and [H-1A](#). (Injection into a Reservoir Productive of Oil or Gas, Rule 46).

NOTE:

A productive reservoir is a reservoir with past or current production within a 2-mile radius of the proposed injection well.

If any part of the proposed injection zone is or ever has been productive, then the permit application should be filed on Form H-1/H-1A.

Please use the current Forms. Using older forms may result in requests for addition information and corresponding delays in permitting

- Form [W-14](#), (Injection into a Formation Not Productive of Oil or Gas, Rule 9).

2. Fees.

1. \$100 disposal permit application (Rule 9) filing fee (per wellbore).
2. \$200 injection permit application (Rule 46) filing fee (per wellbore).
3. \$150 (additional) for each exception request.
4. These fees are non-refundable.

NOTE:

Fees changed effective September 1, 2001 per SB 310.

3. Where to file.

1. File original with [Technical Permitting in Austin](#).
2. Send copy to [district office](#).

4. Preliminary review.**1. Organization Report (Form P-5).**

The applicant must have a current organization report on file with the Commission. The Commission's mainframe database is checked to verify that the organization report is on file and current.

2. Certificate of Compliance (Form P-4).

The applicant must be the current operator of the lease. If a Form P-4 has been filed on the lease, the applicant must be shown as the operator on the current Form P-4. For a new lease, the operator will be required to file Form P-4 along with the completion report (Form W-2/G-1) on the injection/disposal well.

3. UIC well inventory.

The Commission's mainframe database is checked to determine whether the application is for a new permit or an amendment of an existing permit. This check determines which application attachments are required. All attachments are required when filing for a new permit, others may not be required depending on the type of the amendment.

This check also prevents two permits being issued accidentally for the same well, since the new injection permit automatically cancels the old permit.

NOTE:

Beginning February 2, 2005, UIC permit applications will be administratively denied if the subject well is under pipeline severance or seal-in for Rule or permit violations on that well. This policy does not apply to permit amendment applications that, if granted, would return the subject well to compliance.

II. Attachments for new injection/disposal wells.**1. Well log.**

The well log is needed to identify the top and bottom of the proposed injection zone and overlying formations.

1. A complete electric log or similar well log of the proposed injection/disposal well.

- The log must include a header and show the proposed disposal/injection zone.

- Driller's logs, caliper logs, and collar logs are not adequate.
- 2. If a well log is not available for the proposed injection/disposal well, the applicant may submit a log of a nearby well and identify the logged well on one of the plats submitted with the application.
- 3. If multiple wells are covered by one Form H-1, only one well log is required.

2. Groundwater depth letter.

The groundwater depth letter is needed to evaluate the level of groundwater protection present in the proposed injection well.

1. With Forms H-1/H-1A, [Form TCEQ-0051](#) stating the depth to which usable quality groundwater must be protected. This form is commonly referred to as a "surface casing letter", "water board letter", "TNRCC letter", and most recently, "TCEQ letter".
2. With Form W-14, a [letter stating that the proposed injection will not endanger usable quality groundwater](#). An applicant may request this letter from the Texas Commission on Environmental Quality, formerly the Texas Natural Resource Conservation Commission by filing two copies of the Form W-14, a plat showing the location of the well with surveys marked, and a representative electric log.
3. The TCEQ is setting up a website that will provide an [estimated groundwater depth](#) to aid in planning. Check the site periodically to see if your county of interest has been added yet.

3. Area of review.

The purpose of this requirement is to identify any wells near the proposed injection well which may provide an avenue for migration of injected fluids out of the proposed disposal/injection zone.

1. [Map of all wells of public record](#) within a 1/4-mile radius of the proposed injection/disposal well showing the total depth of each well.

MAP GUIDELINES:

- Use a current map
- Use a legible map clearly showing operator names, lease names, and well numbers
- Draw 1/4 mile radius around the well, wells (multi-well applications), or lease (area permit applications)
- Show the total depth of each well on map
- Always provide map scale
- Be able to distinguish wells with same numbers
- Provide table of wells that penetrate the injection/disposal zone
- The use of matching labels on the AOR map and table is strongly recommended

2. [The RRC Mapping database](#) is now accessible on the Internet. This is the map that UIC staff will use to verify that all wells within a 1/4-mile radius have been examined.

RRC MAPPING DATABASE:

- The interface allows you to locate the well by API number, Lease Id number, Survey, or GPS

coordinates.

- You may also navigate by zooming in using landmarks such as cities and highways.
- You may use the "MAP TOOLS" function to either navigate, identify wells, surveys or draw a 1/4 or 1/2 mile circle around the subject well.

3. Table of wells within the 1/4-mile radius that penetrate the top of the injection/disposal zone. For each well, show the well name and number, date drilled, and current status, including the date plugged if applicable.

TABLE OF WELLS GUIDELINES:

- List all wells within 1/4 mile radius around the well, wells (for multi-well applications), or lease (for area permit applications) that penetrate the top of the proposed injection zone
- For each well, show the well names, well numbers, API numbers, and Total Depth
- For each well, show date drilled, current status, and date plugged (if applicable)
- Include a copy of the plugging report for any wells plugged prior to January 1, 1967
- If records are not readily available for any plugged wells, including copies of the plugging report will expedite processing

4. If space allows, the Map and Table of wells within the 1/4-mile radius can be combined.
5. For area permit applications, the Area of Review consists of the entire lease area, plus a 1/4-mile radius outside the lease boundary.

4. Notice.

The notification process ensures that all affected parties are informed and have opportunity to protest the permitting of the proposed injection well.

1. Mail or deliver a copy of the application form(s), both front and back, to:
 1. the owner "of record" of the surface of the tract on which the well is located. by owner "of record" we mean the owner that is listed on deed and tax records.
 2. Each Commission designated operator of any well within one-half mile of the proposed disposal/injection well (excluding permanently plugged wells)
 3. the county clerk for the county where the well is located
 4. the city clerk if the well is located within corporate city limits.
 5. If the application is for commercial disposal, notice must also be given in the same manner to owners of record of each surface tract that adjoins the proposed disposal tract. If the tract has been subdivided, then notify all surface owners of record within a 1/2 mile radius of the wellbore. Although not required, we recommend that you include a cover letter to briefly explain the nature of the application.
2. Notice of the application must be published once by the applicant in a form approved by the Commission for Form W-14 or Form H-1 in a newspaper of general circulation in the county where the well is located. Notice instructions and forms may be obtained from the Commission's Austin office, district offices, or downloaded from this website. The

following information must be submitted with the application:

- Affidavit of publication. The [affidavit](#) must be notarized and must state that the newspaper has general circulation in the county where the well is located.
- Newspaper clipping.

PUBLICATION GUIDELINES:

- The direction/miles to the nearest town must be consistent with the information in the application.
- The injection interval/disposal zone must be consistent with the information in the application.
- For H-1 applications where several wells are involved, use the top of the shallowest and the bottom of the deepest interval for the subsurface depth interval.
- Notice must be published for (once for injection or disposal under Rules 9 or 46 and once a week for three consecutive weeks for hydrocarbon storage under Rule 95, 96, or 97) at your expense on or before the day the application is filed.
- The newspaper need not be in the same county as the well, but must have general circulation in that county.
- The legal authority paragraph must be included in the publication.
- The notice must contain instructions for persons who wish to protest the application or who wish to request further information concerning the application.
- The published notice for commercial disposal wells shall include the language "Application for Commercial Oil and Gas Waste Disposal Well"
- The published notice for an area permit shall include the language "Area Permit Application"

3. [Submit a plat showing the lease](#) on which the well is located and adjoining offset leases or unleased tracts. Lease boundaries should be clearly outlined, with all offset operators clearly identified and any unleased acreage clearly labeled.

LAND OWNERSHIP MAP GUIDELINES:

- Clearly show the location of all wells of public record within one-half mile radius of the proposed injection/disposal well.
- Identify the commission designated operators of wells within one-half mile of the proposed injection/disposal well.
- For a commercial disposal well application, show the owners of record of the surface tracts that adjoin the proposed disposal well tract.

4. Include a list of the names and addresses of the surface owners or record, operators or wells within one-half mile, county clerk, and, if applicable, city clerk.
5. Submit a signed statement indicating the date that a copy of the application form(s) was mailed or delivered to each person on the list.

NOTE:

Operators of wells within one-half mile must be notified regardless of the status of the wells. The only wells that may be excluded are wells that have been permanently plugged and abandoned.

5. Fresh water injection.

The injection of fresh water as a make-up fluid is restricted to cases where there is no technically or economically viable alternative. This part of the permit review verifies that all alternatives have been investigated.

1. [Fresh water questionnaire](#) to justify use of fresh water.
2. Form H-7 (Fresh Water Data Form).
 1. Chemical analysis of fresh water to be injected.
 2. Plat outlining fresh water rights.

NOTE:

If fresh water is purchased, only the fresh water questionnaire is required.

The Commission is required by statute to forward a copy of an application involving injection of fresh water to the Texas Commission on Environmental Quality (TCEQ), formerly the Texas Natural Resource Conservation Commission (TNRCC) for comment. The TCEQ has up to 30 days to respond.

6. Requests for exceptions.

Requests to construct and operate a well in a manner other than that specified in the rules requires an exception to the specific requirement.

1. Types.
 1. Tubing and packer - to inject down casing without tubing and packer.
 2. Packer setting depth - to allow the packer to be set higher than normally allowed.
 3. Pressure observation valves - to waive the requirement for wellhead pressure valves on the tubing and each annulus.
2. Request must be in writing and include the \$150 filing fee.

III. Transfer and amendment of existing permits.

1. Transfer.

1. Form P-4 must be filed at least fifteen days before the proposed transfer is to take place.
2. Transfer of the injection/disposal permit is approved upon approval of the Form P-4.

2. Amendment.

1. Unless otherwise provided in the permit, the well must be constructed and operated as proposed in the permit application. Changes in well construction or operation may require a permit amendment.
2. Applications for amendment require the same forms and fees as new applications. (See 1. above.)
3. Attachments required for amended applications are determined based on the nature and magnitude of the proposed changes. See the "Guidelines for Permit Amendments" to determine attachments required for various types of permit amendments.
 - [Attachments required for Rule 9 permit amendments \(disposal into non-productive formations\)](#)
 - [Attachments required for Rule 46 permit amendments \(injection or disposal into productive formations\)](#)

IV. Technical review.

; ; This part of the permit review verifies that the proposed injection well meets construction and operation standards for groundwater protection and confinement of injected fluids.

Technical Staff contact information**1. Surface casing requirements.**

This part of the permit review verifies that groundwater is adequately protected.

1. For new wells, surface casing must be set to the protection depth determined by the Texas Commission on Environmental Quality (TCEQ), formerly the Natural Resource Conservation Commission (TNRCC), and cemented to the surface.

NOTE:

Cementing the long-string casing from total depth to the surface instead of setting surface casing is not normally allowed.

2. Proposals to convert existing wells with short surface casing or single string completions will be considered on a case-by-case basis. They may be permitted for injection or disposal with [additional safeguards](#) such as remedial cementing, annual pressure testing, and/or annulus pressure monitoring.

3. [Technical discussion](#)

2. Cementing requirements for production casing.

This part of the permit review verifies that the production casing is adequately cemented to confine injected fluids to the proposed injection zone.

1. The production casing must be cemented immediately above the injection/disposal zone with at least:
 1. 400 feet of cement based on cement volume calculations;
 2. 250 feet of cement verified by a temperature survey conducted at the time of cementing; or

3. 100 feet of cement verified by a cement bond log that shows the cement is well bonded to the pipe and formation (80% bond or higher) with no indication of channeling.

NOTE:

In verifying cement top calculations, our staff assumes Class A cement with no volume extenders unless the application indicates otherwise. A washout factor is used in the calculations (30% along the Gulf Coast, and 20% inland).

2. In the absence of cementing records, the casing will be presumed to be un-cemented and the applicant will be required to file a cement bond log to demonstrate the adequacy of existing cement, or perform a cement squeeze.

NOTE:

Cement bond logs must contain a cement bond amplitude curve, an amplified cement bond curve, a transit/travel time curve, and a variable density/sonic waveform display.

3. [Technical discussion](#)

3. Geological requirements.

This part of the permit review verifies that the proposed injection zone is adequately isolated by relatively impermeable strata to confine injected fluids to the proposed zone.

1. The authorized injection or disposal strata must be isolated from overlying usable quality water by a sufficient thickness of relatively impermeable strata, which is generally considered to be an accumulative total of at least 250 feet of clay or shale.
2. For injection/disposal wells permitted under Rule 46, an exception may be made for injection into productive formations located near the base of usable quality water. In these cases, injection fluids are limited to waters produced from the productive formation and from wells on the same lease.

NOTE:

Both Rules 9 and 46, as well as the permit itself require that injected fluids be confined to the authorized injection interval, which is the depth interval stated on the application and resulting permit.

The entire formation/reservoir is not authorized for injection unless the stipulated depth intervals correspond to the entire formation/reservoir.

4. Area of review requirements.

This part of the permit review verifies that all wells within the area of review are adequately plugged to ensure that injected fluids are confined to the proposed injection zone.

1. All abandoned wells within a 1/4-mile radius must have been plugged in a manner that will prevent movement of fluids from one zone to another.
2. The applicant may show by calculation that a lesser area will be affected by pressure increases to justify using the

lesser area in lieu of the 1/4-mile radius. These calculations must be performed by and bear the seal of a professional engineer registered in the State of Texas.

3. Shallow disposal in the Barnett Shale area (shallower than the Barnett Shale) of North central Texas is required to show that all wells within a 1/2-mile radius have been adequately plugged or cemented across the disposal interval and to perform reservoir pressure increase calculations because of bradenhead pressure buildup problems in the area
4. Shallow disposal in the Barnet Shale area (shallower than the Barnett Shale) of North central Texas is further limited to 1/4 psi per foot of depth because of bradenhead pressure buildup problems in the area
5. The Area of Review does not stop at the Texas state line. If the AOR extends into an adjoining state, UIC staff will require that the adjoining state UIC program staff be notified of the permit application.
6. A variance from the Area of Review requirements can be granted to a field or other area if an applicant can prove that the variance will not result in a material increase in the risk of fluid movement into groundwater or to the ground surface. This can be demonstrated by:
 1. showing that reservoir pressure is insufficient to raise fluids to groundwater;
 2. showing that geological conditions are present that preclude upward movement of fluids; or
 3. other compelling evidence.

7. [Technical discussion](#)

5. [Packer requirements..](#)

This part of the permit review verifies that the proposed packer setting depth will ensure that injected fluids are confined to the proposed injection zone.

1. Disposal wells permitted under Rule 9 (Form W-14) must have a packer set within 100 feet of the permitted disposal interval.
2. Injection/disposal wells permitted under Rule 46 (Form H-1) must have a packer set no higher than 200 feet below the known top of cement behind the production casing and at least 150 feet below the base of usable quality water.

NOTE:

If there are potentially permeable zones between the proposed packer setting depth and the proposed injection interval, the packer must be set below those zones or the application must be amended to include those zones in the proposed injection interval. As a practical matter, staff will direct applicants to specify a packer setting depth within 100 feet of the top of the permitted interval.

3. [Technical discussion](#)

6. [Injection pressure requirements.](#)

This part of the permit review verifies that the proposed injection pressure does not exceed the formation fracture gradient and that the existing casing cement is adequate to ensure that injected fluids are confined to the proposed injection zone.

1. Generally, the maximum surface injection pressure will be the pressure requested in the application or 1/2 psi per foot of depth to the top of the injection/disposal interval, whichever is less.
2. The permitted pressure will not exceed 1/2 psi per foot of depth to the top of the injection/disposal interval, unless the results of a [fracture pressure step-rate test](#) support a higher pressure.
3. Shallow (2,000 feet or less) disposal along the Gulf coast is further limited to 1/4 psi per foot of depth because of low fracture gradients in the coastal sediments
4. Shallow disposal in the Barnet Shale area (shallower than the Barnett Shale) of North central Texas is further limited to 1/4 psi per foot of depth because of bradenhead pressure buildup problems in the area

5. Technical discussion

7. Rule exception review.

Exceptions to the rule specified standard construction only when the proposed completion maintains the safety factor for groundwater protection and confinement of injected fluids.

1. **Tubing and Packer Exceptions** (which allows injection down casing)

An exception to the tubing and packer requirement can be considered for certain types of low-risk wells that exceed the rule specified well construction standard. As a matter of administrative policy, a tubing and packer exception will be considered only if:

1. A conventional tubing and packer completion is not feasible.
2. Surface casing must be cemented through the entire zone of usable quality ground water, and production casing cemented from total depth to surface. Both strings of casing have good mechanical integrity. Casing that has failed an MIT does not count as one of the two strings cemented T.D. to surface until it is repaired and passes an H-5 pressure test. Cement behind both strings of casing must meet cement quality requirements of Rule 13.
3. The well can operate at low injection pressure (500 psi or less) and low injection volume (500 bbls/day or less).
4. Wells that are approved for casing injection will be required to perform a casing pressure test against a temporary packer/plug to demonstrate mechanical Integrity of the long string casing at least annually.

2. **Packer Depth Exceptions** (allows packer to be farther uphole from injection zone)

An exception to the packer setting depth requirement can be considered only if confinement of injected fluids to the authorized injection zone can be ensured.

General requirements

1. Packer must be set opposite cemented casing, with adequate cement above the packer.
2. There must be at least 250 feet of clay/shale between the packer depth and B.U.Q.W.
3. There are no productive horizons or potential disposal zones between packer depth and injection zone.
4. There is no indication of casing leaks below packer.
5. The permit may be issued with an additional radioactive tracer survey requirement to demonstrate mechanical integrity of the casing between the packer and permit zone.

NOTE:

The packer setting depth requirements of Statewide Rule 46 (Forms H-1 and H-1A) allows greater flexibility in packer setting depths.

The packer depth proposed in the application is reviewed for the presence of potential zones between the packer and permitted injection zone. If any potential zones are found, the packer depth will be rejected. In this case, the packer must be lowered or the permitted zone must be raised to include the potential zone.

Moving the packer uphole after the permit is issued will likely result in subsequent mechanical integrity tests being ruled inconclusive.

3. **Pressure Observation Valve Exceptions**

Rule 9 and 46 require that wells to be equipped with wellhead pressure observation valves on the tubing and each

annulus. An exception to the observation valve requirement can be considered only if confinement of injected fluids to the authorized injection zone can be ensured.

General requirements

1. There are no overpressured formations in the area
2. There are no bradenhead pressure problems in the area
3. An exception is not required if the subject annulus is fully cemented to ground surface
4. Exception approval requires more frequent mechanical integrity testing and/or monitoring.

8. Injected fluids.

This part of the permit review verifies that the proposed injection fluids are Oil and Gas Exploration and Production wastes. Only these wastes may be injected into wells under Railroad Commission jurisdiction.

1. The permit will be limited to the injection of produced salt water unless the application specifically lists other fluids to be injected. Injected fluids must be oil and gas exploration and production fluids.
2. If the application involves injection of fresh water, the applicant must show that there is no economically or technically feasible alternative to the use of fresh water as an injection fluid.

9. Requirements for commercial facilities.

1. RRC Rules 9 and 46, define a "commercial well" is a well whose owner or operator receives compensation from others for the disposal of oil field fluids or oil and gas wastes that are wholly or partially trucked or hauled to the well, and the primary business purpose for the well is to provide these services for compensation.
2. Special surface facility provisions will be included in the permit for a commercial well. These provisions include requirements for spill prevention and containment, pit permitting, and site security.
3. The Commission requires that the provisions set out below be included in commercial disposal well and fluid injection well permits. These provisions are designed to prevent pollution from activities associated with the surface facilities.

SURFACE FACILITY REQUIREMENTS:

- Prior to beginning operation, all collecting pits, skimming pits, or washout pits must be permitted under the requirements of Statewide Rule 8.
- Prior to beginning operation, a catch basin constructed of concrete, steel, or fiberglass must be installed to catch oil and gas waste which may spill as a result of connecting and disconnecting hoses or other apparatus while transferring oil and gas waste from tank trucks to the disposal facility.
- Prior to beginning operation, all fabricated waste storage and pretreatment facilities (tanks, separators, or flow lines) shall be constructed of steel, concrete, fiberglass, or other materials approved by the Assistant Director of Technical Permitting. These facilities must be maintained so as to prevent discharges of oil and gas waste.
- Prior to beginning operation, dikes shall be placed around all waste storage, pretreatment, or disposal facilities. The dikes shall be designed so as to be able to contain a volume equal to the maximum holding capacity of all such facilities. Any liquids or wastes that do accumulate in the containment area

- shall be removed within 24 hours and disposed of in an authorized disposal facility.
- Prior to beginning operation, the facility shall have security to prevent unauthorized access. Access shall be secured by a 24-hour attendant, a fence and locked gate when unattended, or a key-controlled access system. For a facility without a 24-hour attendant, fencing shall be required unless terrain or vegetation prevents truck access except through entrances with lockable gates.
 - Prior to beginning operation, each storage tank shall be equipped with a device (visual gauge or alarm) to alert drivers when each tank is within 130 barrels from being full.

10. Requirements for dual completion wells.

1. The permit application must clearly indicate that the well will be a dual completion and identify the production and injection zones.

NOTE:

Normal permit conditions do not allow any perforations outside the permitted injection interval.

2. Appropriate mechanical integrity testing and monitoring conditions will be added to the permit.

NOTE:

The most common mechanical integrity testing procedure, for productive perforations in the tubing/packer annulus, is as follows:

1. Pull the tubing and packer string(s) from the well
2. Set a temporary plug within 100 feet of the injection perforations
3. Run a test packer on tubing and set it just below the productive perforations
4. Perform a standard H-5 pressure test of the casing between the test packer and temporary plug (above perforations)
5. Reset the test packer just above the productive perforations
6. Perform a standard H-5 pressure test of the annulus to test the casing from the test packer to the wellhead
7. Pull the tubing, test packer, and temporary plug, and then reset the injection string
8. Perform a radioactive tracer survey through the injection string to demonstrate tubing integrity and packer seal
9. File the Pressure Test Reports (Forms H-5) for each of the three parts of the mechanical integrity test

3. Technical discussion

11. Requirements for horizontal injection wells.

1. Notification must indicate that the well includes a horizontal segment and must include a plat showing the direction and extent of the horizontal segment.
2. The Area of Review will be a ¼ mile radius along the horizontal segment.
3. Provide measured and true vertical depths on the application.
4. Provide a wellbore sketch.
5. Appropriate mechanical integrity testing and monitoring conditions may be added to the permit.

12. Requirements for downhole water separation wells.

1. The application must clearly indicate that produced water will be separated from the oil or gas downhole.
 - Include a detailed wellbore configuration showing the separation mechanism.
 - Include a proposed mechanical integrity testing and monitoring program.
2. Appropriate mechanical integrity testing and monitoring conditions will be added to the permit.

13. Requirements for area injection permits.

1. File the area permit application with at least one well. The Form H-1 or cover letter must specify that this is an "area permit application"
2. Include the depth of usable quality groundwater in the area of the permit.
3. File a wellbore diagram for each type of existing well configuration in the area. Including:
 1. Casing and liner information,
 2. Packer setting depth,
 3. Type and volume of cements used, and
 4. Top of cement and how it was determined (calculated, bond log, etc.)
4. File a wellbore diagram for each type of well configuration for newly drilled wells. Including:
 1. Casing and liner information,
 2. Packer setting depth, and
 3. a statement that the well will be cased and cemented in accordance with Rule 13.
5. Injected fluids to be injected, maximum daily injection volume, and maximum surface injection pressure for the permit area.
6. Perform an Area of review for the entire permit area, plus a ¼ mile perimeter around the boundary of the permit area.
7. Provide a map showing all wells to be converted, with each well keyed to the appropriate wellbore configuration diagram.
8. Notify each surface owner of record within the permit area, all offset operators around the permit area, the county clerk where the well is located, and the city clerk if any well is within city limits.
9. File application to add wells to an area permit at least 20 days prior to conversion and include the following:
 1. well identification and, for newly drilled wells, location plat,
 2. well configuration,
 3. \$200 filing fee , and
 4. any additional requirements stipulated by the area permit
10. Only wells that meet the construction standard set out in the area permit may be authorized under the area permit
11. Regular permitting procedures can be used for wells that don't meet the area permit standard due to:
 1. Different well construction
 2. Different operating conditions, injection pressure, volumes, fluids, zones
 3. Unplugged or unknown status wells within the area of review

14. Engineering and Geological Studies.

1. **Engineering Analysis** The practice of Engineering is regulated by the [Texas Occupations Code, Title 6, Chapter 1001](#) Any Engineering analysis required for the permit application must be performed by a licensed Professional Engineer.

Some examples are:

 1. Pressure front calculations which are typically done in conjunction with the Area of Review process.
 2. Closure cost estimates for pits associated with commercial disposal well operations under SWR 78
 3. Check the Texas Board of [Professional Engineers website](#) for other situations requiring an Engineer seal.
2. **Geological Analysis** The practice of Geology is regulated by the [Texas Occupations Code, Title 6, Chapter 1002](#) Any Geological analysis required for the permit application must be performed by a licensed Professional Geocientist.

Some examples are:

 1. Well log formation correlation and analysis which are typically done in conjunction with the Area of Review process.
 2. Well log interpretation for reservoir evaluation of geologic separation, effective thickness, etc.

3. Check the Texas Board of [Professional Geoscientists website](#) for other situations requiring an Geologist seal.

V. Permit Processing.

1. Review turnaround time

The Commission adopted Practice and Procedure Rule 201, which sets specific time limits for RRC staff to act on permit applications.

1. Uic staff has 30 days to complete the initial review or the application. UIC staff must either:
 1. Request additional data if the application is incomplete.
 - If the application involves injection of fresh water, an additional 30 day review period is allowed for TCEQ (formerly TNRCC) review.
 2. Notify the applicant that the application is administratively complete
2. UIC staff has 15 days to complete the final review and either issue, or deny the permit applications.

2. Expediting your permit application

The most effective method of expediting permit approval is to file a complete and correct application initially.

1. The average permit application that requires a request for additional information or explanation takes twice as long (an average of 46 days) to process than the average application that is initially complete and correct (an average of 23 days).
2. Check the application before sending it in to make sure that all required items are present.
3. Check over the application as a stranger would see it. For example, you may know that the property to the North is unleased, but the RRC staff that checks the application won't know this unless it is clearly marked on the map.
4. Check over the application to make sure any discrepancies or apparent deficiencies are explained or resolved. For example, check the RRC mapping database to make sure that all wells on the RRC map are shown on your area of review map.

3. Requests for additional information

1. When an incomplete application is received, the staff mail out a letter requesting additional information.
 - UIC staff has up to 30 days to evaluate the additional information filed by the operator
 - A second Request additional data letter will be sent within 30 days of the first if no response is received.
 - UIC staff has up to 30 days to evaluate the additional information filed by the operator

NOTE:

The Commission adopted Practice and Procedure Rule 201 which limits subsequent filings on incomplete applications to two filings of additional data.

After the second filing of additional information, Technical Permitting staff must either approve or deny the permit application.

Since incomplete applications must be denied, it is

imperative that application deficiencies be resolved promptly to avoid the application being returned.

4. Administrative permit denial

1. A permit denial letter will be sent if the proposed well completion or operating conditions do not meet minimum standards. The applicant's revisions to the application to include changes in the well completion, remedial cementing, etc. will be reviewed for reconsideration of the permit application. If the deficiency cannot be resolved, the permit application will be denied. Once the permit is denied, the operator has two options:
 1. A hearing may be requested once the application is administratively complete.
 2. The denial letter may include instructions for modifying the application to allow administrative approval.

5. Processing Flowchart

VI. Protested applications.

1. Types of protestants.

1. Affected person. The rules define an affected person as "a person who has suffered or will suffer actual injury or economic damage other than as a member of the general public, and includes surface owners of record of property on which the well is located and adjoining offset operators."
2. Local government.

2. Time limits for protesting.

1. The rules provide a minimum fifteen-day opportunity for protest. The fifteen-day period begins on the latest of three dates:
 1. the date the application is received by the Commission with the appropriate fee;
 2. the date notice is mailed or delivered to the surface owner, offset operators, and city/county clerks; and
 3. the date notice is published.
2. A protest may be filed anytime before the permit is issued.

3. Options for applicant.

1. Withdraw the application.
2. Obtain a letter from the protestant withdrawing the protest.
3. Request a hearing.

NOTE:

An application must be administratively complete before it may be set for hearing.

VII. Post-permitting.

1. Annual Monitoring Report (Form H-10)

1. Every well with a valid injection permit must file an annual monitoring report unless the well is actively producing and files an annual production status report (Form W-10 or G-10) instead.

2. Mechanical integrity test (Form H-5)

1. A mechanical integrity test (MIT) must be performed before any fluids are injected into the well.
2. Once the well is converted to injection, an MIT must be performed periodically for the life of the permit.

3. Completion report (Form W-2 or G-1)

1. File a completion report within 30 days of conversion to reflect the actual completion of the well.
2. UIC staff will review the actual completion against the proposed completion in the permit application.

GUIDELINES FOR FILING COMPLETION REPORTS:

- Fill in required dates and permit numbers. Be certain injection into a productive zone for disposal purposes is shown under injection rather than disposal authority.
- The well location blocks are to be completed on both front and back sides of Form W-2 or G-1.
- Casing and liner record must be completed.
- Presence of packer and packer depth must be included.
- The "producing" interval must be included. Show the perforated intervals here, not the permitted intervals.
- Please include all cement squeeze information.
- Please indicate if the well is dually completed for disposal and production.

Please direct questions or comments to: Technical Permitting, (512) 463-6792

**RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION**

Form H-1

05/2004

APPLICATION TO INJECT FLUID INTO A RESERVOIR PRODUCTIVE OF OIL OR GAS

1. Operator name _____ (as shown on P-5, Organization Report)		2. Operator P-5 No. _____	
3. Operator Address _____			
4. County _____		5. RRC District No. _____	
6. Field Name _____		7. Field No. _____	
8. Lease Name _____		9. Lease/Gas ID No. _____	
10. Check the Appropriate Boxes: New Project <input type="checkbox"/> Amendment <input type="checkbox"/> If amendment, Fluid Injection Project No. F- _____ Reason for Amendment: Add wells <input type="checkbox"/> Add or change types of fluids <input type="checkbox"/> Change pressure <input type="checkbox"/> Change volume <input type="checkbox"/> Change interval <input type="checkbox"/> Other (explain) _____			
RESERVOIR DATA FOR A NEW PROJECT			
11. Name of Formation _____		12. Lithology _____ (e.g., dolomite, limestone, sand, etc.)	
13. Type of Trap _____ (anticline, fault trap, stratigraphic trap, etc.)		14. Type of Drive during Primary Production _____	
15. Average Pay Thickness _____		16. Lse/Unit Acreage _____	
17. Current Bottom Hole Pressure (psig) _____		18. Average Horizontal Permeability (mds) _____	
19. Average Porosity (%) _____			
INJECTION PROJECT DATA			
20. No. of Injection Wells in this application _____			
21. Type of Injection Project: Waterflood <input type="checkbox"/> Pressure Maintenance <input type="checkbox"/> Miscible Displacement <input type="checkbox"/> Natural Gas Storage <input type="checkbox"/> Steam <input type="checkbox"/> Thermal Recovery <input type="checkbox"/> Disposal <input type="checkbox"/> Other _____			
22. If disposal, are fluids from leases other than the lease identified in Item 9?		Yes <input type="checkbox"/> No <input type="checkbox"/>	
23. Is this application for a Commercial Disposal Well?		Yes <input type="checkbox"/> No <input type="checkbox"/>	
24. If for commercial disposal, will non-hazardous oil and gas waste other than produced water be disposed? Yes <input type="checkbox"/> No <input type="checkbox"/>			
25. Type(s) of Injection Fluid: Salt Water <input type="checkbox"/> Brackish Water <input type="checkbox"/> Fresh Water <input type="checkbox"/> CO ₂ <input type="checkbox"/> N ₂ <input type="checkbox"/> Air <input type="checkbox"/> H ₂ S <input type="checkbox"/> LPG <input type="checkbox"/> NORM <input type="checkbox"/> Natural Gas <input type="checkbox"/> Polymer <input type="checkbox"/> Other (explain) _____			
26. If water other than produced salt water will be injected, identify the source of each type of injection water by formation, or by aquifer and depths, or by name of surface water source:			
<p align="center">CERTIFICATE I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that the data and facts stated therein are true, correct, and complete, to the best of my knowledge.</p>		Signature _____ Date _____	
		Name of Person (type or print) _____	
		Phone _____ Fax _____	
For Office Use Only		Register No. _____ Amount \$ _____	

INSTRUCTIONS FOR FORM H-1

1. **Application.** File the original Form H-1 application, including all attachments, with Assistant Director, Environmental Services, Railroad Commission of Texas, P. O. Box 12967, Capitol Station, Austin, Texas 78711. File one copy of the application and all attachments with the appropriate Railroad Commission District Office. Include with the original application a non-refundable fee of \$200, payable to the Railroad Commission of Texas. Submit an additional \$150 for each request for an exception to Statewide Rule 46(g)(3) and/or (j)(5)(B).
2. **Well Logs.** Attach the complete electric log or a similar well log for one of the proposed injection wells or for a nearby well. Attach any other logging and testing data, such as a cement bond log, available for the well that supports this application.
3. (a) **For a new project**, attach a map with surveys marked showing the location and depth of all wells of public record within one-quarter (1/4) mile radius of the proposed injection well(s).
 (b) **For an amendment to add wells to a previous authority**, attach a map with surveys marked showing the location and depth of all wells of public record within one-quarter (1/4) mile radius of the additional wells, unless such data has been submitted previously for the project.
 (c) **Table of Wells.** For those wells in 3(a) or 3(b) that penetrate the top of the injection interval, attach a table of wells showing the dates drilled and their current status. The Commission may adjust or waive this data requirement in accordance with provisions in the "Area of Review" section of Statewide Rule 46 (Rule 46(e)).
4. **Water Letter.** Attach a letter from the Texas Commission on Environmental Quality (TCEQ) or its predecessor or successor agencies for a well within the project area stating the depth to which usable quality water occurs.
5. **Form(s) H-1A.** Attach Form H-1A showing each injection well to be used in the project. Up to TWO wells can be listed on each Form H-1A.
6. **Use of Fresh Water.** Attach Form H-7, Fresh Water Data Form, for a new injection project that includes the use of fresh water. An updated Form H-7 must be attached to Form H-1 for an expansion of a previously authorized fresh water injection project unless the fresh water is purchased from a commercial supplier, public entity, or from another operator.
7. **Plat of Leases, Notice and Hearings**
 - (a) **Plat of Leases.** Attach a plat of leases showing producing wells, injection wells, offset wells and identifying ownership of all surrounding leases within one-half (1/2) mile.
 - (b) **Notice.**
 - (1) Send or deliver a copy of the application to the owner of record of the surface tract on which the well(s) is located; each Commission-designated operator of any well located within one-half (1/2) mile of the proposed injection well(s); and the clerk of the city and county in which the well(s) is located. If this is the initial application for fluid injection authority for this reservoir, send copies of the application to all operators in the reservoir. Attach a signed statement indicating the date the copies of the application were mailed or delivered and the names and addresses of the persons to whom copies were sent.
 - (2) **Attach an affidavit of publication** signed by the publisher that notice of the application has been published in a newspaper of general circulation in the county where the well(s) will be located. Notice instructions and forms may be obtained from the Commission's Austin Office, the Commission's website (www.rrc.state.tx.us) or the District Offices. Attach a newspaper clipping of the published notice.
 - (c) **Protests and Hearings.** An affected person or local government may protest this application. A hearing on the application will be held if a protest is received and the applicant requests a hearing, or if the Commission determines that a hearing is in the public interest. Any such request for a public hearing shall be in writing and contain: (1) the name, mailing address and phone number of the person making the request; and (2) a brief description of how the protestant would be adversely affected by the granting of the application. If the Commission determines that a valid protest has been received, or that a hearing would be in the public interest, a hearing will be held after issuance of proper and timely notice of the hearing by the Commission. If no protest is received within fifteen (15) days of publication or receipt in Austin of the application, the application may be processed administratively.

RAILROAD COMMISSION OF TEXAS -- OIL AND GAS DIVISION

Form H-1A

INJECTION WELL DATA (attach to Form H-1)

1. Operator Name (as shown on P-5)				2. Operator P-5 No.				
3. Field Name				4. Field No.				
5. Current Lease Name				6. Lease/Gas ID No.				
7. Lease is _____ miles in a _____ direction from _____ (center of nearest town).								
				13. Base of Usable Quality Water (ft)				
14. (a) Legal description of well location, including distance and direction from survey lines:								
(b) Latitude and Longitude of well location, if known (optional) Lat. _____ Long. _____								
15. New Injection Well <input type="checkbox"/> or Injection Well Amendment <input type="checkbox"/>			Reason for Amendment: Pressure <input type="checkbox"/> Volume <input type="checkbox"/> Interval <input type="checkbox"/> Fluid Type <input type="checkbox"/> Other (explain) _____					
Casing	Size	Setting Depth	Hole Size	Casing Weight	Cement Class	# Sacks of Cement	Top of Cement	Top Determined by
16. Surface								
17. Intermediate								
18. Long string								
19. Liner								
20. Tubing size	21. Tubing depth	22. Injection tubing packer depth			23. Injection interval _____ to _____			
24. Cement Squeeze Operations (List all)			Squeeze Interval (ft)			No. of Sacks	Top of Cement (ft)	
25. Multiple Completion? Yes <input type="checkbox"/> No <input type="checkbox"/>			26. Downhole Water Separation? Yes <input type="checkbox"/> No <input type="checkbox"/>			NOTE: If the answer is "Yes" to Item 25 or 26, provide a Wellbore Sketch		
27. Fluid Type			28. Maximum daily injection volume for each fluid type (rate in bpd or mcf/d)			29. Estimated average daily injection volume for each fluid type (rate in bpd or mcf/d)		
30. Maximum Surface Injection Pressure: for Liquid _____ psig			for Gas _____ psig.					
						13. Base of Usable Quality Water (ft)		
14. (a) Legal description of well location, including distance and direction from survey lines:								
(b) Latitude and Longitude of well location, if known (optional) Lat. _____ Long. _____								
15. New Injection Well <input type="checkbox"/> or Injection Well Amendment <input type="checkbox"/>			Reason for Amendment: Pressure <input type="checkbox"/> Volume <input type="checkbox"/> Interval <input type="checkbox"/> Fluid Type <input type="checkbox"/> Other (explain) _____					
Casing	Size	Setting Depth	Hole Size	Casing Weight	Cement Class	# Sacks of Cement	Top of Cement	Top Determined by
16. Surface								
17. Intermediate								
18. Long string								
19. Liner								
20. Tubing size	21. Tubing depth	22. Injection tubing packer depth			23. Injection interval _____ to _____			
24. Cement Squeeze Operations (List all)			Squeeze Interval (ft)			No. of Sacks	Top of Cement (ft)	
25. Multiple Completion? Yes <input type="checkbox"/> No <input type="checkbox"/>			26. Downhole Water Separation? Yes <input type="checkbox"/> No <input type="checkbox"/>			NOTE: If the answer is "Yes" to Item 25 or 26, provide a Wellbore Sketch		
27. Fluid Type			28. Maximum daily injection volume for each fluid type (rate in bpd or mcf/d)			29. Estimated average daily injection volume for each fluid type (rate in bpd or mcf/d)		
30. Maximum Surface Injection Pressure: for Liquid _____ psig			for Gas _____ psig.					

FORM H-1A INSTRUCTIONS

05/2004

1. File as an attachment to Form H-1 to provide injection well data for each application for a new injection well permit or to amend an injection well permit.
2. Complete the current field name and number (Items 3 and 4) with the current field designation in Commission records.
3. Complete the current lease name and number (Items 5 and 6) with the current lease identification in Commission records for each well in the application. Use separate H-1A Forms for each lease.
4. Provide the current well number(s) for existing wells in Item 8. Provide the proposed well numbers for wells that have not yet been drilled.
5. Check in Item 15 the appropriate box for a new injection well permit or an amendment to an injection well permit. If an amendment, check the appropriate boxes for the reason(s) for the application(s) for amendment. If "other" is checked, provide a brief explanation.
6. Provide complete well construction information (Items 16 through 26), including all proposed re-completion (e.g. liner, cement squeeze, tubing, packer). Attach additional sheets if necessary. For Item 19, if the liner was not to the surface, indicate both the top and the bottom depth of the liner as the "Setting Depth."

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APPENDIX C-2

TCEQ UIC General
Permit

May 2014

**CDM
Smith**

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TCEQ DOCKET NO. 2012-0640-UIC
CLASS I UIC GENERAL PERMIT
NO. WDWG010000

This permit supersedes and
replaces UIC General Permit
WDWG010000 issued on
December 15, 2009.

Texas Commission on Environmental Quality

P.O. Box 13087
Austin TX 78711-3087

General Permit to Dispose of Nonhazardous Brine from a Desalination Operation or Nonhazardous Drinking Water Treatment Residuals into a Class I Well

under provisions of
Chapter 27 of the Texas Water Code
and 30 Texas Administrative Code Chapter 331

Operators of Class I wells located in the state of Texas may inject nonhazardous brine from a desalination operation or nonhazardous drinking water treatment residuals according to standards, monitoring requirements and other conditions set forth in this general permit, as well as the rules of the Texas Commission on Environmental Quality (TCEQ), the laws of the State of Texas, and other orders of the TCEQ. This general permit meets the Safe Drinking Water Act and the Texas Water Code requirements for the protection of human health and the environment. Authorization for the use of an injection well under this general permit does not confer a vested right. This general permit does not authorize any invasion of rights and does not authorize any violation of federal, state, or local laws and regulations. The issuance of this general permit does not grant to the owner or operator the right to use private or public property. It is the responsibility of the owner or operator to acquire property rights as necessary to conduct the permitted activities.

This general permit and the authorization contained herein shall expire at midnight ten years after the date of issuance.

ISSUED AND EFFECTIVE DATE: **NOV 19 2012**

Bryan W. Shaw
For the Commission

TCEQ General Permit Number WDWG010000
Relating to Disposal of Nonhazardous Brine
from a Desalination Operation or Nonhazardous
Drinking Water Treatment Residuals into a Class I Well

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Part I. Definitions and Terminology

Section A. Definitions

All definitions in Section 27.002 of the Texas Water Code (TWC) and 30 Texas Administrative Code (TAC) Chapters 3, 37, 281, 305, 331 and 335 shall apply to this permit and are incorporated by reference. For convenience, some specific definitions of words or phrases used in this permit are listed as follows:

Applicant--See 30 TAC §3.2

Bedded salt--See 30 TAC §3.2

Bedded salt cavern disposal well--See 30 TAC §3.2

Class I nonhazardous industrial solid waste--See Texas Health and Safety Code (THSC) §361.003.

Commission--See 30 TAC §3.2

Desalination brine--See 30 TAC §331.2

Desalination concentrate--See 30 TAC §331.2

Desalination operation--See 30 TAC §331.2

Drinking water treatment residuals--See 30 TAC §331.2

Enhanced oil recovery project (EOR)--See 30 TAC §331.2

Executive Director--See 30 TAC §3.2

General permit--See Texas Water Code (TWC), §27.025 and 30 TAC §331.2

Hazardous waste--See 30 TAC §335.1

Individual permit--See 30 TAC §331.2

Industrial solid waste--See THSC §361.003

Municipal solid waste--See THSC §361.003

Naturally occurring radioactive material--See THSC §401.003

Notice of Change (NOC)--See 30 TAC §331.2

Notice of Intent (NOI)--See 30 TAC §331.2

Notice of Termination (NOT)--A written submittal to the executive director from an owner or operator authorized under a general permit requesting termination of coverage under this general permit.

Operator--See 30 TAC §335.1

Owner--See 30 TAC §335.1

Public water system--See 30 TAC §331.2

Radioactive substance--See THSC §401.003

Solid waste--See 30 TAC §335.1

Section B. Commonly Used Abbreviations, Acronyms and Symbols

CFR	Code of Federal Regulations
DWTR	Drinking Water Treatment Residuals
EOR	Enhanced Oil Recovery
EPA	United States Environmental Protection Agency
NOC	Notice of Change
NOI	Notice of Intent
NORM	Naturally Occurring Radioactive Material
NOT	Notice of Termination (to terminate coverage under general permit)
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
THSC	Texas Health and Safety Code
TWC	Texas Water Code
UIC	Underground Injection Control
USDW	Underground Source of Drinking Water
§	Section
§§	Sections

Part II. Permit Applicability and Coverage

This general permit provides authorization for use of a Class I injection well to inject nonhazardous brine from a desalination operation or nonhazardous drinking water treatment residuals. This includes disposal of nonhazardous drinking water treatment residuals that contain naturally occurring radioactive material into a salt cavern in horizontally bedded or non-domal salt. The terms "nonhazardous" and "hazardous" in this general permit are used in the context of solid waste as defined in 30 TAC §335.1. This general permit contains requirements applicable to all Class I wells that are eligible for coverage under the general permit.

Section A. Waste Eligible to be Injected under the General Permit

Only nonhazardous brine from a desalination operation or nonhazardous drinking water treatment residuals not listed under paragraph B.2. below, may qualify for disposal into a Class I well under the general permit. To be

classified as nonhazardous, the waste must not meet any of the criteria for hazardous waste as specified in 40 Code of Federal Regulations (CFR) Part 261 (relating to Identification and Listing of Hazardous Waste) and 30 TAC Chapter 335 Subchapter R (relating to Waste Classification). If the waste is not classified as hazardous according to state and federal rules, it is considered nonhazardous.

Section B. Limitations on Coverage

1. Waste injection is not eligible for authorization under this general permit where prohibited by any other applicable rules or laws.
2. Waste streams prohibited from injection under the general permit include, but are not limited to:
 - a. waste streams other than nonhazardous brine from a desalination operation or nonhazardous drinking water treatment residuals;
 - b. wastes prohibited from injection in 40 CFR Part 148, Subpart B (relating to Prohibitions on Injection);
 - c. hazardous wastes as defined under 40 CFR §261.3(a) through (d), issued pursuant to the Resource Conservation and Recovery Act and the Hazardous and Solid Waste Amendments, which are regulated by the commission as authorized by the United States Environmental Protection Agency (EPA), including but not limited to any listed hazardous waste or a waste derived from the treatment, storage or disposal of a listed hazardous waste;
 - d. radioactive substances, as defined by Texas Health and Safety Code (THSC) §401.003(19), except for drinking water treatment residuals containing NORM or radioactive substances that are exempt by rule from requirements as provided under THSC §401.106(a). Specific radioactive materials prohibited from injection include, but are not limited to:
 - i. any by-product material as defined by THSC §401.003(3);
 - ii. any low-level radioactive waste as defined by THSC §401.004;
 - iii. any oil and gas NORM waste as defined by THSC §401.003(27);
 - iv. any special nuclear material as defined by THSC §401.003(24); and
 - e. waste streams associated with the exploration, development, or production of oil, gas and geothermal resources, and other wastes regulated by the Railroad Commission of Texas, except such waste

streams authorized for injection and disposal by a Class II permit issued by the Railroad Commission of Texas.

3. An applicant seeking a permit, or an owner or operator with a Class I injection well authorized under a general permit, that requests injection of any of the wastes listed in Section B of this Part must seek authorization under 30 TAC Chapter 331 for an individual Underground Injection Control (UIC) permit, or authorization under the jurisdiction of the Railroad Commission of Texas, and not under this general permit.
4. This general permit does not authorize the use of nonhazardous brine from a desalination operation or nonhazardous drinking water treatment residuals as an injection fluid for enhanced recovery purposes. That activity is regulated by the Railroad Commission of Texas.
5. The executive director may cancel, revoke, or suspend authorization to inject waste under this general permit based on a finding of historical and significant noncompliance with the provisions of this general permit. Denial of authorization to dispose of waste in a Class I well under this general permit or suspension of an owner or operator's authorization under this general permit shall be done according to commission rules in 30 TAC Chapter 331 Subchapter L (relating to General Permit Authorizing Use of a Class I Injection Well to Inject Nonhazardous Desalination Concentrate or Nonhazardous Drinking Water Treatment Residuals).

Section C. Obtaining Authorization

1. Submission of a Notice of Intent (NOI) is an acknowledgment that the conditions of this general permit are applicable to the proposed waste injection, and that the applicant agrees to comply with the conditions of this general permit.
2. For all wells, authorization begins upon issuance by the TCEQ of written acknowledgment of both the Notice of Intent and demonstration of financial assurance.
3. All applicants seeking authorization to operate a Class I injection well under this general permit must submit a completed NOI conforming with a form and instructions approved by the executive director. The NOI shall, at a minimum, include:
 - a. legal name (as filed with the Texas Secretary of State), address and contact information for the facility, operator and owner;
 - b. location of the injection well activity including the latitude and longitude of the proposed well;

- c. ownership status of the facility (public, private, etc.);
- d. size of the facility and a general description of the nature of the business including Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) codes which best reflect the principal products or services provided by the facility;
- e. type of well (industrial, municipal, etc.) and whether it is a new or existing (conversion) well;
- f. for existing wells, the authorization status of the well (active, inactive or terminated permit or authorization);
- g. whether the facility is located on Indian lands;
- h. TCEQ Solid Waste Registration Number;
- i. a listing of all existing, pending, interim status, or permit-by-rule State and/or Federal permits, licenses or construction approvals which pertain to pollution control or industrial solid waste management activities conducted by or existing at the facility;
- j. public interest demonstration, including the compliance history;
- k. letter from the Railroad Commission of Texas stating that the drilling of a disposal well and the injection of the waste into the subsurface stratum selected for disposal will not endanger or injure any oil or gas formation;
- l. signature page;
- m. certification statement (to confirm, in detail, responsibility for the facility to be constructed and operated in accordance with the requirements of this UIC general permit); and
- n. technical report, including
 - i. a topographic map (or other map if a topographic map is unavailable) extending one mile beyond the property boundaries of the source depicting the facility and each of its intake and discharge structures; each of its hazardous waste treatment, storage, or disposal facilities; each well where fluids from the facility are injected underground; and those wells, springs, and other surface water bodies, and drinking water wells listed in public records or otherwise known to the applicant within a quarter mile of the facility property boundary;
 - ii. area of review;

- iii. corrective action plan and well data;
 - iv. maps and cross sections of underground sources of drinking water (USDWs);
 - v. maps and cross sections of the geologic structure of the area;
 - vi. well design and construction procedures;
 - vii. formation testing and stimulation program;
 - viii. injection procedures and operating data (injection rate, volume, pressure, annulus fluid, etc.);
 - ix. chemical, physical, radiological and biological characteristics of the waste;
 - x. contingency procedures for well failures and shut-ins;
 - xi. monitoring program (mechanical integrity testing, monitoring and recording devices, sampling frequency, parameters measured, etc.);
 - xii. plugging and abandonment plan for the well including a cost estimate; and
 - xiii. pre-injection units, if not authorized under another TCEQ permit.
4. The technical information submitted in the NOI (as described in the NOI form and instructions) must demonstrate that the project will prevent the movement of fluids that could result in the pollution of an underground source of drinking water (USDW) and must establish that the applicant's plans and specifications meet all applicable standards, rules and the requirements of the general permit. The technical reports shall:
- a. be prepared in accordance with good engineering and geoscience practices, signed and sealed by a licensed Texas professional engineer or licensed Texas professional geoscientist, as appropriate, and in conformance with the Texas Engineering Practice Act and the Texas Geoscience Practice Act and the licensing and registration boards under these acts;
 - b. include plans for design, construction, completion, operation, waste analysis, testing and closure of the Class I injection well to prevent the movement of fluids that could result in the pollution of a USDW;
 - c. describe and ensure the implementation of practices which are to be used to assure compliance with the limitations and conditions of this permit;

- d. include all information required in the NOI form and instructions;
 - e. be organized and labeled consistent with the organization of the NOI; and
 - f. identify specific individual(s) responsible for development, implementation, operation, maintenance, inspections, recordkeeping, and revision of the technical report. The activities and responsibilities of the technical report personnel shall address all aspects of the facility's technical report.
5. An NOI shall be signed in accordance with 30 TAC §305.44 (relating to Signatories to Applications).
 6. Following review of the NOI, the executive director shall either acknowledge coverage by providing an identification number to the applicant or notify the applicant that coverage under this general permit is denied.
 7. A copy of the NOI, along with any correspondence from the executive director acknowledging the NOI, shall be retained at the facility site and kept with other records related to authorization under this general permit at all times during operation of the authorized well and for a period of three years following the completion of any plugging and abandonment procedures or termination of authorization under the general permit.
 8. Existing Class I wells authorized under the expiring general permit are required to submit a new NOI within 90 days after renewal of the general permit to continue authorization.
 9. Authorization under this general permit is not transferable. A transfer of operational control includes changes to the structure or business organization of a company, such as changing from a partnership to a corporation, or changing to a different corporation type such that a different filing (or charter) number is established with the Texas Secretary of State. Any change in an owner or operator's charter number, as registered with the Texas Secretary of State, is considered a change in ownership of the company and requires the new owner and operator to apply for permit coverage as stated below, including providing financial assurance coverage. If the owner or operator of the regulated entity changes, the present owner and operator must submit a Notice of Termination (NOT), and the new owner and operator must submit a new NOI. The NOT and NOI must be submitted not later than 30 days prior to the change in owner or operator status. If the NOT and NOI are submitted as required under this provision, there will be no lapse in authorization for

this facility. An NOT is not required for a company name change without a change in operational control or business organization as long as the secretary of state can verify that a change in name alone has occurred.

Section D. Amending the Notice of Intent (NOI)

1. The owner or operator shall revise the NOI by submitting a Notice of Change (NOC) to the same address as the NOI before any change is made in the design, construction or completion of the Class I injection well.
2. An NOC letter must be submitted with supplemental or corrected information within 14 days following:
 - a. the time when the operator becomes aware that the design, construction, completion, operation, testing or closure of the well are not effective in preventing the movement of fluids that could result in the pollution of a USDW;
 - b. the time when the owner or operator becomes aware that he/she failed to submit any relevant facts in an NOI, or submitted incorrect information in an NOI or in any report to the executive director; or
 - c. the time when relevant facts in the NOI change (for example, a phone number, map or drawing).

Section E. Financial Assurance Prior to Commencement of Well Construction

1. For new wells, evidence of financial assurance shall be submitted at least 60 days prior to commencement of drilling operations. All financial assurance mechanisms shall be in effect before commencement of drilling operations.
2. For converted wells and other previously constructed wells, the owner or operator shall submit an acceptable financial assurance mechanism along with the Notice of Intent.

Section F. Approval of Construction and Completion for Class I Wells Except Bedded Salt Cavern Disposal Wells

1. A new injection well may not commence injection until construction is complete; and
 - a. The owner or operator has submitted notice of completion of construction to the executive director; and
 - b. the executive director has inspected or otherwise reviewed the new injection well and finds it is in compliance with the conditions of the permit; or

- c. the owner or operator has not received notice from the executive director of his intent to inspect or otherwise review the new injection well within 13 days of the date of the notice in 30 TAC §331.65(e)(1)(A), in which case prior inspection or review is waived and the owner or operator may commence injection. The executive director shall include in his notice a reasonable time period in which he shall inspect the well.
2. Within 90 days after the completion or conversion of the well, the owner or operator shall submit a completion report to the executive director. The report must include:
 - a. all available logging and testing program data on the well;
 - b. a demonstration of mechanical integrity;
 - c. the anticipated maximum pressure and flow rate at which the owner or operator will operate;
 - d. the results of the formation testing program;
 - e. the actual injection procedure;
 - f. the compatibility of injected waste with fluids in the injection zone and minerals in both the injection zone and the confining zone; and
 - g. the status of corrective action on defective wells in the area of review.
3. The executive director may approve or disapprove the construction and completion for an injection well or project. In making a determination whether to grant approval of construction and completion, the executive director shall review the project for compliance with standards in 30 TAC §331.45(2).

Section G. Approval of Construction and Completion for Class I Bedded Salt Cavern Disposal Wells and Their Associated Caverns

1. Before beginning cavern construction and operation, the permittee shall obtain written approval from the executive director which states that the well construction is in compliance with the applicable provisions of the permit. To obtain approval, the permittee shall submit to the executive director reports and certifications in accordance with §331.243(k) within 90 days of completion of well construction.
2. Within 30 days of completion of the bedded salt cavern construction stage the operator shall submit a report with the results of all tests regarding cavern integrity.

3. Within 90 days of completion of cavern construction, the permittee shall provide notification to the executive director which states that the cavern construction is in compliance with the applicable provisions of the permit. The permittee shall submit to the executive director reports and certifications in accordance with §331.244(f)(2).

Section H. Termination of Coverage

1. An owner or operator shall terminate coverage under this general permit through the submittal of an NOT, on a form approved by the executive director, when one of the following conditions occurs:
 - a. owner or operator of the facility changes;
 - b. the injection of waste becomes authorized under an individual permit;
 - c. the use of the property changes and is no longer subject to regulation under this general permit; or
 - d. the waste injection becomes unnecessary or is completed.
2. Authorization to inject waste under the general permit terminates at midnight on the day that an NOT is postmarked for delivery to the TCEQ except in the case of a permit transfer. Please refer to Part II.C.9.

Section I. Denial of Authorization

1. The executive director shall deny authorization to inject waste under an existing general permit for reasons stated in 30 TAC §331.203(c)(2).
2. The executive director may deny authorization to inject or operate an injection well under an existing general permit for reasons including, but not limited to those stated in 30 TAC §331.203(c)(3).
3. As stated in 30 TAC §331.203(c)(1), the executive director shall provide written notice to a facility if the executive director denies the facility's NOI or authorization to inject waste under a general permit, including, at a minimum, a brief statement of the basis for this decision.

Section J. Suspension of Authorization

1. The executive director shall provide written notice to an owner or operator that the executive director intends to suspend the owner or operator's authority to inject waste under a general permit, including:
 - a. a brief statement of the basis for this decision;
 - b. a statement of whether the owner or operator shall immediately cease injection of waste;

- c. a statement setting the deadline for filing the application for an individual permit; and
 - d. a statement that the owner or operator's waste injection authorization under the general permit shall be suspended on the effective date of the commission's action on the individual permit application unless the commission expressly provides otherwise, or unless the executive director has required the owner or operator to immediately cease injection of waste.
2. If an owner or operator's authorization under a general permit is suspended, the owner or operator shall immediately cease waste injection.
 3. The executive director may require the person whose authorization to inject or operate an injection well is suspended to apply for and obtain an individual permit.
 4. After providing written notice to the owner or operator, the executive director shall suspend authorization to inject or operate an injection well under an existing general permit for the following reasons:
 - a. the quantity of waste, the type of waste, or the type of operation does not comply with the general permit;
 - b. the owner or operator of the facility:
 - i. has failed to pay any portion of a delinquent fee or charge assessed by the executive director;
 - ii. is not in compliance with all requirements, conditions, and timeframes specified in an unexpired commission final enforcement order relating to the activity regulated by the general permit; or
 - iii. is subject to an unexpired enforcement order that requires the facility to comply with operating conditions different from or additional to the requirements of the general permit; and
 - c. an application is not received by the deadline specified by rule or in the general permit.
 5. After providing written notice to the owner or operator, the executive director may suspend authorization to inject waste under an existing general permit for reasons including, but not limited to, the following:
 - a. a change has occurred in the availability of demonstrated technology or practices for the prevention, control, or abatement of pollutants

applicable to the injection necessary to be implemented to meet applicable federal or state standards;

- b. the owner and/or the operator of the facility has not filed an NOI in accordance with 30 TAC §305.43;
- c. circumstances have changed since the time of the NOI so that injection of waste is no longer appropriately controlled to meet applicable standards under the general permit, or either a temporary or permanent cessation of the authorized waste injection is necessary;
- d. the facility has been determined by the executive director to have been out of compliance with any rule, order, or permit of the commission, including nonpayment of fees assessed by the executive director; and
- e. the owner or operator of the facility is the subject of an unresolved agency enforcement action in which the executive director has issued written notice that enforcement has been initiated.

Section K. Authorization under an Underground Injection Control (UIC) Individual Permit

1. Injection of waste eligible for authorization by this general permit may alternatively be authorized by an individual Class I UIC permit according to 30 TAC Chapter 331 (relating to Underground Injection Control).
2. When an individual permit is issued for injection of waste that is currently authorized under this general permit, the owner or operator shall terminate coverage under this general permit and shall submit an NOT to the executive director. The authorization under this general permit will be terminated when the executive director has issued the individual permit and received the NOT.

Section L. Authorization of an Individually-Permitted Well under the UIC General Permit

A facility shall not have Class I injection well authorization under both an individual permit and the general permit. Waste injection at facilities currently authorized by a Class I UIC individual permit may only be authorized under this general permit if the following conditions are met:

1. the injection of waste meets the applicability and eligibility requirements for coverage under this general permit;
2. the executive director has determined that continued coverage under an individual permit is not required based on consideration of the quantity of waste to be injected, type of waste, type of operation, injection well design,

- injection well construction, compliance history, or other site-specific considerations;
3. no previous application or permit for waste injection by the applicant has been denied, terminated, or revoked by the executive director as a result of an enforcement action or concerns about movement of fluids along the borehole into or between USDWs or freshwater aquifers. The executive director may provide a waiver to this provision based on new circumstances at the facility, or if there is a new facility owner or operator; and
 4. the applicant requests cancellation of authorization under the existing UIC individual permit within 30 days after receiving notice from the executive director that authorization under this general permit is effective.

Section M. Permit Renewal and Expiration

1. Permit term. This general permit is effective from the date of issuance for a term of ten years, unless otherwise amended, revoked, or cancelled by the commission prior to that date. Authorizations for waste injection under the provisions of this general permit may be issued until the expiration date of the permit. This general permit may be amended, revoked, or cancelled by the commission after notice and comment as provided by 30 TAC §§331.202 and 331.204.
2. Amended general permit. Upon issuance of an amended general permit by the TCEQ, all owners or operators covered under the general permit shall submit an NOI in accordance with the requirements of the new permit or obtain an individual permit.
3. Permit renewal. If the commission proposes to renew a general permit before its expiration, the general permit shall remain in effect after the expiration date for those existing owners and operators covered by the general permit until the date on which the commission takes final action on the proposed permit renewal. No new NOIs will be accepted or new authorizations honored for authorization under the general permit after the expiration date.
4. Application following renewal. Upon issuance of a renewed general permit, all facilities, including those covered under the expired general permit, will be required to submit an NOI according to the requirements of the new general permit, or obtain an individual permit.
5. Expiration without renewal. According to 30 TAC §331.204(d), if the commission has not proposed to renew a general permit at least 90 days before its expiration date, owners and operators authorized under the

general permit shall submit an application for an individual permit before the general permit's expiration. If an application for an individual permit is submitted before the general permit's expiration, authorization under the expired general permit remains in effect until the issuance or denial of an individual permit.

Part III. Technical Standards and Requirements

The owner or operator must comply with the following standards and requirements for injection of waste into a Class I well under the general permit:

1. Construction Standards. All Class I wells shall be designed, constructed, and completed to prevent the movement of fluids that could result in the pollution of an underground source of drinking water (USDW).
2. Operating Requirements (Performance standard). All Class I wells shall be operated to prevent the movement of fluids that could result in the pollution of a USDW and to prevent leaks from the well into unauthorized zones.
3. Public Interest. A well authorized under the general permit must be in the public interest with respect to criteria stated in TWC §27.051 and 30 TAC §331.121(b).
4. Siting. Wells shall be sited in such a fashion that they inject into a formation which is beneath the lowermost formation containing, within one quarter mile of the well bore, a USDW.
5. Area of Review. The area of review shall be determined by a radius of 1/4 mile from the proposed or existing wellbore, or the area within the cone of influence, whichever is greater.
6. Defective Wells in Area of Review. For wells within the area of review which penetrate the injection zone but are not properly completed or plugged, corrective action must be taken.
7. Drilling and Completion. The drilling and completion of the well shall be done in accordance with the detailed in the plans and specifications of the technical report and 30 TAC §331.62(b), and for bedded salt cavern disposal wells §331.243.
8. Casing and Cementing. In accordance with 30 TAC §331.62(b)(2), and for bedded salt cavern disposal wells, §331.243(d)(1), wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements,

the factors listed in 30 TAC §331.62(b)(2)(A)-(G), and for bedded salt cavern disposal wells, §331.243(d)(1)(A)-(K) shall be considered.

9. **Tubing and Packer.** Injection wells, except those municipal wells injecting noncorrosive wastes, shall inject fluids through tubing with a packer set immediately above the injection zone. The tubing, packer, and fluid seal shall be designed for the expected service. The factors listed in 30 TAC §331.62(b)(3)(A)-(B), and for bedded salt cavern disposal wells, §331.243(e)(2) shall be considered.
10. **Annular Fluid.** The annulus between the tubing and the long string of casings shall be filled with a fluid approved by the executive director and a pressure, also approved by the executive director, shall be maintained on the annulus in accordance with 30 TAC §331.63(n), and for bedded salt cavern disposal wells, §331.245(a)(4).
11. **Logging and Testing.** Appropriate logs and other tests shall be conducted during the drilling and construction of a new well. A descriptive report interpreting the results of such logs and tests shall be prepared by a knowledgeable log analyst and submitted to the executive director. At a minimum, such logs and tests shall include those required under 30 TAC §331.62(b)(4), and for bedded salt cavern disposal wells, §331.243(g).
12. **Injection Formation Properties.** In accordance with 30 TAC §331.62(b)(5), at a minimum, the following information concerning the injection formation shall be determined or calculated for a new well:
 - a. fluid pressure;
 - b. temperature;
 - c. fracture pressure;
 - d. other physical, chemical and radiological characteristics of the injection matrix; and
 - e. physical and chemical characteristics of the formation fluids.
13. **Injection Pressure.** For wells not located in non-domal or bedded salt, except during well stimulation, the injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the injection zone, initiate new fractures or propagate existing fractures in the confining zone, or cause movement of fluid out of the injection zone that may pollute USDWs or surface water.

14. Bedded Salt Cavern Disposal Wells. For bedded salt cavern disposal wells, a maximum allowable operating pressure and test pressure shall not exceed 0.8 pounds per square inch per foot of depth measured at the higher elevation of either the long string casing seat or the highest interior elevation of the cavern roof, but in no case shall it disrupt the bond between the salt, cement, and the casing seat, initiate new fractures or propagate existing fractures in the cavern or the confining zone, or cause movement of fluid or waste out of the injection zone. A minimum operating pressure that is protective of bedded salt cavern integrity shall be maintained.
15. Annular Injection. Injection between the outermost casing protecting USDWs and fresh or surface water and the wellbore is prohibited.
16. Monitoring and Testing. Monitoring and testing shall include the activities specified in 30 TAC §331.64(k), and for bedded salt cavern disposal wells and their associated caverns, §331.246.
17. Reporting. The owner or operator shall comply with requirements for completion reports, operating reports and annual reports as specified in 30 TAC §331.65(e), and for bedded salt cavern disposal wells, as specified in §331.247.
18. Recordkeeping. The owner or operator shall keep complete and accurate records as required by 30 TAC §305.157 and 30 TAC Chapters 331 and 335. The owner or operator shall furnish to the executive director, upon request and within a reasonable time frame, and in no case later than 30 days from the date of the request, copies of records required to be kept by the permit.
19. Closure Standards. The well shall be closed in accordance with the applicable standards as specified in 30 TAC §331.46(a). Bedded salt cavern disposal wells and their associated caverns shall be closed in accordance with §331.250. The obligation to implement the closure plan survives the termination of a permit or the cessation of injection activities. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the closure plan requirement is a condition of the permit.
20. Corrective Action. The owner or operator may perform corrective action as is necessary to prevent the movement of fluid into or between USDWs caused by the lack of mechanical integrity. The owner or operator may resume injection upon receipt of written notification from the executive director that the owner or operator has demonstrated mechanical integrity under 30 TAC §331.64(k)(4).

21. Pre-injection Units. According to 30 TAC §331.2, pre-injection units are defined as the onsite above-ground appurtenances, structures, equipment, and other fixtures including the injection pumps, filters, tanks, surface impoundments, and piping for wastewater transmission between any such facilities and the well that are or will be used for storage or processing of waste to be injected, or in conjunction with an injection operation. Pre-injection units for wells authorized under this general permit must be authorized through either this general permit or another permit or authorization issued by the commission.
- a. No authorization of a pre-injection unit shall be approved, and authorization may be denied or revoked, if:
 - i. a pre-injection unit causes or allows the release of fluid that would result in the pollution of underground sources of drinking water, fresh water, or surface water; or
 - ii. a pre-injection unit poses an immediate threat to public health or safety.
 - b. As provided in the NOI form and instructions, the owner and operator shall:
 - i. identify pre-injection units associated with Class I well(s) to be authorized under this general permit;
 - ii. state the authorization status of the pre-injection units (either this general permit or another permit issued by the commission); and
 - iii. for pre-injection units to be authorized under this general permit, submit information for each pre-injection unit demonstrating compliance with the applicable design criteria of 30 TAC §§331.5(c), 331.17(d) and 331.18(b)(6).
 - c. Unless subject to a radioactive materials license issued under 30 TAC Chapter 336, applicants requesting authorization under this general permit for a nonhazardous waste commercial Class I injection well, but who are not required to have a Resource Conservation and Recovery Act (RCRA) permit for the surface facility, must submit form TCEQ-0024, "Application for a Permit to Store, Process or Dispose of Industrial Nonhazardous Solid Waste," to the Waste Permits Division, Industrial and Hazardous Waste Permits Section, Mail Code 130 at the TCEQ address.
 - d. For NORM waste disposal, Class I injection well permitting must be accompanied by an application for a radioactive materials license.

Part IV. Standard Permit Conditions

1. Authorization to inject waste in a Class I well must be obtained prior to the construction of any new waste disposal well facility as stated in 30 TAC §331.7. This authorization may be obtained through either this general permit or an individual permit.
2. Pre-injection units as defined in 30 TAC §331.2 for wells authorized under this general permit must be authorized through either this general permit or another permit issued by the commission.
3. NOIs, NOTs, and NOCs shall be signed in accordance with the requirements of 30 TAC §305.44(a) (relating to Signatories to Applications). Plans, reports, and other information requested or required by the executive director shall be signed in accordance with the requirements of 30 TAC §305.128 (relating to Signatories to Reports).
4. The applicant must provide acceptable financial assurance in accordance with 30 TAC Chapter 37, Subchapter Q (relating to Financial Assurance for Underground Injection Control Wells).
5. The owner or operator has a duty to comply with all conditions in this general permit and 30 TAC Chapters 305, 335 and 331. Failure to comply with any condition is a violation of the general permit and the statutes under which the general permit was issued. Any violation may be grounds for enforcement action, for terminating coverage under this general permit, or for requiring an owner or operator to apply for and obtain an individual permit.
6. It is not a defense for an owner or operator in an enforcement action that it would have been necessary to halt or reduce the permitted waste injection to maintain compliance with the permit conditions.
7. The owner or operator shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) installed or used by the owner or operator to achieve compliance with the permit conditions. Proper operation and maintenance also includes adequate laboratory and process controls, and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the permit conditions.
8. All monitoring and reporting records, including strip charts and records of calibration and maintenance, the waste analysis plan, records of all data used to complete the NOI for authorization under this general permit, reports, maps, drawings, and other documentation required by this

general permit must be maintained for a minimum period of ten years from the date of the record and either be kept on site or made readily available for review by an authorized representative of the commission upon request. This period may be extended at the request of the executive director.

9. The owner or operator shall furnish any information, at the request of the executive director, which is necessary to determine whether cause exists for revoking, suspending, or terminating authorization under this permit. The requested information must be provided within a reasonable time frame and in no case later than 30 days from the date of the request. Any noncompliance or any required information not submitted or submitted incorrectly shall be reported to the executive director as promptly as possible.
10. Inspection and entry shall be allowed under TWC, Chapters 26 and 27 and THSC §361.032. The statement in TWC §26.014 that commission entry of a regulated entity shall occur in accordance with an establishment's rules and regulations concerning safety, internal security, and fire protection is not grounds for denial or restriction of entry to any part of the regulated entity, but merely describes the commission's duty to observe appropriate rules and regulations during an inspection.
11. At various times the permittee is required to collect and analyze samples and submit reports of the results of their analysis to TCEQ. To ensure the quality of the samples obtained by the permittee, the permittee is required to have in place a quality assurance/quality control program consistent with the TCEQ's EPA-approved "Quality Assurance Project Plan for Environmental Monitoring and Measurement Activities Relating to the Resource Conservation and Recovery Act and Underground Injection Control" (TCEQ QAPP). Additionally, pursuant to state law, the permittee is subject to administrative, civil, and criminal penalties, for knowingly making any false statement, representation, or certification on any report, record, or document submitted or required to be maintained by the permit.
 - a. Samples required by this general permit shall be collected and measurements shall be taken at times and in a manner so as to be accurate and representative of the monitored activity. Samples shall be delivered to the laboratory immediately upon collection, in accordance with any applicable analytical method and required maximum holding time. All waste analyses utilized for waste identification or verification and other analyses for environmental monitoring must be performed

in accordance with methods specified in the current editions of EPA SW-846, American Society for Testing and Materials (ASTM) or other methods accepted by the TCEQ.

- b. The owner or operator shall ensure that properly trained and authorized personnel monitor and sample the wastewater related to any permitted activity.
 - c. Records of monitoring and testing activities must include:
 - i. the date, time, and place of sample or measurement;
 - ii. the identity of any individual who collected the sample or made the measurement;
 - iii. the chain-of-custody procedures used to maintain sample integrity from sample collection to laboratory delivery;
 - iv. the date and time of laboratory analysis;
 - v. the identity of the individual and laboratory who performed the analysis;
 - vi. the technique or method of analysis; and
 - vii. the results of the analysis or measurement, and for wastewater, the quality assurance/quality control records.
12. All analytical data produced in compliance with the monitoring and testing requirements under this general permit must be generated by a lab that the Texas Laboratory Accreditation Program (TLAP) has accredited under the National Environmental Laboratory Accreditation Conference (NELAC) standard for matrices, methods, and parameters of analysis, unless:
- a. the lab is an in-house lab and either the lab performs work for its owner, for another company with a unit located on the same site, or without compensation for a governmental agency or charitable organization, or the lab is in another state and is accredited or inspected by that state;
 - b. the lab is accredited under federal law;
 - c. the data are needed for emergency-response activities and no TLAP-accredited lab is available; or
 - d. the lab provides analytical data for which the TCEQ does not offer accreditation.

13. Authorization under this permit may be suspended or revoked for the reasons stated in 30 TAC §331.203 (relating to Authorizations and Notices of Intent). Notifying the TCEQ of planned changes or an anticipated noncompliance does not stay any permit condition.
14. This permit does not convey any property rights of any sort or any exclusive privilege.
15. The owner or operator is subject to administrative, civil, and criminal penalties, as applicable, under Chapter 7 of the TWC for violations including but not limited to the following:
 - a. violating the TWC Chapters 26 and 27 or applicable rules of the commission or terms of this General Permit;
 - b. falsifying, tampering with, or knowingly rendering inaccurate any monitoring device or method required to be maintained under a permit; or
 - c. knowingly making any false statement, representation, or certification in any record or other document submitted or required to be maintained under a permit, including monitoring reports or reports of compliance or noncompliance.

Part V. Fees

Section A. Application Fees

1. A person shall include with the NOI requesting coverage under the terms of a general permit a fee of \$100 for each disposal well.
2. An owner or operator authorized under this general permit shall include with each NOC a fee of \$100 for each disposal well.
3. A fee is not required for submission of an NOT.

Section B. Annual Fees

A person authorized by a general permit shall pay annual facility and waste management fees according to 30 TAC Chapter 335, Subchapter J (relating to Hazardous Waste Generation, Facility and Disposal Fee System).

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APPENDIX D

**Class II Study Task 3
Report**

May 2014

**CDM
Smith**

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1 San Antonio Water System (SAWS) Brackish Groundwater Desalination Project Case Study

At the time of submission of this project proposal for potential funding to the Texas Water Development Board (TWDB), the San Antonio Water System (SAWS) was actively engaged in feasibility and design efforts for the SAWS Brackish Groundwater Desalination (BGD) Project to be located in southern Bexar County. Due to changes in injection well permitting statutes that occurred in 2007 with the passage of House Bill (HB) 2654 (see the Background section of the *Manual for Permitting Process* for the full discussion on HB 2654), the Texas Commission on Environmental Quality (TCEQ) has the authority to dually permit Class II wells as Class I-Class II wells under a General Permit for the disposal of nonhazardous desalination concentrate and nonhazardous drinking water treatment residuals (DWTR). Please note that throughout this document, the terms “desalination concentrate” and “DWTR” refer to nonhazardous desalination concentration and nonhazardous DWTR respectively, unless otherwise specified.

SAWS, a project co-sponsor, was interested in the potential of utilizing a currently permitted Class II injection well located in the area of the SAWS BGD Project for desalination concentrate disposal under the TCEQ General Permit because of the anticipated efforts, costs, and time required to drill, complete, and permit a new Class I or Class V injection well for desalination concentrate management.

2 Introduction

The SAWS service area continues to experience rapid growth. According the 2011 Regional and 2012 State Water Plans, the population of the SAWS service area is expected to grow by almost 56 percent by 2060 from a population of 1,354,381 in 2010 to 2,116,782 in 2060. Due to restrictions on pumping in the Edwards Aquifer to protect endangered species habitat and the increasing demands of a rapidly growing population, the 2012 State Water Plan projects that SAWS will experience a deficit in water supplies which, without additional supply alternatives, is estimated to reach approximately 169,336 acre feet per year (151 million gallons per day [MGD]) by 2060.

One of the primary water supply strategies for SAWS is to implement an economically viable brackish groundwater desalination project. SAWS plans to construct a 13,000 acre feet per year (11.6 MGD) brackish groundwater desalination facility by 2015. The proposed desalination plant location is shown in **Figure 2-1**. Due to the water supply options available to SAWS, the relative cost of a brackish groundwater desalination facility located close to the City, and the diversification that this type of facility would provide, this initiative is a high priority for SAWS.

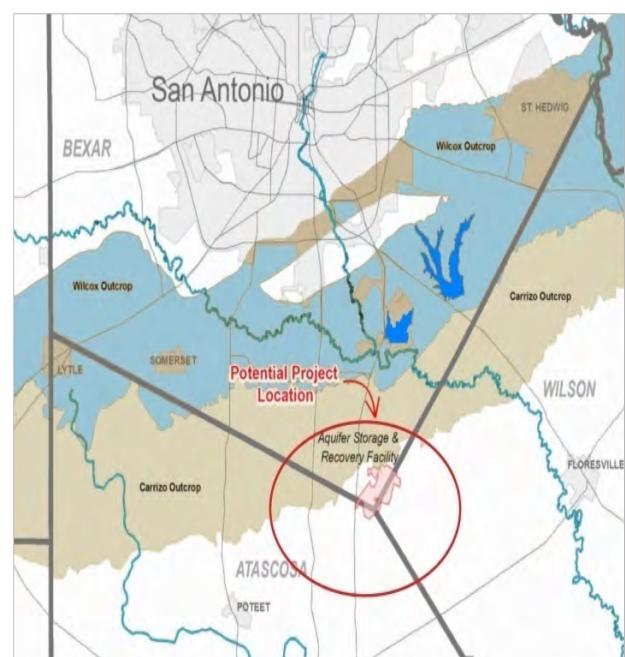


Figure 2-1. Proposed SAWS Brackish Groundwater Desalination Plant

One of the most significant technical issues to be addressed during the implementation of any inland desalination facility is the reliable management and ultimate disposal of concentrate, as is the case for the proposed SAWS facility. This study examines two potential options that SAWS considered for concentrate disposal into injection wells. The first option, the strategy which SAWS has proceeded with, was utilizing deep well injection through a new Class I well (drilled by SAWS in conjunction with LBG-Guyton Associates. As an alternative to the Class I injection well, the second option considered was the use of an existing Class II well (that may be dually permitted as a Class I well) near the project site.

2.1 Task Scope of Work

This specific project task is comprised of three main objectives:

1. Obtain basic information and evaluate the feasibility of utilizing the existing Class II injection well proposed by SAWS as a candidate well for the purpose of obtaining a Class I-Class II permit under the TCEQ General Permit option (as allowed by HB 2654);
2. Provide the actual costs for SAWS to drill, complete, and permit a Class I nonhazardous injection well for the SAWS BGD Project; and
3. Provide relevant information to interested cities and utilities with regards to basic information necessary to successfully obtain a Class I-II TCEQ General Permit (30 TAC §331 Subchapter L) if potential Class II wells are available and appropriate for use.

During the initial design phase of the SAWS Brackish Groundwater Project, a Class II well, the FEDC-Lincoln No. 2 Well located in the general area of the proposed BGDBGD Project, was identified and considered for potentially obtaining a Class I nonhazardous injection well permit under the TCEQ General Permit option. A description of this well is described below.

3 The FEDC-Lincoln No. 2 Well

The FEDC-Lincoln No. 2 well (herein referred to as the Injection Well), originally drilled by INCO Investments Corporation and located in the Sas pamco Field in Wilson County was originally drilled as an oil development well in 1988. In order to collect pertinent information on the Injection Well, data and other relevant information were obtained from SAWS, the Railroad Commission of Texas (RRC), and the Bureau of Economic Geology at the University of Texas at Austin. **Table 3-1** contains summary information assembled as part of this effort. The complete data set obtained is presented in **Appendix D-1**.

Table 3-1. Summary Information on FEDC-Lincoln No. 2 Well, Located in Wilson County.

Item	Value/Description
Field Name	Saspamco
Lease Name	FEDC-Lincoln
Well Number	2
Operator	INCO Inv. Inc./P.S.NN. Petroleum, Inc.,
Drilling Permit	No. 348885
Well Location (Section, Block, and Survey)	Jose De La Garza, A-14

Item	Value/Description
API Number	No. 42-493-32087
Original purpose of well	Oil development
Total depth	3,143 feet
Date drilling completed	July 20, 1988
Casing/Completion records	
Surface – 165 ft.	8 ⁵ / ₈ " casing, 23 lb./ft., hole diameter 12 ¹ / ₄ ", cemented from 165 ft. to surface
Intermediate – surface to 3,135 ft.	5 ¹¹ / ₂ " casing, 15.5 lb./ft., hole diameter 7 ⁷ / ₈ ", cemented from 1,150 – surface, 3,135 ft. – 2,021 ft.
Tubing – surface to 3,135 ft.	2 ³ / ₈ " tubing with packer set at 3,135 ft., production interval from 3,135 – 3,143 ft. (open hole), (also note, according to well schematic obtained from RRC, annulus from 2,021 ft. – 165 ft. is not cemented)
Perforated intervals	3,129 ft. - 3,135 ft.; 2,850 ft. – 2,854 ft.; 2,826 ft. – 2829 ft.
Squeezed intervals prior to injection (and sacks of cement used)	3,135 ft. – 3,139 ft., 2,850 ft. – 2,854 ft., 2,826 ft. – 2,829 ft., (100 sacks)
Depth to base of deepest fresh water zone	1,100 ft.
Depth to shallowest zone productive of oil and gas in this field	2,900 ft.
Anticipated injection rate	Average 1,000 barrels per day, Maximum 1,500 barrels per day
Anticipated injection pressure	Average 400 psig, Maximum 600 psig
Geologic formation tops (as recorded on W-2)	
Midway	1,088 ft.
Navarro	1,829 ft.
Anacacho	2,560 ft.
Austin Chalk	2,825 ft.
Eagle Ford	2,960 ft.
Buda	2,975 ft.
Del Rio	3,050 ft.
Georgetown	3,100 ft.
Edwards	3,125 ft.
Date plugged	August 11, 2011
Records included in Appendix D-1	
W-1 Application for Permit to Drill dated July 14, 1988	
W-2 Well Completion Report dated May 19, 1992	
W-2 Well Completion Report dated June 3, 1993	
W-3 Well Plugging Record dated August 23, 2011	
W-12 Well Inclination Report dated May 20, 1992	
W-14 Application to dispose of oil and gas waste by injection dated May	

Item	Value/Description
	21, 1992
	W-15 Cementing Report - surface casing dated July 15, 1988
	W-15 Cementing Report - second stage casing dated July 20, 1988
	Class II Injection Well Permit No. 09705 dated November 24, 1992
	L-1 Electric Log Status Report dated May 24, 1992

According to the W-2 Well Completion Report dated May 19, 1992, (see **Appendix D-1**), the FEDC-Lincoln Well No. 2 was recorded as not being commercially viable with respect to the production of oil. Immediately afterwards, in the W-14 permit application, P.S.N. Petroleum Inc., (who acquired the well from INCO Investment Inc.,) applied for a Class II injection well permit for salt water disposal from the RRC. The Class II injection well permit was granted on November 24, 1992 (permit No. 09705). No records were located, however, from the RRC or any other source documenting that the injection well was ever used to inject salt water or any other permitted fluids. The injection well was plugged and abandoned on August 23, 2011.

Figure 3-1 illustrates the geophysical log run in this well when initially drilled along with significant geologic formation picks illustrated.

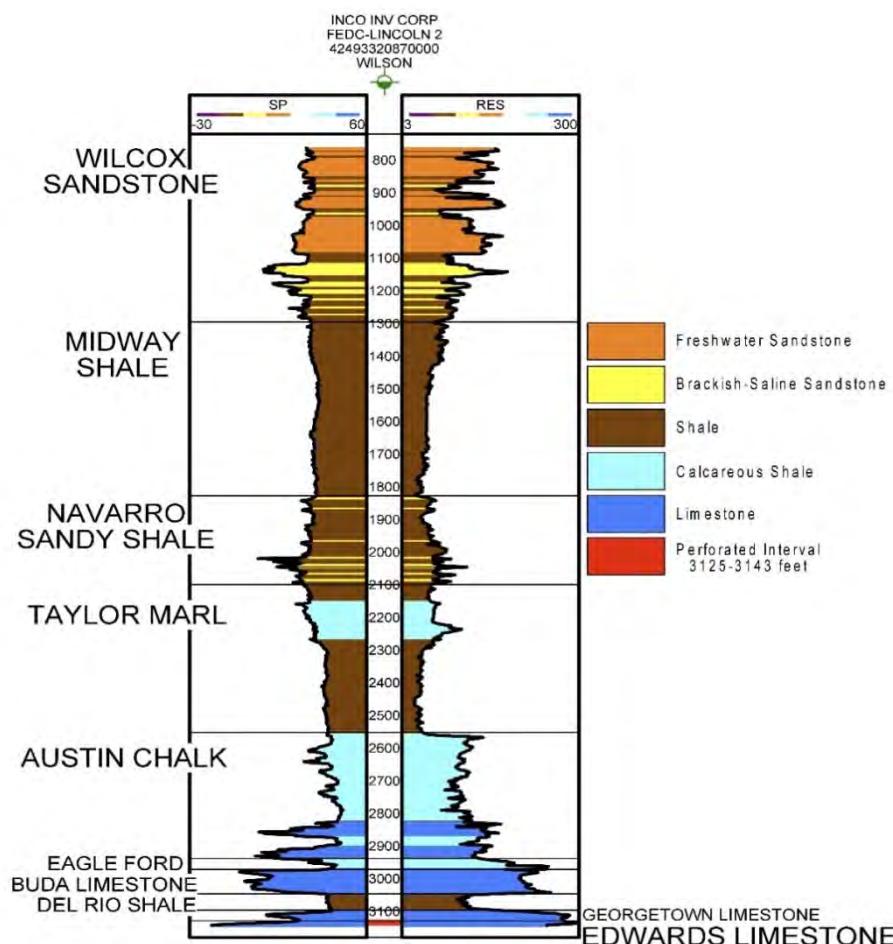


Figure 3-1 Geophysical log of INCO Inv. Corp. FEDC Lincoln No. 2 well.

In the area of the Injection Well, the base of fresh to slightly saline water is found at a depth of approximately 1,100 feet and is located in the lower Wilcox Sandstone, located at a depth of approximately 1,300 feet. The Injection well has continuous cement casing from the surface to 1,150 feet deep, just below of the base of usable quality water (BUQW) at 1,100 feet. Refer to **Figure 3-2** to see the Injection Well diagram. With the well drilled and cased to 3,143 feet, the well has an injection point within the Edwards Limestone and just below Austin Chalk.

Both the Edwards Limestone and Austin Chalk formations have high concentrations of calcium carbonate, and these formations are known to have salt concentrations that far exceed concentrations ($\leq 10,000$ mg/L total dissolved solids [TDS]) that define an underground source of drinking water (USDW). While no official USDW determination has been made by the RRC, the depth of the base of USDW is estimated near the BUQW depth, based on discussion with an RRC representative. Therefore it can be reasonably concluded that the Injection Well has a depth that injects below the lowermost USDW, as required by the TCEQ General Permit.

With regard to fault zones, the Injection Well is located at the downdip edge of the Luling fault zone, which also occurs to the northeast of the Injection Well. The Carrizo Formation is also exposed at land surface at the Injection Well. The potential impact of the presence of these faults was not addressed in any of the documentation obtained as part of this study. However, it is widely recognized that the presences of certain types of faults, especially faults that intersect a well bore such as this well, has the potential for providing a conduit for the movement of fluids into other geologic formations. Generally, in areas of known subsurface faulting, the evaluation process will need to be focused on the identification of faulted horizons and adequate testing via cement bond logs, radioactive tracer testing, and pressure testing to ensure that faults intersecting the well bore are not acting as conduits for the movement of fluids away from the target injection zone.

Information identified as part of this study within the Injection Well records that would have been necessary during preparation of the Technical Report required for obtaining authorization of a Class I nonhazardous injection well under the General Permit included:

1. A set of geophysical logs with spontaneous potential (SP), resistivity, Gamma Ray (GR), density, neutron, and caliper logs; and radioactive tracer and pressure tests;
2. A well inclination survey;
3. The history and schematics of well completion procedures, including cementing and casing/tubing characteristics; and
4. Area of review data.

However, no information on mechanical integrity, pressure testing, or other required well testing protocols necessary to qualify for Class I-II TCEQ General Permit coverage was researched as part of this study. For a more inclusive listing of anticipated testing protocols necessary to obtain a General Permit for an existing Class II well, the testing program for the SAWS Class I well is relevant and is summarized below in **Section 3.0**. Such additional testing protocols would therefore have been required to acquire a dual Class I-II General Permit for the FEDC Lincoln No. 2 well.

P.S.N. Petroleum, Inc., FEDC-Lincoln (13527) Lease, Well #2

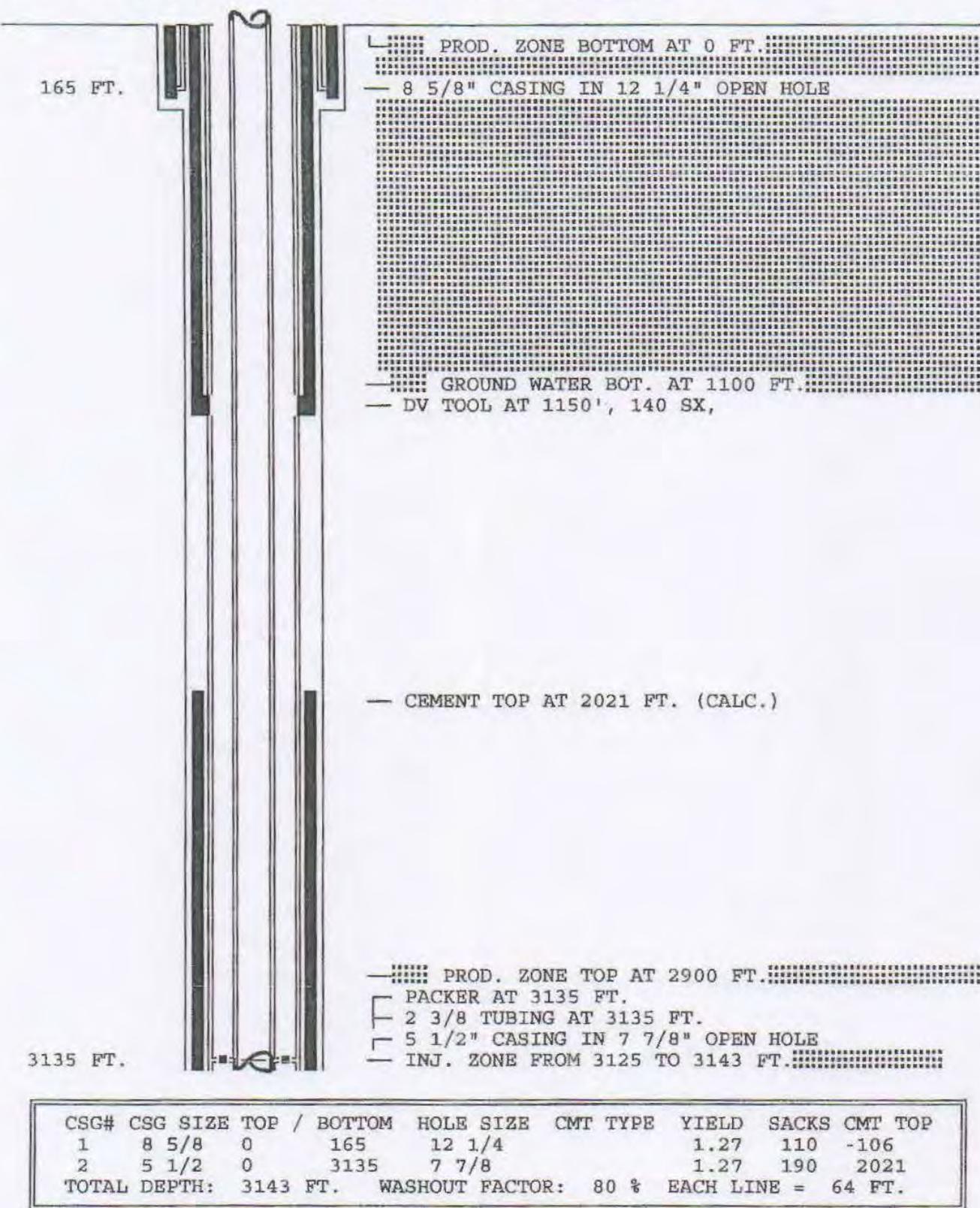


Figure 3-2. FEDC Lincoln No. 2 Well Diagram

SAWS ultimately decided not to pursue the use of the Class II Injection Well for desalination concentrate disposal. Instead, SAWS decided to drill, complete, and permit five new Class I nonhazardous injection wells. To date, only the first well, SAWS Well 1, has been drilled and completed, although SAWS has completed the permitting process for all five wells. According to SAWS representatives, the initial plan to utilize the existing Injection Well was terminated based on the following costs:

1. The estimated cost of land acquisition for the Class II Injection Well and associated property (approximately 1,010 acres) was approximately \$4.9 million. In comparison, the Class I well completion cost \$5.1 million, which included drilling, testing, and permitting (Note: because SAWS already owned the project site as part of the SAWS Aquifer Storage and Recovery Project, the total cost does not include expenses associated with land acquisition);
2. The Injection Well was located near the middle of one large tract of land. Moreover, SAWS would likely need to drill at least two additional injection wells to meet Phase I demands of the BGD Project if the assumed injection rates were similar to rates documented during test drilling efforts;
3. Utilizing the existing Class II Injection Well would require approximately 11 miles of concentrate transmission pipeline from the SAWS BGDBGD Project treatment plant to this Injection Well, therefore increasing the total cost of the project;
4. A concentrate transmission line would cross the San Antonio River. As such, SAWS anticipated significant additional costs associated with the permitting and engineering work (e.g. a Section 404 permit from the U.S Army Corps of Engineers) necessary to complete such a waterway pipeline crossing;
5. A recognized but unquantified cost of well rehabilitation was determined for the Injection Well, along with the reality of an uncertain permitting outcome (i.e., there was no guarantee that at the end of the effort SAWS would be successful in obtaining a Class I General Permit from the TCEQ, which would allow the well to be dually permitted);
6. The difficulty in obtaining well design information, including material standards, and documentation by a Professional Engineer (P.E.) that the well construction met design standards;
7. The lack of information about the fluids that had been previously injected into the well;
8. The uncertainty of the current condition of the well considering that it was drilled in the late 1980s;
9. There would have been significant costs associated with conveying required electricity to the Injection Well from the Karnes Electric Cooperative since the well is located in Wilson County; and
10. Due to the remote nature of the Class II Injection Well with respect to the SAWS BGD Project site, costs associated with a separate supervisory control and data acquisition (SCADA) system, radios, and repeater antennas would further increase the total cost of the project.

As described later in this appendix, a Class II well must meet Class I injection well construction and environmental requirements to be dually authorized under the TCEQ Class I General Permit. Rules governing the issuance of the General Permit give final authority to TCEQ in the dual

permit decision process. As certain factors, such as those listed above, rendered this option to be cost prohibitive for SAWS to proceed, it is unknown whether TCEQ would have dually permitted this Class II well as a Class I-II injection well for desalination concentrate disposal under the TCEQ General Permit. Yet several factors suggest that the Injection Well had potential to meet Class I standards, as long as required testing was performed and yielded satisfactory results. These factors include:

- The well appears to have adequate records for a comprehensive evaluation by TCEQ, (as presented in the appendices of this section).
- As shown on the geophysical log (shown in **Figure 2**), the well has a depth of 3,143 feet that injects into formations with high carbonate concentrations. Additionally, based on discussion with RRC representatives, the well has sufficient depth below the lowermost USDW.
- In 1992, the well was granted a permit as a salt water disposal well, (i.e. a Class II, Type 1 well). These types of wells are used solely for disposal of oil and gas fluids. Class II, Type 1 wells, like Class I wells, must meet Safe Drinking Water Act requirements without exception. This past permit approval suggests that the well has adequate construction characteristics to protect any movement of fluids into USDW formations.

These points, related to availability of records and the protection of USDW formations, prove essential in determining the feasibility of a Class II well qualifying for a dual Class I General Permit authorization, as summarized at the end of this appendix and as discussed in detail in **Appendix C** of the *Manual for the Permitting Process*. Although SAWS did not pursue the option for utilizing the existing Class II well for desalination concentrate disposal for the reasons stated above, from a regulatory standpoint, the well has potential to meet Class I General Permit standards, contingent upon the following:

- Additional mechanical and pressure testing protocols are performed and have satisfactory results;
- The USDW depth is confirmed and the well injects below the lowermost USDW; and
- TCEQ determines that sufficient construction requirements are in place to protect the lowermost USDW.

TCEQ has the final interpretation of General Permit regulations and in determining whether the well has adequate construction characteristics to prevent the movement of fluids into USDW formations. Given that TCEQ has not yet approved a General Permit to a Class I-II well, it is difficult to predict whether this particular Class II well would have received authorization under the General Permit. TCEQ strongly encourages water providers meet and discuss with TCEQ Underground Injection Control (UIC) staff early in the permitting process to fully understand the potential of utilizing a Class II well under this General Permit option.

4 SAWS Class I Nonhazardous Injection Well

Following a review and evaluation of available information for the Class II Injection Well, SAWS determined not to use the existing Injection Well for their BGD Project. Instead, SAWS determined that the best approach to concentrate management was to drill, complete, and permit one or more Class I nonhazardous injection wells at the BGD Project site. To date, SAWS has permitted five Class I nonhazardous injection wells and drilled and completed one of the five

permitted wells. A primary determining factor for eliminating the Injection Well was that the well was located too far away (11 miles) to the east and a pipeline would have required significant state and federal permitting for crossing the San Antonio River. It should be recognized that these specific factors may not apply to water providers in other areas considering brackish groundwater desalination.

SAWS, as part of their support of this research project, has compiled and provided the following well completion, testing protocols and results, and cost information to allow sponsors of potential brackish groundwater desalination projects to better understand the potential costs to drill, complete, and permit a nonhazardous injection well for desalination concentrate management.

Table 4-1. Drilling, Completion, and Testing Information Summary: SAWS Injection Well No. 1 (summarized from SAWS General Permit Notice of Intent [NOI]).

Item	Value/Description
Well Name/Number	SAWS Injection Well No. 1
Operator	SAWS
Notice of Intent (NOI)	The NOI for Injection Well No. 1 was issued to SAWS by the TCEQ on August 2, 2011. The NOI was amended on September 30, 2011 and March 27, 2012. The NOI amendments associated with the installation of Injection Well No. 1 provides for the installation of four additional wells (September 30, 2011) and a procedure to complete the wells open-hole (March 27, 2012).
TCEQ Permit Number	WDWG-010001
Well Location	Latitude: 29.139472, Longitude: -98.383889, at 551-foot elevation above mean sea level
Total depth	5,040 feet
SAWS Injection Well No. 1 drilling and completion dates	Field operations began on February 10, 2012. Drilling operations began March 16, 2012, and continued through June 4, 2012. Completion operations were conducted from June 5, 2012 through June 29, 2012.
<i>Casing/Completion records</i>	
Conductor casing	20" x 0.625" wall driven to refusal at 82 ft.
Surface casing	13 3/8", 61.0 lb./ft, K-55, ST&C set at 1,990 ft. in a 17 1/2" borehole, cemented to land surface.
Long string casing	9 5/8", 60 lb./ft., L-80; LT&C, set at 4,195 ft. in a 12 1/4" borehole, cemented to 1,620 ft.
Cement stage collar	Set at 3,941 ft.
Injection tubing	7", 26.0 lb./ft., N-80, LT&C with latch-in seal assembly at 4,160 ft.
Packer	7" x 9 5/8" with latch-in polished bore set at 4,160 ft. Bottom of packer at 4,165 ft.
Open hole	8 1/2" open hole from 4,195 ft. to 5,040 ft.
<i>Logging and testing program</i>	
Directional survey	Conducted from land surface to injection well total dept

Item	Value/Description
High Definition Induction Resistivity	Run 1 logged interval from 81 ft to 2,003 ft below land surface. Run 2 from 1,984 ft to 4,190 ft. Purpose of this suite of logs is to understand and quantify geologic units penetrated by the borehole and correlate with other boreholes in the area, evaluate confining one geophysical properties, evaluate injection zone geophysical properties, and estimate formation fluid TDS
Spontaneous Potential (SP)	See above for logged intervals and purpose of log
Compensated Z-Densilog	See above for logged intervals and purpose of log
Compensated Neutron	See above for logged intervals and purpose of log
Gamma Ray	See above for logged intervals and purpose of log
Borehole caliper	See above for logged intervals. Purpose is to calculate annular hole volumes
Temperature survey log	Cased hole log from land surface to 1,950 feet through 13 3/8" casing
Segmented Bond Log/Gamma Ray	Log run to inspect quality and adequacy of cement in well. Log run from 50 ft to 1,975 ft below land surface
Mechanical integrity testing	Purpose is to evaluate potential for fluids moving through the wellbore into zones other than the injection zone
Radioactive tracer survey	Purpose is to evaluate potential for fluids moving through the wellbore into zones other than the injection zone
Pressure testing	Pressure testing was conducted on both the surface casing and also on the long string (tubing)
Coring of geologic intervals for laboratory testing	Core samples were collected during the drilling of the injection well from the Del Rio Formation confining layer (4,140 feet to 4,162 feet), the Upper Edwards injection zone (4,435 feet to 4,465 feet), and the Lower Edwards injection zone (4,558 feet to 4,588 feet)
Injectivity/Falloff test	Test was performed in order to measure bottom-hole pressure and permeability of injection zone
Quality of water present in injection zone	SAWS tested the Upper Edwards Formation water quality to determine if it was a USDW or not. Calculation of TDS through the use of several old nearby well logs indicated that TDS was around 10,000 to 15,000 parts per million--too close to determine without obtaining a water quality sample. SAWS needed to confirm that the Upper Edwards Formation was a viable injection zone. The TDS of the sample collected from above the target injection zone was found to be 68,000 mg/L. A representative water sample from the entire anticipated injection interval (Edwards through the Upper Glen Rose Formations), was obtained at 4,950 feet. The composite water sample yielded a TDS concentration of 90,100 mg/L.
Geologic formations penetrated by SAWS Injection Well No. 1 (as reported in SAWS NOI Appendix 5.1-1)	
Reklaw Clay	95 ft.
Carrizo/Wilcox	1,580 ft.
Midway/Navarro	1,756 ft.

Item	Value/Description
Anacacho	280 ft.
Austin Chalk	153 ft.
Eagle Ford Shale	39 ft.
Buda Limestone	78 ft.
Del Rio Clay	52 ft.
Georgetown Formation	46 ft.
Edwards Group – Person Formation	260 ft.
Edwards Group – Kainer Formation	362 ft.
Glen Rose Formation	200+ ft.

Table 4-1 provides an example of important construction data for the new Class I well. When comparing this data to records of the existing onsite Class II Injection Well (**Table 3-1**), key points include the following:

- The SAWS Injection Well No.1 has significantly more depth at 5,040 feet than the Class II Injection Well. For the Class I well, the shale and sandstone formations extend much deeper, however. This well also injects into similar limestone formations as the Class II well.
- Water quality tests above and within the target injection zone showed concentrations of 68,000 and 90,100 milligrams per liter (mg/L) of TDS, respectively. The defining upper limit for USDW formations is 10,000 mg/L TDS. Based on analysis of resistivity profiles from the geophysical logs obtained for the Class II well, water quality tests would have likely have confirmed that the TDS of water in the target formation were greater than 10,000 mg/L, and thus below the base of the USDW.
- Cement requirements are more robust for the new Class I well, especially since the Class II well is not cemented from 1,150 to 2,021 feet. For the Class II well to qualify for the Class I General Permit for concentrate disposal, TCEQ would have to determine that the well has sufficient casing to prevent the movement of injection fluids into USDW formations.

Table 4-2 presents cost values provided for this study by SAWS with regards to the new Class I nonhazardous injection well located at the SAWS BGD Project, (submitted via correspondence from Philip Campos (SAWS) to Roger Schenk (CDM Smith) dated April 18, 2013). These costs have been adjusted for site-specific factors such as depth to targeted injection zone and proximity to potential Class II wells, which will need to be considered by potential brackish groundwater desalination project sponsors.

Table 4-2. SAWS Brackish Groundwater Desalination Project – Class I Injection Well Costs

Item	Status	Cost (2013 US dollars)
1. Drilling and testing of a new Class I injection well	Complete	\$4,832,000
2. Electronic copy of SAWS NOI submitted to TCEQ	Complete	\$198,941
3. Electronic copy of SAWS Class I injection well report	Complete	\$50,940
Total Cost		\$5,081,881

5 Class II Well Considerations

A key objective of this study is to provide relevant information to water providers with regards to the basic data and information necessary to evaluate the feasibility of successfully obtaining Class I-Class II injection well coverage under the TCEQ General Permit option if potential Class II wells are available in the area of interest. For TCEQ to dually permit a Class II well (specifically for the Type 1 and 2 wells) under the General Permit option, the Class II well must meet Class I construction, performance, and environmental standards established by TCEQ under the General Permit, for the disposal of “nonhazardous desalination concentrate” and/or “nonhazardous drinking water treatment residual.” While current requirements for Class II disposal wells as established by the RRC are comparable to Class I requirements under the General Permit, certain construction requirements differ significantly, and confirming whether a Class II well, especially an older well, meets current Class I requirements can become a complex task. Consulting with the RRC and TCEQ staff early in this process is highly encouraged to avoid delays or unnecessary costs.

For the purposes of this study, the technical requirements for obtaining authorization under the General Permit option are fully documented in the Permitting Roadmap (refer to **Appendix C**), also developed as part of this study. A major element of this permitting process is the required Technical Report that is submitted with the NOI. Upon NOI submittal, the required Technical Report must provide the following elements:

- A topographic map extending one mile beyond the property boundary of the well depicting the facility and any water management facilities
- Area of review (AOR)
- Corrective action plan and well data
- Maps and cross sections of USDW
- Maps and cross sections of the geologic structure of the area
- Well design and construction procedures
- Formation testing and stimulation program
- Injection procedures and operating data (injection rate, volume, pressure, annulus fluids, etc.)

- Chemical, physical, radiological, and biological characteristics of the waste
- Contingency procedures for well failures and shut-ins
- Monitoring program (mechanical integrity testing, monitoring, and recording devices, sampling frequency, parameters measured, etc.)
- Plugging and abandonment plan for the well including a closure cost estimate [30 TAC Chapters 305.49(a)(4) and 331.143]
- Pre-injection units

The costs and time required to drill, complete, and permit a Class I nonhazardous well versus the costs and time required to identify, evaluate, test, and dually permit a Class II well under the General Permit are largely based on local, site-specific conditions. Currently, no wells are dually permitted as a Class II well and as a Class I well under the General Permit that was adopted in 2008. One well is active in the Cleburne area that was originally permitted as a Class II well and subsequently obtained a Class I Individual Permit. It is important to note that the process for obtaining the more rigorous Individual Permit is different from the process to obtain authorization under the General Permit and that the Individual Permit process does not directly relate to the efforts associated with the potential SAWS dual permitted wells. Until a Class II well has been dually permitted under the General Permit, it will not be possible to fully understand the level of effort, testing, and costs required for this permitting effort.

However, the cost and time savings from the use of locally available Class II injection wells may be significant to warrant further evaluation by potential project sponsors. When evaluating Class II injection wells for their potential to be dually permitted under the General Permit option, the following considerations will be necessary (summarized 30 TAC §331.62 Subchapter D describing construction requirements for General Permit Class I wells):

- TCEQ will evaluate each well permit application on a case-by-case basis;
- Wells shall be cased and cemented to prevent the movement of fluids into or between USDWs. The casing and cement used in the construction of each newly drilled well shall be designed for the life expectancy of the well. In determining and specifying casing and cementing requirements, the following factors will be considered by the TCEQ during the permitting process:
 - Depth to the injection zone;
 - Injection pressure, external pressure, internal pressure, and axial loading;
 - Hole size;
 - Size and grade of all casing strings (wall thickness, diameter, nominal weight, length, joint specification, and construction material);
 - Corrosiveness of injected fluid, formation fluids, and temperatures;
 - Lithology of injection and confining intervals;
 - Type or grade of cement; and
 - Results from mechanical integrity tests and anticipated injection volumes and maximum pressures.

Reviewing this list of permitting requirements illustrates the basic types of information one should gather to begin the evaluation and permitting process. Information regarding the original well completion design (including casing and tubing sizes and quality, cementing programs,

squeeze jobs, and perforated intervals), detailed geologic characteristics (such as formation depths, targeted injection zones, depth to the base of fresh water), and proximity to other applicable penetrations (e.g. wells) and their status (e.g. producing, plugged and abandoned) within the area of review will be necessary. Potential Class II wells “shall be sited in such a fashion that they inject into a formation which is beneath the lowermost formation containing, within one quarter mile of the well bore, an underground source of drinking water” (30 TAC 331.62 (b)(2)).

As part of this study, meetings were held with representatives of the TCEQ, RRC, and TWDB. Most important to potential sponsors of brackish groundwater desalination projects is the need to obtain sufficient well records and USDW information (if available) from the RRC and to have pre-application meetings early in the process with program staff at TCEQ Underground Injection Control (UIC) Permit Section. All available technical information about potential Class II injection wells should be gathered prior to this pre-application meeting so that any potential issues that might delay or prevent authorization under the General Permit option may be identified and resolved early in the process.

6 Conclusion

Examining the SAWS BGD Project case study has provided significant insight on the following:

- A summary of the feasibility of an existing Class II well to meet the needs of the SAWS project; as well as an example evaluation of the Class II well and its potential eligibility for coverage under a Class I nonhazardous injection well General Permit.
- A summary of important data and costs provided by SAWS, for the construction of a new Class I well for desalination concentrate and DWTR disposal.
- A general overview of important considerations for interested cities, utilities, and other water providers with regards to utilizing an existing Class II well for the disposal of desalination concentrate or DWTRs.

SAWS did not find the existing Class II well to be economically feasible for the desalination project because of its proximity, land purchasing costs, additional permitting challenges for crossing the San Antonio River, and well injection capacity, among other factors. However, from a regulatory perspective, records suggest that the existing Class II well has potential to meet Class I General Permit standards, as long as additional mechanical and pressure testing protocols are performed and satisfactory results are obtained.

The TCEQ has the final say in interpreting General Permit regulations and in determining whether the well has adequate construction characteristics to prevent the movement of fluids into USDW formations. Since TCEQ has not yet authorized an existing Class II well to operate as a Class I well under the General Permit, it is difficult to predict whether this particular Class II well would have received General Permit coverage. It is strongly recommended that water providers meet and discuss with TCEQ UIC Permits Section staff to fully understand the potential of utilizing a Class II well under this General Permit option.

Information provided by SAWS about the new Class I well shows important factors and costs to consider for such construction. Overall, reviewing case studies such as the SAWS project will prove helpful to water providers considering an inland brackish groundwater desalination project with the use of existing injection wells for concentrate disposal. Each project will have site-

specific conditions that need to be carefully evaluated and greatly affect the decision-making process. Refer to **Appendix C – Permitting Roadmap** for more detailed and sequential information on the regulatory process.

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APPENDIX D-1

Permitting Information
Obtained from the
RRC

May 2014

**CDM
Smith**

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- Return each W-1 with plat and \$100.00 fee
Make a check or money order payable to the State Treasurer of Texas. Address to:
Railroad Commission of Texas
Oil and Gas Division, Drilling Permits
P. O. Drawer 12967, Capitol Station
Austin, Texas 78711
- File a copy of W-1 and plat in RRC District Office

RAILROAD COMMISSION OF TEXAS

Oil and Gas Division

Application for Permit to Drill, Deepen, Plug Back, or Re-Enter

Form W-1

Rev. 9/1/83
483-060

► Read Instructions on Back

Purpose of filing (mark appropriate boxes)

- Drill Deepen (below casing) Deepen (within casing) Plug Back Re-Enter
 Directional Well Sidetrack Amended Permit (enter permit no at right & explain fully in Remarks)

Enter here, if assigned:
API No. **42-493-32087**
Permit No. **348885**

1 Operator's Name (exactly as shown on Form P-5, Organization Report)

INCO Investments Corporation

2 Address (including city and zip code)
5324 Briar Tree Drive
Dallas, Texas 75248

OK 7/14/88

3 RRC Operator No

423651

4 RRC District No

01

5 County of Well Site

Wilson

Rule 37 Case No.

348885

6 Lease Name (32 spaces maximum)

FEDC - Lincoln

7 RRC Lease/ID No

8 Well No.

#2

9. Total Depth

3300'

10 Location

• Section _____ Block _____ Survey _____ Jose De La Garza Abstract No A-14

• This well is to be located 1 miles in a SouthWesterly direction from Saspamco

2 1/2 West Calavera

which is the nearest town in the county of the well site

11 Distance from proposed location to nearest lease or unit line

1255' ft

12. Number of contiguous acres in lease, pooled unit, or unitized tract **1012** (OUTLINE ON PLAT.)

13 FIELD NAME (Exactly as shown on RRC proration schedule)
 List all established and wildcat zones of anticipated completion. Attach additional Form W-1's as needed to list these zones. One zone per line.

1255'

Completion depth	14	15	16	17	18	19	20	21. No. of applied for, permitted, or completed locations (including this one) on lease in this reservoir.
	Spacing pattern (ft.)		Density pattern (acres)	Number of acres in drilling unit for this well OUTLINE ON PLAT	Is this acreage assigned to another well on this lease & in this reservoir? If so, explain in Remarks.	Distance from proposed location to nearest applied for, permitted, or completed well, thus lease & reservoir (ft.)	Oil, gas, or other type well (Specify)	OIL GAS
Saspamco 8115000/	2900' 330/660	20	20	No	None	oil	None	None

Code: A660

22. Perpendicular surface location from two nearest designated lines:

* Lease/Unit **1255' FNL & 5000' FSL**
 * Survey/Section **6000' FEL & 5000' FSL**

If a directional well, show also projected bottom-hole location:

* Lease/Unit _____
 * Survey/Section _____

23 Is this a pooled unit?

Yes ► (Attach Form P-12 and certified plat)

No

24 Is Item 17 less than Item 16 (substandard acreage for any field applied for)?

Yes ► (Attach Form W-1A)

No

25 Is this wellbore subject to Statewide Rule 36 (hydrogen sulfide area)? Yes No

If subject to Rule 36, is Form H-9 filed? Yes No ► If not filed, explain in Remarks

26 Do you have the right to develop the minerals under any right-of-way that crosses, or is contiguous to, this tract? Yes No
 If not, and if the well requires a Rule 37 or 38 exception, see Instructions for Rule 37

I certify that information stated in this application is true and complete, to the best of my knowledge.

Edward D. Hayden, Sr.

Signature *Edward D. Hayden, Sr.* Name and title of operator's representative

7/08/88 (214) 248-9792

Date mo day yr Tel Area Code Number

* RRC Use Only *

219675 JUL 14 88

348885

OEFINGER LEASE

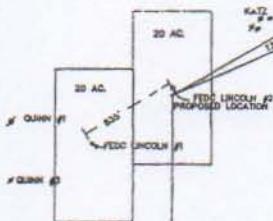
RECEIVED
R.R.C. OF TEXAS
MAY 20 1992
O.S.
SAN ANTONIO, TX



SCALE 1" = 1000'

C. RECTOR SUR. NO. 13A
CALAVERAS CREEK

JOSE DE L. GARZA SUR.



DIAMOND COLLER

JOSE DE LA GARZA SUR.

SAN ANTONIO

RIVER

VINCENT ZEPEDA SUR. NO. 17

PLAT SHOWING LOCATION SITE	
FEDC LINCOLN #2	
INCO INVESTMENTS CORPORATION	
BEXAR & WILSON COUNTIES, TEXAS	
SCALE 1" = 1000'	MAY 1988

<i>Amil M. Baker Jr.</i>	
AMIL M. BAKER JR.	
REGISTERED PUBLIC SURVEYOR	
JOB NO. 88-060	

BAKER SURVEYING, INC.
11003 RYE DR.
SAN ANTONIO, TEXAS 78217
PHONE 655-7370

THE DRAWINGS AND THE INFORMATION CONTAINED THEREIN ARE THE PROPERTY OF BAKER SURVEYING, INC. AND ARE NOT TO BE COPIED OR USED BY ANYONE WITHOUT THE WRITTEN CONSENT OF THE COMPANY. THESE DRAWINGS ARE PREPARED FOR THE USE OF THE CONTRACTOR AND ARE NOT TO BE USED FOR ANY OTHER PURPOSE. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PAYMENT OF THE SURVEY FEE.

RAILROAD COMMISSION OF TEXAS

Oil and Gas Division

Please Read InstructionsELECTRIC LOG
STATUS REPORT

FORM L-1

Rev. 12/88

INSTRUCTIONS

When to file the L-1

- with Forms G-1, W-2, and GT-1 for new and deepened gas, oil, and geothermal wells
- with Form W-3 for plugged dry holes
- when sending in a log which was held under a request for confidentiality and the period of confidentiality has not yet expired

When the L-1 is NOT required

- with Forms W-2, G-1, and GT-1 filed for injection wells, disposal wells, water supply wells, service wells, re-test wells, re-classifications, and plugbacks of oil, gas, and geothermal wells
- with Form W-3 for plugging of other than a dry hole

Where to file the L-1

- with the appropriate Commission district office

Filling out the L-1

- Section I and the signature section must be filled out for all wells
- complete only the appropriate part of Section II

Type of log required

- any wireline survey run for the purpose of obtaining lithology, porosity, or resistivity information
- no more than one such log is required but it must be of the subject well
- if such a log is NOT run on the subject well, do NOT substitute any other type of log; just select Section II, Part A below

SEE REVERSE SIDE

SECTION I. IDENTIFICATION		
Operator Name P.S.N. Petroleum, Inc.	District No. 1	Completion Date 7/20/88
Field Name Saspamco	Drilling Permit No. 348885	
Lease Name FEDC-Lincoln	Lease/ID No. N/A	Well No. 2
County Wilson	API No. 42 - 493-32087	

SECTION II. LOG STATUS (complete either A. or B.)

<input type="checkbox"/>	A. BASIC ELECTRIC LOG NOT RUN
<input checked="" type="checkbox"/>	B. BASIC ELECTRIC LOG RUN (select one)
<input checked="" type="checkbox"/> 1. Confidentiality requested. <input type="checkbox"/> 2. Confidentiality already granted on basic electric log covering this interval (applicable to deepened wells only). <input type="checkbox"/> 3. Basic electric log covering this interval already on file with Commission (applicable to deepened wells only). <input type="checkbox"/> 4. Log attached to (select one)	
<input type="checkbox"/> (a) Form L-1 (this form). If the company/lease name on log is different from that shown in Section I, please enter name on log here: _____	
Check here if attached log is being submitted after being held confidential <input type="checkbox"/>	
<input type="checkbox"/> (b) Form P-7, Application for Discovery Allowable and New Field Designation.	
<input type="checkbox"/> (c) Form W-4, Application for Multiple Completion: lease or ID no.(s) _____, well no.(s) _____	

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R.R.C. OF TEXAS

MAY 27 1992

<u>Matt Montamat</u> signature	Agent _____	O.G. SAN ANTONIO, TX
<u>Matt Montamat</u> name (print)	(512) 657-2081 phone	5/24/92 date

For Railroad Commission use only

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION

JAMES E. (JIM) NUGENT, Commissioner
BOB KRUEGER, Commissioner
JIM WALLACE, Commissioner



DAVID M. GARLICK
Director
LORI WROTBERRY
Director of
Environmental Services
(512) 463-6790
Fax (512) 463-6780

1701 N. CONGRESS

P. O. BOX 12967

AUSTIN, TEXAS 78711-2967

**PERMIT TO DISPOSE OF NON-HAZARDOUS OIL AND GAS WASTE BY INJECTION
INTO A POROUS FORMATION NOT PRODUCTIVE OF OIL AND GAS**

PERMIT NO. 09705

P.S.N. Petroleum, Inc.
8209 Roughrider, Ste. 201
San Antonio, TX 78239

Based on information contained in your application (Form W-14) dated May 21, 1992, you are hereby authorized to dispose of oil and gas waste into your well designated as follows:

FEDC-Lincoln Lease, (13527), Well No. 2, Saspmco Field, Wilson County, RRC
District 01

Authority is granted to inject in accordance with Statewide Rule 9 of the Railroad Commission of Texas and subject to the following special and standard conditions:

SPECIAL CONDITIONS:

1. Oil and gas waste shall only be injected into strata in the subsurface depth interval from 3125 feet to 3143 feet.
2. The injection volume shall not exceed 1500 barrels per day.
3. The maximum operating surface injection pressure shall not exceed 600 psig.
4. The authority to dispose of oil and gas waste is limited to the disposal of produced salt water.
5. An annual annulus pressure test must be performed and the results submitted in accordance with the instructions of Form H-5.
6. The tubing-casing annulus pressure must be monitored at least weekly and reported annually on Form H-10 to the Commission's Austin Office.

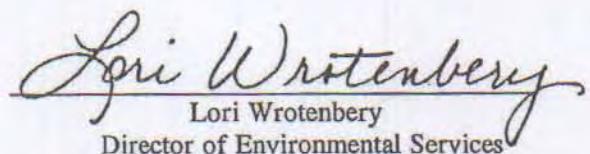
STANDARD CONDITIONS:

1. Injection must be through tubing set on a packer. The packer must be set no higher than 100 feet above the top of the permitted interval.
2. The District Office must be notified 48 hours prior to:
 - a. running tubing and setting packer;
 - b. beginning any workover or remedial operation;

- c. conducting any required pressure tests or surveys.
- 3. The wellhead must be equipped with a pressure observation valve on the tubing and for each annulus.
- 4. Prior to beginning injection and subsequently after any workover, an annulus pressure test must be performed. The test pressure must equal the maximum authorized injection pressure or 500 psig, whichever is less, but must be at least 200 psig. The test must be performed and the results submitted in accordance with the instructions of Form H-5.
- 5. The injection pressure and injection volume must be monitored at least monthly and reported annually on Form H-10 to the Commission's Austin office.
- 6. Within 30 days after completion, conversion to disposal, or any workover which results in a change in well completion, a new Form W-2 or G-1 must be filed in duplicate with the District Office to show the current completion status of the well. The date of the disposal well permit and the permit number must be included on the new Form W-2 or G-1.
- 7. Written notice of intent to transfer the permit to another operator must be submitted to the Commission at least 15 days prior to the date the transfer will occur by filing Form P-4.
- 8. Unless otherwise required by conditions of the permit, completion and operation of the well shall be in accordance with the information represented on the application (Form W-14).

Provided further that, should it be determined that such injection fluid is not confined to the approved strata, then the permission given herein is suspended and the disposal operation must be stopped until the fluid migration from such strata is eliminated.

APPROVED AND ISSUED ON November 24, 1992.



Lori Wrotenberry
Director of Environmental Services

APPLICATION TRACKING SYSTEM STATUS REPORT

OPERATOR FIELD/LEASE	COUNTY LEASE#	APP NO & TYPE	RECEIVE & STAMP	#WELLS DIST#	EMP INITIALS WELL NO(S)
-------------------------	------------------	------------------	--------------------	-----------------	----------------------------

Mark McCoury

P.S.N. Petroleum, Inc.

Saspamco FEDC-Lincoln	Wilson	6415	07/21/92	1	MM
		W14	07/29/92	01	2

APPLICATION DATA ENTRY DATE					
REC	07/21/92				
92	07/24/92	08/23/92	Fee Request		MM
OB	08/05/92		Tech Overview Began & Telerad (table, republish, &w15). jf		mm
AO	08/05/92		Admin Overview		jf
OE	11/05/92		Tech Overview Ended		
RE	11/05/92		Tech Review Ended. jf		dj
PC	11/20/92		Phone Call - RUSH APPLICATION		DJ
FR	11/20/92		Final Review priority		MM
PA	11/23/92		Permit# Assigned		MB
PM	11/24/92		Permit Mailed		mm

P.S.N. Petroleum, Inc., FEDC-Lincoln (13527) Lease, Well #2

165 FT.

— PROD. ZONE BOTTOM AT 0 FT.
— 8 5/8" CASING IN 12 1/4" OPEN HOLE
— GROUND WATER BOT. AT 1100 FT.
— DV TOOL AT 1150', 140 SX,

— CEMENT TOP AT 2021 FT. (CALC.)

3135 FT.

— PROD. ZONE TOP AT 2900 FT.
— PACKER AT 3135 FT.
— 2 3/8 TUBING AT 3135 FT.
— 5 1/2" CASING IN 7 7/8" OPEN HOLE
— INJ. ZONE FROM 3125 TO 3143 FT.

CSG#	CSG	SIZE	TOP / BOTTOM	HOLE SIZE	CMT TYPE	YIELD	SACKS	CMT TOP
1	8 5/8	0	165	12 1/4		1.27	110	-106
2	5 1/2	0	3135	7 7/8		1.27	190	2021
TOTAL DEPTH:	3143 FT.			WASHOUT FACTOR:	80 %	EACH LINE =	64 FT.	

Cementer: Fill in shaded areas.
Operator: Fill in other items.

Tkt#647221

RAILROAD COMMISSION OF TEXAS
Oil and Gas Division

Form W-15
Cementing Report
Rev. 4/1/83
483-045

1. Operator's Name (As shown on Form P-5, Organization Report) Inco Investments Corp.	2. RRC Operator No. 423651	3. RRC District No. 01	4. County of Well Site Bexar
5. Field Name (Wildcat or exactly as shown on RRC records) Sasparaco	6. API No. 42-493 32079	7. Drilling Permit No. 347611	
8. Lease Name F.E.D.C. Lincoln	9. Rule 37 Case No.	10. Oil Lease/Gas ID No.	11. Well No. 1

CASING CEMENTING DATA:	SURFACE CASING	INTER-MEDIATE CASING	PRODUCTION CASING		MULTI-STAGE CEMENTING PROCESS	
			Single String	Multiple Parallel Strings	Tool	Shoe
12. Cementing Date					6-21-88	6-21-88
13. *Drilled hole size					7 3/4"	
*Est. % wash or hole enlargement					20%	
14. Size of casing (in. O.D.)					4 1/2"	
15. Top of liner (ft.)					N/A	
16. Setting depth (ft.)					3133	
17. Number of centralizers used			RECEIVED R.R.C. OF TEXAS		6	
18. Hrs. waiting on cement before drill-out			MAY 20 1992			
19. API cement used: No. of sacks	►				125	310
1st Slurry	Class	►			HLC	50/50 Poz
	Additives	►	SAN ANTONIO, TX		3% salt 1/4 Flocele	10% salt 1/4 # floce
2nd Slurry	No. of sacks	►				
	Class	►				
	Additives	►				
3rd Slurry	No. of sacks	►				
	Class	►				
	Additives	►				
1st	20. Slurry pumped: Volume (cu. ft.)	►			230	396.8
	Height (ft.)	►			1009	1741
2nd	Volume (cu. ft.)	►				
	Height (ft.)	►				
3rd	Volume (cu. ft.)	►				
	Height (ft.)	►				
Total	Volume (cu. ft.)	►			230	396.8
	Height (ft.)	►			1009	1741
21. Was cement circulated to ground surface (or bottom of cellar) outside casing?					yes	no
22. Remarks						

OVER ▶

CEMENTING TO PLUG AND ABANDON	PLUG # 1	PLUG # 2	PLUG # 3	PLUG # 4	PLUG # 5	PLUG # 6	PLUG # 7	PLUG # 8
23. Cementing date								
24. Size of hole or pipe plugged (in.)								
25. Depth to bottom of tubing or drill pipe (ft.)								
26. Sacks of cement used (each plug)								
27. Slurry volume pumped (cu. ft.)								
28. Calculated top of plug (ft.)								
29. Measured top of plug, if tagged (ft.)								
30. Slurry wt. (lbs/gal)								
31. Type cement								

CEMENTER'S CERTIFICATE: I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this certification, that the cementing of casing and/or the placing of cement plugs in this well as shown in the report was performed by me or under my supervision, and that the cementing data and facts presented on both sides of this form are true, correct, and complete, to the best of my knowledge. This certification covers cementing data only.

Felix Herrera

Name and title of cementer's representative

Halliburton Services

Cementing Company

Felix Herrera

Signature

Rt 1 Box 1B

Pleasanton, Tx 78064

512 569-2126

6-21-88

Address

City, State, Zip Code

Tel: Area Code Number

Date: mo. day yr.

OPERATOR'S CERTIFICATE: I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this certification, that I have knowledge of the well data and information presented in this report, and that data and facts presented on both sides of this form are true, correct, and complete, to the best of my knowledge. This certification covers all well data.

Edward Hayden

Typed or printed name of operator's representative

Pres.

Title

Edward Hayden

Signature

5324 Briar Tree Drive

Address

Dallas TX 75248

City, State, Zip Code

214/248-9772

Tel: Area Code Number

6/21/88

Date: mo. day yr.

Instructions to Form W-15, Cementing Report

IMPORTANT: Operators and cementing companies must comply with the requirements of the Commission's Statewide Rules 8 (Water Protection), 13 (Casing, Cementing, Drilling, and Completion), and 14 (Well Plugging). For offshore operations, see the requirements of Rule 13 (c).

A. What to file. An operator should file an original and one copy of the completed Form W-15 for each cementing company used on a well. The cementing of different casing strings on a well by one cementing company may be reported on one form. Form W-15 should be filed with the following:

- An initial oil or gas completion report, Form W-2 or G-1, as required by Statewide or special field rules;
- Form W-4, Application for Multiple Completion, if the well is a multiple parallel casing completion; and
- Form W-3, Plugging Record, unless the W-3 is signed by the cementing company representative. When reporting dry holes, operators must complete Form W-15, in addition to Form W-3, to show any casing cemented in the hole.

B. Where to file. The appropriate Commission District Office for the county in which the well is located.

C. Surface casing. An operator must set and cement sufficient surface casing to protect all usable-quality water strata, as defined by the Texas Department of Water Resources, Austin. Before drilling a well in any field or area in which no field rules are in effect or in which surface casing requirements are not specified in the applicable rules, an operator must obtain a letter from the Department of Water Resources stating the protection depth. Surface casing should not be set deeper than 200 feet below the specified depth without prior approval from the Commission.

D. Centralizers. Surface casing must be centralized at the shoe, above and below a stage collar or diverting tool, if run, and through usable-quality water zones. In nondeviated holes, a centralizer must be placed every fourth joint from the cement shoe to the ground surface or to the bottom of the cellar. All centralizers must meet API specifications.

E. Exceptions and alternative casing programs. The District Director may grant an exception to the requirements of Statewide Rule 13. In a written application, an operator must state the reason for the requested exception and outline an alternate program for casing and cementing through the protection depth for strata containing usable-quality water. The District Director may approve, modify, or reject a proposed program. An operator must obtain approval of any exception before beginning casing and cementing operations.

F. Intermediate and production casing. For specific technical requirements, operators should consult Statewide Rule 13 (b) (3) and (4).

G. Plugging and abandoning. Cement plugs must be placed in the wellbore as required by Statewide Rule 14. The District Director may require additional cement plugs. For onshore or inland wells, a 10-foot cement plug must be placed in the top of the well, and the casing must be cut off three feet below the ground surface. All cement plugs, except the top plug, must have sufficient slurry volume to fill 100 feet of hole, plus ten percent for each 1,000 feet of depth from the ground surface to the bottom of the plug.

To plug and abandon a well, operators must use only cementers approved by the Director of Field Operations. Cementing companies, service companies, or operators can qualify as approved cementers by demonstrating that they are able to mix and pump cement in compliance with Commission rules and regulations.

Cementer: Fill in shaded areas.
Operator: Fill in other items.

Form W-15
Cementing Report
Rev. 4/1/83
483-045

Tkt#647150

RAILROAD COMMISSION OF TEXAS
Oil and Gas Division

1. Operator's Name (As shown on Form P-5, Organization Report) Inco Investments Corp.	2. RRC Operator No. 423651	3. RRC District No. 01	4. County of Well Site Bexar
5. Field Name (Wilcat or exactly as shown on RRC records) Saspamco	6. API No. 42-493 32077	7. Drilling Permit No. 347611	
8. Lease Name FEDC Lincoln	9. Rule 37 Case No.	10. Oil Lease/Gas ID No.	11. Well No. 1

CASING CEMENTING DATA:		SURFACE CASING	INTER-MEDIATE CASING	PRODUCTION CASING		MULTI-STAGE CEMENTING PROCESS	
				Single String	Multiple Parallel Strings	Tool	Shoe
12. Cementing Date	6-15-88						
13. •Drilled hole size	12 1/4"						
•Est. % wash or hole enlargement	20%						
14. Size of casing (in. O.D.)	3 5/8"						
15. Top of liner (ft.)	N/A						
16. Setting depth (ft.)	160'			MAY 20 1992			
17. Number of centralizers used	4						
18. Hrs. waiting on cement before drill-out	6			O.G. SAN ANTONIO, TX			
1st Slurry	19. API cement used: No. of sacks ► Class ► Additives ►	80					
2nd Slurry	No. of sacks ► Class ► Additives ►						
3rd Slurry	No. of sacks ► Class ► Additives ►						
1st	20. Slurry pumped: Volume (cu. ft.) ► Height (ft.) ►	94.4					
2nd	Volume (cu. ft.) ► Height (ft.) ►						
3rd	Volume (cu. ft.) ► Height (ft.) ►						
Total	Volume (cu. ft.) ► Height (ft.) ►	94.4					
21. Was cement circulated to ground surface (or bottom of cellar) outside casing?	yes						
22. Remarks							

OVER ➤

Return To:
DIRECTOR, Underground Injection Control
Oil and Gas Division
Railroad Commission of Texas
Capitol Station-P.O. Drawer 12967
Austin, Texas 78711

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION

RECEIVED
R.R.C. OF TEXAS

JUL 16 1992

D.J. H.
AUSTIN TEXAS

Form W-14
1/82

APPLICATION TO DISPOSE OF OIL AND GAS WASTE BY INJECTION
INTO A POROUS FORMATION NOT PRODUCTIVE OF OIL OR GAS

1. Operator Name	P.S.N. Petroleum, Inc. <i>TAX CR 65-72 min</i>			2. Operator No.	631524	
3. Address (Street, City, State and Zip Code)	8209 Roughrider, Ste. 201 San Antonio, TX 78239			4. RRC Dist.	01 ✓	
5. Lease Name	FEDC-Lincoln ✓			6. RRC Lease ID No.	<input checked="" type="checkbox"/> 13527	
7. Field Name	Saspamco ✓			8. RRC Field No.	<input checked="" type="checkbox"/> 8115000100	
9. County				10. County	Wilson ✓	
11. (a) Location (Sec., Blk., Survey-Give perpendicular location from two designated survey lines.)	A-14			11. (b) This well is to be located	1 miles SW direction	
12. Surface Casing	SIZE	SETTING DEPTH	SACKS CEMENT TOP OF CEMENT	TOP DETERMINED BY	HOLE SIZE	
13. Intermediate	8 5/8"	165'	110 sx / surface	observation	12 1/4" 23#	
14. Long String	5 1/2"	3135	190 702A ¹ 330 sx / surface	observation	7 7/8" 15.5#	
15. Tubing (Size and Depth)	2 3/8" @ 3135' Baker Model R 3135' ✓			16. Name, Model and Depth of Tubing Packer	17. Total Depth of Well	
18. Injection Interval	Top 3125' Bottom 3143'			19. Name of Formation	20. Is Injection through	
22. Is Injection through	<input type="checkbox"/> Perforations or <input checked="" type="checkbox"/> Open Hole			<input checked="" type="checkbox"/> Tubing or <input type="checkbox"/> Casing	21. Fracture Gradient	
26. List All Cement Squeeze Operations, Giving Interval and Number of Sacks of Cement	3139-3135, 2850-2854, 2826-2829			27. Depth to Base of Deepest Fresh Water Zone	28. Depth of Shallowest Zone Productive of Oil or Gas in this Field	29. Anticipated Daily Injection Volume(Bbls)
30. Is Injection System	<input type="checkbox"/> Open or <input checked="" type="checkbox"/> Closed			31. Is Injection by Gravity or Pressure	32. Injection Pressure (Psi)	
33. Will it be necessary for water to be filtered or chemically treated?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			34. Is this well so cased and completed that water can enter no other formation than the above set out injection zone?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
35. Name and Address of Surface Owner	Bill Miller 7983 Hwy 87 East, San Antonio, Texas 78263					
36. (a) Source of Fluids (Geological Name of Formation and Depth)	(b) Are Fluids produced from sources other than Applicant's?					
Austin Chalk	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
(c) If answer is Yes to Question 36(b) attach a list of other sources identifying operators, sources, and types of waste.	N/A ✓ 216169-1-29-92					
37. Have notices of this application been mailed or given to all Offset Operators?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
38. Are there any other Salt Water Disposal Wells using this same Zone in this Field?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
39. If answer is Yes to Question 38, name one such well.	Lease Name	Lease or I. D. No.	Well No.			
Name of Operator	N/A					

CERTIFICATE

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

Matt Montamat
Signature

Matt Montamat Agent
Name of Person (Type or print)
Telephone (512) 657-2081 Date 5/21/92
Area Code Number

FOR RRC USE ONLY

RRC-216169-1-29-92

PR-1

bml

APPLICANT MUST COMPLY WITH THE INSTRUCTIONS ON REVERSE SIDE

P

P.S.N. PETROLEUM, INC.

8209 ROUGHRIDER #201
SAN ANTONIO, TEXAS 78239
(512) 657-2081

October 22, 1992

Jeff Fuller
Railroad Commission of Texas
Oil & Gas Division, Environmental Services
P.O. Drawer 12967 - Capitol Station
Austin, TX 78711-2967

Re:Application for Salt Water
Disposal Well Wiley "C">#1,
FEDC-Lincoln #2, and Lamastus #1

Dear Jeff:

Here is the additional information you have requested. I have enclosed a log offsetting the Wiley "C" #1 and a log offsetting the Lamastus #1. Also I have enclosed the information requested on the offset wells to the FEDC-Lincoln #2 and the Form W-2 for the Lamastus #1. Please call me if you have any more questions.

Sincerely yours,

Matt Montamat
Geologist

mam
enclosure(s)

RECEIVED
R.R.C. OF TEXAS
OCT 23 1992
REC'D - LAG
ALL INFORMATION

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION

Form W-12
(1-7-71)

INCLINATION REPORT (One Copy Must Be Filed With Each Completion Report.)		
1. FIELD NAME (as per RRC Records or Wildcat)	2. LEASE NAME F.E.D.C. LINCOLN	7. RRC Lease Number (Oil completions only)
3. OPERATOR INCO Investments		8. Well Number 1
4. ADDRESS 5234 Briar Tree, Dallas, Texas 75248		9. RRC Identification Number (Gas completions only)
5. LOCATION (Section, Block, and Survey)	O.G. SAN ANTONIO, TX	10. County Wilson

RECORD OF INCLINATION

If additional space is needed, use the reverse side of this form.

17. Is any information shown on the reverse side of this form? yes no
18. Accumulative total displacement of well bore at total depth of 3138 feet = 28.77 feet.
19. Inclination measurements were made in - Tubing Casing Open hole Drill Pipe
20. Distance from surface location of well to the nearest lease line _____ feet.
21. Minimum distance to lease line as prescribed by field rules _____ feet.
22. Was the subject well at any time intentionally deviated from the vertical in any manner whatsoever? no
(If the answer to the above question is "yes", attach written explanation of the circumstances.)

INCLINATION DATA CERTIFICATION

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this certification, that I have personal knowledge of the inclination data and facts placed on both sides of this form and that such data and facts are true, correct, and complete to the best of my knowledge. This certification covers all data as indicated by asterisks (*) by the item numbers on this form.

Dianna Stricker

Signature of Authorized Representative

Dianna L. Stricker Sec/Tres.

Stricker

Name of Company 512-663-2215

Telephone: 512-422-0000

OPERATOR CERTIFICATION

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this certification, that I have personal knowledge of all information presented in this report, and that all data presented on both sides of this form are true, correct, and complete to the best of my knowledge. This certification covers all data and information presented herein except inclination data as indicated by asterisks (*) by the item numbers on this form.

Edward Hayder

Signature of Authorized Representative

Edward Hayden / President

Name of Person and Title (type or print) INGO, Executive Committee

INCO

Operator 314-348-8703

Telephone: 214-27
Area Code:

Railroad Commission Use Only:

Approved By: _____ Title: _____ Date: _____

* Designates items certified by company that conducted the inclination surveys.

Plugging Record

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISIONFORM W-3
Rev. 12/92 (99)

		API No. (if available) 42-493-32087 ✓		1. RRC District 01	
FILE IN DUPLICATE WITH DISTRICT OFFICE OF DISTRICT IN WHICH WELL IS LOCATED WITHIN THIRTY DAYS AFTER PLUGGING				4. RRC Lease or ID Number 13527	
2. FIELD NAME (as per RRC records) SasPamco		3. Lease Name FEDC-Lincoln ✓		5. Well Number 2	
6. OPERATOR P. S. H. Petroleum, Inc. ✓		6a. Original Form W-1 filed in name of: 6000 ✓		10. County Wilson	
7. ADDRESS 1153 E. Commerce San Antonio, TX 78205		6b. Any subsequent W-1's filed in name of: 6000 ✓		11. Date Drilling Permit Issued NIA 7-15-88	
8. Location of well, relative to nearest lease boundaries of lease on which this well is located		1285 feet from NE line and 5000 feet from line of the FEDC-Lincoln lease		12. Permit Number 348835 ✓	
9a. SECTION, BLOCK and SURVEY Jose De La Garza, A-14 ✓		9b. Distance and direction from nearest town in this county 1 mile SSW of SasPamco, TX		13. Date Drilling Commenced. 7-13-88 ✓	
16. Type Well (oil, gas, or dry) O:1	Total Depth 3143'	If multiple completion list all field names and oil lease or gas id no.'s Gas ID or Oil Lease #		Oil - O Gas - G	Well # 7-20-88 ✓
18. If gas, amt. of cond. on hand at time of plugging				14. Date Drilling Completed 7-20-88 ✓	
19. Cementing Data		PLUG #1 8-11-11	PLUG #2 8-11-11	PLUG #3 8-12-11	PLUG #4 8-12-11
20. Size of Hole or Pipe in which Plug Placed (inches)		5 1/2	5 1/2	5 1/2	5 1/2
21. Depth to Bottom of Tubing or Drill Pipe (ft.)		2700'	1200'	2700'	1200'
22. Sacks of Cement Used (each plug)		205X	255X	205X	205X
23. Slurry Volume Pumped (cu. ft.)		23.6	29.5	23.6	29.5
24. Calculated Top of Plug (ft.)		2526'	982'	2526'	918'
25. Measured Top of Plug (if lagged) (ft.)		—	—	997'	—
26. Slurry Wt. # / Gal.		15.6	15.6	15.6	15.6
27. Type Cement		A	A	A	A
28. CASING AND TUBING RECORD AFTER PLUGGING					
29. Was any non-drillable material (other than casing) left in this well? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
SIZE	WT.# / FT.	PUT IN WELL (ft.)	LEFT IN WELL (ft.)	HOLE SIZE (in.)	29a. If answer to above is "Yes" state depth to top of "junk" left in hole and briefly describe non-drillable material. (Use reverse side of form if more space is needed.) RECEIVED R.R.C. OF TEXAS
8 1/2		165'	165'		
5 1/2		3135'	3135'		
30. LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS					
FROM	TO			FROM	OIL & GAS DIVISION SAN ANTONIO, TEXAS
FROM 2826'	TO 3135'			FROM	TO
FROM	TO			FROM	TO
FROM	TO			FROM	TO
FROM	TO			FROM	TO

I have knowledge that the cementing operations, as reflected by the information found on this form, were performed as indicated by such information.
 * Division items to be completed by Cementing Company. Items not so designated shall be completed by operator

Signature of Cementer or Authorized Representative

Name of Cementing Company

CERTIFICATE:

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

Wesley Dresen
REPRESENTATIVE OF COMPANYEng.Spec.II
TITLE8-23-11
DATEPHONE 210 227-1313
A/C NUMBERWesley Dresen /
SIGNATURE: REPRESENTATIVE OF RAILROAD COMMISSION

1-204841

MAPPING

74

31. Was well filled with mud - laden fluid, according to the regulations of the Railroad Commission?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	32. How was mud applied? <i>Spotted between Plugs</i>	33. Mud Weight <i>9.5</i> LBS/GAL	
34. Total Depth <i>3143'</i>	Other Fresh Water Zones by T D.W.R. TOP BOTTOM <i>Surface 1100'</i> Depth of Deeper Fresh Water <i>1100'</i>	35. Have all abandoned wells on this lease been plugged according to R.R.C Rules? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	36. If No, Explain	
37. Name and address of cementing or service company who mixed and pumped cement plugs in this well <i>U.S.A. Plugging, PO Box 784, Pearshall, TX 78061</i>		Date RRC District Office notified of plugging		
38. Name(s) and address(es) of surface owners of well site <i>William T. & Ira Faye Miller C/o Miller GIST Trust 430 South Santa Rosa Pearland, TX 78207</i>				
39. Was notice given before plugging to the above? <i>Yes</i>				
FILL IN BELOW FOR DRY HOLES ONLY				
40. For dry holes, this form must be accompanied by either a driller's, electric, radioactivity, or acoustical/sonic log or such log must be released to a commercial log service.				
<input type="checkbox"/> Log Attached		<input checked="" type="checkbox"/> Log released to _____	Date _____	
Type Logs:	<input type="checkbox"/> Driller's	<input type="checkbox"/> Electric	<input type="checkbox"/> Radioactivity	<input type="checkbox"/> Acoustical / Sonic
41. Date FORM P-8 (Special Clearance) filed:				
42. Amount of oil produced prior to plugging bbls * File FORM P-1 (Oil Production Report) for month this oil was produced				
R.R.C USE ONLY				
Nearest field _____				

REMARKS

SFP Code:01-304841

*Well Plugged w/ state funds
No Stock on hand, remove from Schedule.
GPS: N29.22321, W98.29938*

W14-0975

RAILROAD COMMISSION OF TEXAS

Oil and Gas Division

Type or print only

Form W-2

Rev. 4/1/83

483-046

API No 42493-32087

7 RRC District No

1

8 RRC Lease No

13527

9 Well No.

2

10 County of well site

Wilson

11 Purpose of filing

 Initial Potential Retest Reclass Well record only
(explain in Remarks)

Oil Well Potential Test, Completion or Recompletion Report, and Log

1 FIELD NAME (as per RRC Records or Wildcat)
SASPAMCO

2 LEASE NAME

FEDC-Lincoln

RECEIVED
RRC OF TEXAS

JUN 04 1993

3 OPERATOR'S NAME (Exactly as shown on Form P-5, Organization Report)
P.S.N. Petroleum, Inc.

RRC Operator No

631524

4 ADDRESS

8209 Roughrider, Ste. 201, San Antonio, Texas 78239

5 If Operator has changed within last 60 days, name former operator

N/A

6a Location (Section, Block, and Survey)

Jose De La Garza, A-14

6b Distance and direction to nearest town in this county

1 mile SSW from Sasapamco

12 If workover or reclass, give former field (with reservoir) & gas ID or oil lease no
FIELD # RESERVOIRGAS ID or
OIL LEASE #Oil - O
Gas - G

WELL NO

N/A

13 Type of electric or other log run

Dual Induction

RECORD CODIFICATION

14 Completion or recompletion date

7/20/88

JUL 2 1993

SECTION I: POTENTIAL TEST DATA IMPORTANT: Test should be for 24 hours unless otherwise specified in field rules.

15 Date of test	16 No of hours tested	17 Production method (Flowing, Gas Lift, Jetting, Pumping— Size & Type of pump)			18 Choke size
19 Production during Test Period	► Oil - BBLS	Gas - MCF	Water - BBLS	Gas - Oil Ratio	Flowing Tubing Pressure PSI
20 Calculated 24- Hour Rate	► Oil - BBLS	Gas - MCF	Water - BBLS	Oil Gravity-API-60°	Casing Pressure PSI
21 Was swab used during this test?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	22 Oil produced prior to test (New & Reworked wells)		23. Injection Gas-Oil Ratio

REMARKS W-2 filed for record purposes only to show well status as disposal well.

INSTRUCTIONS: File an original and one copy of the completed Form W-2 in the appropriate RRC District Office within 30 days after completing a well and within 10 days after a potential test. If an operator does not properly report the results of a potential test within the 10-day period, the effective date of the allowable assigned to the well will not extend back more than 10 days before the W-2 was received in the District Office. (Statewide Rules 16 and 51) To report a completion or recompletion, fill in both sides of this form. To report a retest, fill in only the front side.

WELL TESTER'S CERTIFICATION

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I conducted or supervised this test by observation of (a) meter readings or (b) the top and bottom gauges of each tank into which production was run during the test. I further certify that the potential test data shown above is true, correct, and complete, to the best of my knowledge.

Signature: Well Tester

Name of Company

RRC Representative

OPERATOR'S CERTIFICATION

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

Matt Montamat

Geologist

Typed or printed name of operator's representative

(210) 657-2081

6 / 3 / 93

Title of Person

Matt Montamat

Telephone Area Code Number

Date. mo day year

Signature

SECTION II DATA ON WELL COMPLETION AND LOG (Not Required on Retest)							
24. Type of Completion: New Well <input type="checkbox"/> Deepening <input type="checkbox"/> Plug Back <input type="checkbox"/> Other <input checked="" type="checkbox"/>					25. Permit to Drill, Plug Back or Deepen ? 348885 DATE PERMIT NO.		
26. Notice of Intention to Drill this well was filed in Name of Inco Investments							
27. Number of producing wells on this lease in this field (reservoir) including this well 1		28. Total number of acres in this lease 1012			Rule 37 CASE NO Exception Water Injection PERMIT NO Permit Salt Water Disposal PERMIT NO Permit 5/21/93 09705 Other PERMIT NO		
29 Date Plug Back, Deepening, WorkOver or Drilling Operations: 7/13/88		Commenced Completed 7/20/88		30. Distance to nearest well, Same Lease & Reservoir 835'			
31. Location of well, relative to nearest lease boundaries of lease on which this well is located S		1255 Feet From NE Line and 5000 Feet from Line of the Miller Lease					
32 Elevation (DF, RKB, RT, GR, ETC.) 420 GR			33. Was directional survey made other than inclination (Form W-12)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
34 Top of Pay 2810'	35. Total Depth 3143'	36. P. B. Depth	37. Surface Casing Determined by: Field Rules	Recommendation of T.D.W.R. Railroad Commission (Special)		<input type="checkbox"/> <input checked="" type="checkbox"/> Dt. of Letter 7/15/88	Dt. of Letter
38. Is well multiple completion? NO	39. If multiple completion, list all reservoir names (completions in this well) and Oil Lease or Gas ID No. FIELD & RESERVOIR			GAS ID or OIL LEASE # Gas-G	OIL-O WELL #	40. Intervals Drilled by: 0-TD	Rotary Tools Tools Cable
41 Name of Drilling Contractor ?						42. Is Cementing Affidavit Attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
43. CASING RECORD (Report All Strings Set in Well)							
CASING SIZE 8 5/8"	WT #/FT. 23#	DEPTH SET 165'	MULTISTAGE TOOL DEPTH -	TYPE & AMOUNT CEMENT (sacks) Std 110sx	HOLE SIZE 12 1/4"	TOP OF CEMENT surface	SLURRY VOL cu. ft 140
5 1/2"	15.5#	3135	1150	HLC"p" 330sx	7 7/8"	surface	522

44. LINER RECORD					
Size N/A	TOP	Bottom	Sacks Cement	Screen	

45. TUBING RECORD			46. Producing Interval (this completion) Indicate depth of perforation or open hole		
Size 2 3/8"	Depth Set 3135'	Packer Set 3135'	From 3135	To 3143 OH	
			From	To	
			From	To	
			From	To	

47. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.		Amount and Kind of Material Used
Depth Interval 3140		CIBP set
3129-3135		perf 4 spf, 500 gal 15% FE acid
2850-54,2826-29		perf, 2500 gal 7.5% FE acid & 35,000 SCF N ₂

48. FORMATION RECORD (LIST DEPTHS OF PRINCIPAL GEOLOGICAL MARKERS AND FORMATION TOPS)			
Formations Midway	Depth 1088	Formations Austin Chalk	Depth 2825
Navarro	1829	Eagle Ford	2960
Anacacho	2560	Buda	2975

REMARKS _____ Del Rio 3050, Georgetown 3100, Edwards 3125
W-2 filed for record purposes only to show well status as disposal well.

RAILROAD COMMISSION OF TEXAS

Oil and Gas Division

Type or print only

Form W-2

Rev. 4/1/83

483-046

2/90-124

API No 42-493-32087

Oil Well Potential Test, Completion or Recompletion Report, and Log

1 FIELD NAME (as per RRC Records or Wildcat) Saspamco	2 LEASE NAME FEDC-Lincoln	RECEIVED R.R.C. OF TEXAS	7 RRC District No 1
3 OPERATOR'S NAME (Exactly as shown on Form P-5, Organization Report) P.S.N. Petroleum, Inc.	RRC Operator No 631524	MAY 20 1992	8 RRC Lease No 15527
4 ADDRESS 8209 Roughrider, Ste 201 San Antonio, TX 78239	9 Well No 2		
5 If Operator has changed within last 60 days, name former operator Inco Investments Corp.	10 County of well site Wilson		
6a Location (Section, Block, and Survey) Jose De La Garza, A-14	6b Distance and direction to nearest town in this county 1 mile SSW of Saspamco		
12 If workover or reclass give former field (with reservoir) & gas ID or oil lease no FIELD & RESERVOIR N/A	GAS ID or OIL LEASE #	Oil - O Gas - G	WELL NO
13 Type of electric or other log run Dual Induction	14 Completion or recompletion date 7/20/88		

JUN 9 1992

SECTION I: POTENTIAL TEST DATA IMPORTANT: Test should be for 24 hours unless otherwise specified in field rules.

15 Date of test	16 No of hours tested	17 Production method (Flowing, Gas Lift, Jetting, Pumping— Size & Type of pump)		18 Choke size	
19 Production during Test Period	► Oil - BBLS	Gas - MCF	Water - BBLS	Gas - Oil Ratio	Flowing Tubing Pressure PSI
20 Calculated 24- Hour Rate	► Oil - BBLS	Gas - MCF	Water - BBLS	Oil Gravity-API-60°	Casing Pressure PSI
21 Was swab used during this test? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	22 Oil produced prior to test (New & Reworked wells)			23 Injection Gas-Oil Ratio	

REMARKS

W-2 filed for record purposes only. Well did not test commercial.

INSTRUCTIONS: File an original and one copy of the completed Form W-2 in the appropriate RRC District Office within 30 days after completing a well and within 10 days after a potential test. If an operator does not properly report the results of a potential test within the 10-day period, the effective date of the allowable assigned to the well will not extend back more than 10 days before the W-2 was received in the District Office. (Statewide Rules 16 and 51) To report a completion or recompletion, fill in both sides of this form. To report a retest, fill in only the front side.

WELL TESTER'S CERTIFICATION

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I conducted or supervised this test by observation of (a) meter readings or (b) the top and bottom gauges of each tank into which production was run during the test. I further certify that the potential test data shown above is true, correct, and complete, to the best of my knowledge.

Signature Well Tester

Name of Company

RRC Representative

OPERATOR'S CERTIFICATION

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

Matt Montamat

Agent

Typed or printed name of operator's representative
(512) 657-2081

5 / 19 / 92

Telephone Area Code Number

Date mo day year

Title of Person

Signature

Matt Montamat

JUN 2 1982

SECTION II DATA ON WELL COMPLETION AND LOG (Not Required on Retest)							
24. Type of Completion: New Well <input type="checkbox"/> Deepening <input type="checkbox"/> Plug Back <input type="checkbox"/> Other <input checked="" type="checkbox"/> Rule 37 Exception Water Injection Permit Salt Water Disposal Permit Other							
25. Permit to Drill, DATE PERMIT NO. Plug Back or Deepen ? 3488 CASE NO							
26. Notice of Intention to Drill this well was filed in Name of Inco Investments Corp.							
27. Number of producing wells on this lease in this field (reservoir) including this well 1		28. Total number of acres in this lease 1012					
29. Date Plug Back, Deepening, WorkOver or Drilling Operations: 7/13/88		Commenced 7/20/88 Completed		30. Distance to nearest well, Same Lease # Reservoir 835'			
31. Location of well, relative to nearest lease boundaries of lease on which this well is located		1255 Feet From S Line of the		NE Line and Oefinger (Miller) Lease		5000 Feet from	
32. Elevation (DF, RKB, RT, GR, ETC.) 420 GR				33. Was directional survey made other than inclination (Form W-12)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
34. Top of Pay 2810'	35. Total Depth 3143'	36. P. B. Depth	37. Surface Casting Determined by: Field Rules	Recommendation of T.D.W.R. Railroad Commission (Special)		<input type="checkbox"/> Dt. of Letter 7/15/88	
38. Is well multiple completion? NO		39. If multiple completion, list all reservoir names (completions in this well) and Oil Lease or Gas ID No FIELD & RESERVOIR		GAS ID or OIL LEASE #	OIL—O Gas—G	WELL "	40. Intervals Drilled by O-TD
41. Name of Drilling Contractor ?							42. Is Cementing Affidavit Attached? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
43. Casing Record (Report All Strings Set in Well)							
Casing Size	WT #/FT	DEPTH SET	MULTISTAGE TOOL DEPTH	TYPE & AMOUNT CEMENT (sacks)	HOLE SIZE	TOP OF CEMENT	SLURRY VOL. cu. ft.
8 5/8"	23#	165'	-	Std 110sx	12 1/4"	surf.	140 ft ³
5 1/2"	15.5#	3135	1150	HLC "p" 330sx	7 7/8"	surf.	522ft ³

44. LINER RECORD							
Size	TOP		Bottom		Sacks Cement	Screen	
N/A							

45. TUBING RECORD			46. Producing Interval (this completion) Indicate depth of perforation or open hole			
Size	Depth Set	Packer Set	From	N/A	To	
N/A			From		To	
			From		To	
			From		To	

47. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.							
Depth Interval			Amount and Kind of Material Used				
3135-3143			open hole				
3140			CIBP set				
3139-3135			perf 4 spf, 500 gal 15% FE acid				
2850-54, 2826-29'			perf., 2500 gal 7.5% FE acid & 35,000 SCT				

48. FORMATION RECORD (LIST DEPTHS OF PRINCIPAL GEOLOGICAL MARKERS AND FORMATION TOPS)							
Formation	Depth	Formation	Depth				
Midway	1088'	Austin Chalk	2825'				
Navarro	1829'	Eagle Ford	2960'				
Anacacho	2560'	Buda	2975'				

REMARKS Del Rio 3050, Georgetown 3100', Edwards 3125'
Well was drilled and abandoned by Inco. P.S.N. assumed operatorship and will
apply for a salt water disposal well. Form W-12 was not obtained from INCO.

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APPENDIX D-2

Geophysical log (SP,
Resistivity) from
FEDC-Lincoln Well
No. 2

May 2014

**CDM
Smith**

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115° from the wings to the propeller

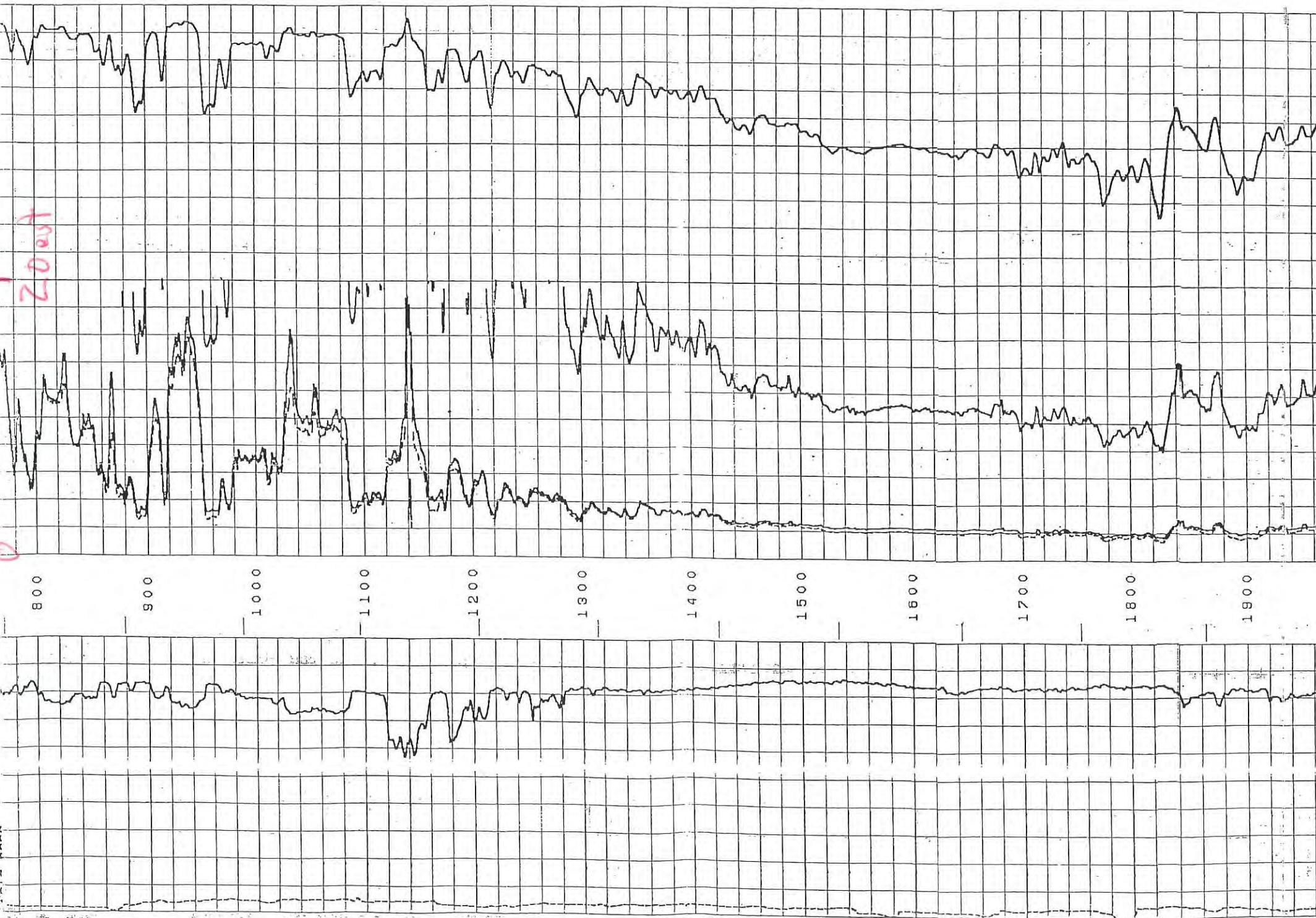
m52814

INDUCTION - ELECTRIC LOG

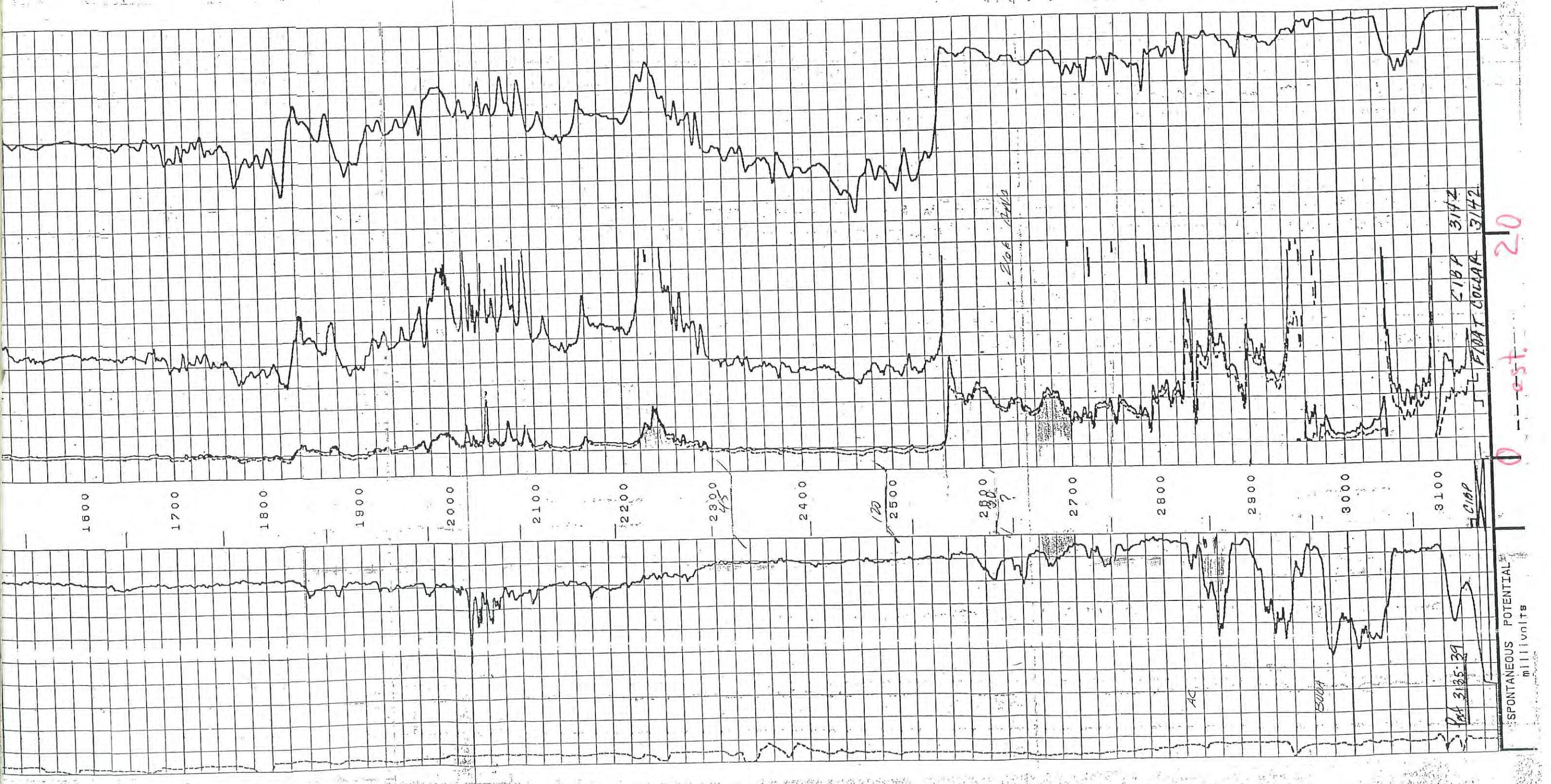
COMPANY	INCO INVESTMENTS CORPORATION		
WELL	FEDC - LINCOLN No. 2		
FIELD	SASPAMCO		
COUNTY	WILSON	STATE	TEXAS
LOCATION: 1255 FNEL and 5000 FEL OF 1012 AC. LEASE 6000 FEL and 5000 FSL OF JOSE De La GARZA SURVEY A-14. 1 MILE SW FROM SASPAMCO			
SEC	TWP	RGE	Other Services DEN-NEU-GR-CAL SWC

Permanent Datum	G.L.	Elev.	451	Elevations:
Log Measured from	K. B.	6.0	Ft. Above Permanent Datum	KB 457
DRILLING MEASURED FROM				DF NA
				GL 451

Date	20 JULY 1988	BUREAU OF GEOLOGY REC'D APR 01 1983			
Run No.	ONE				
Depth-Driller	3134				
Depth-Logger	3143 ✓				
Bottom Logged Interval	3142				
Top Logged Interval	167				
Casing-Driller	8 5/8 @ 167	Q	4000	Q	Q
Casing-Logger	167				
Bit Size	7 7/8				
Type Fluid in Hole	POLYMER-SALTEX				
Density / Viscosity	9.6 45	Q	Q	Q	Q
pH / Fluid Loss	8.9 4.8c	CC	CC	CC	CC
Source of Sample	RETURN LINE				
Rm @ Meas. Temp.	2.75 @ 92 °F	Q	°F	Q	°F
Rmf @ Meas. Temp.	2.5 @ 90 °F	Q	°F	Q	°F
Rmc @ Meas. Temp.	2.9 @ 90. °F	Q	°F	Q	°F
Source of Rmf / Rmc	MEAS.				
Rm @ BHT	1.8 @ 120 °F	Q	°F	Q	°F
Time Since Circ.	1.5 HRS				
Max. Rec. Temp. Deg. F.	120 °F	°F	°F	°F	°F
Equip. No. / Location	850-03 PLSN				
Recorded By	ROUNTREE				
Witnessed By	MR. MODE				



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APPENDIX D-3

Geophysical Log (GR,
Neutron, Density,
Caliper from FEDC-
Lincoln Well No.2)

May 2014

**CDM
Smith**

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Beecher's Fr. E. Hayden Aug. 160



DENSITY-NEUTRON-GR-CALIPER

SIGMA DATA

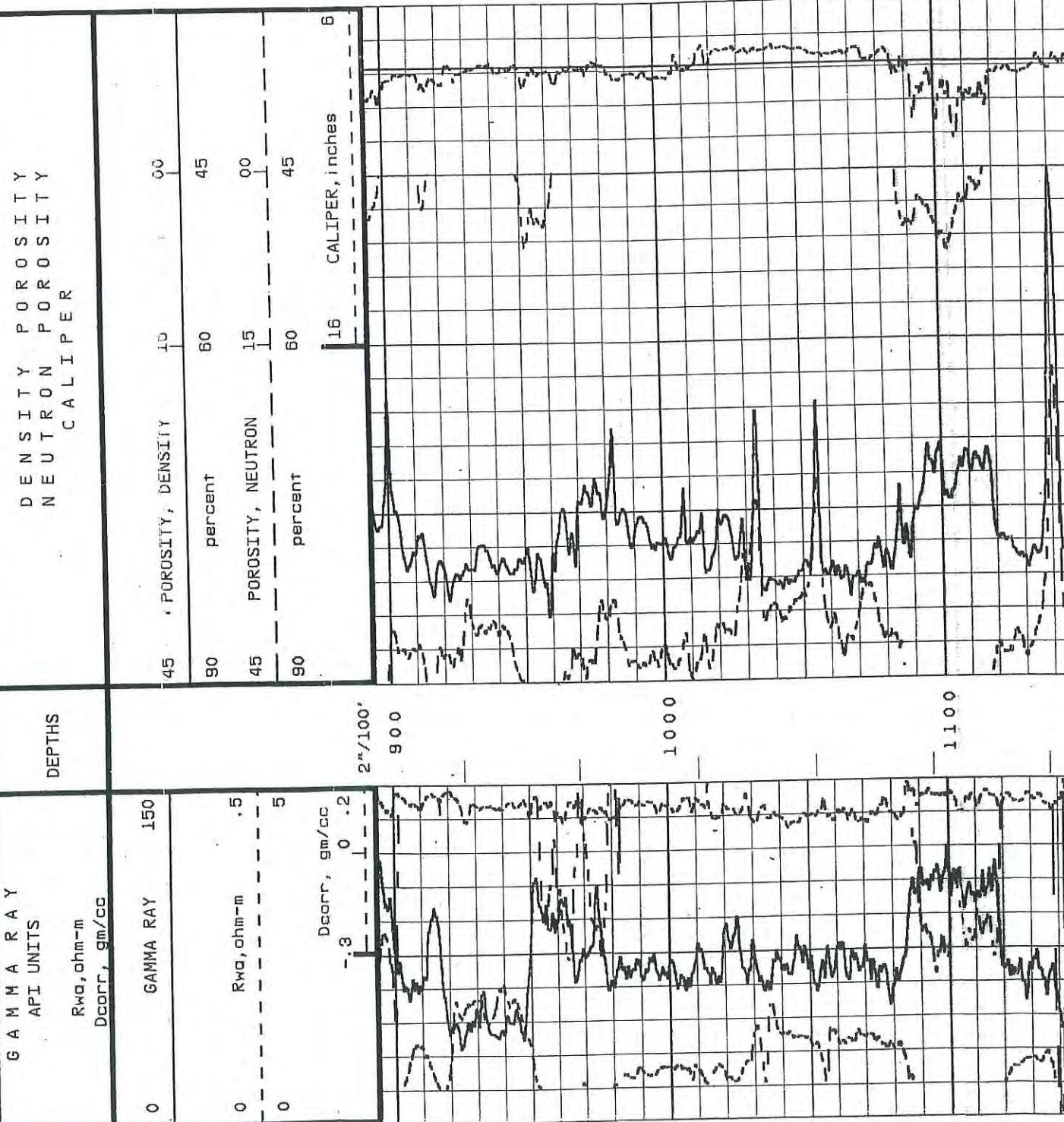
FILING NO.	RECEIVED R.R.C. OF TEXAS	INCO INVESTMENTS CORPORATION	
COMPANY	AUG 05 1992		
WELL	FEDC - LINCOLN No. 2		
O.G. - U.I.C. FIELD AUSTIN, TEXAS	SASPAMCO		
COUNTY	WILSON	STATE	
TEXAS			
LOCATION: 1255 FNEL and 5000 FEL OF 1012 AC. LEASE 6000 FEL and 5000 FSL OF JOSE De La GARZA SURVEY A-14. 1 MILE SW FROM SASPAMCO			Other Services IND.-ELEC. SWC
SEC	TWP	RGE	

Permanent Datum	G.L.	Elev.	451	Elevations:
Log Measured from	K. B.	Ft.	Above Permanent Datum	KB 457
DRILLING MEASURED FROM				DF NA
				GL 451

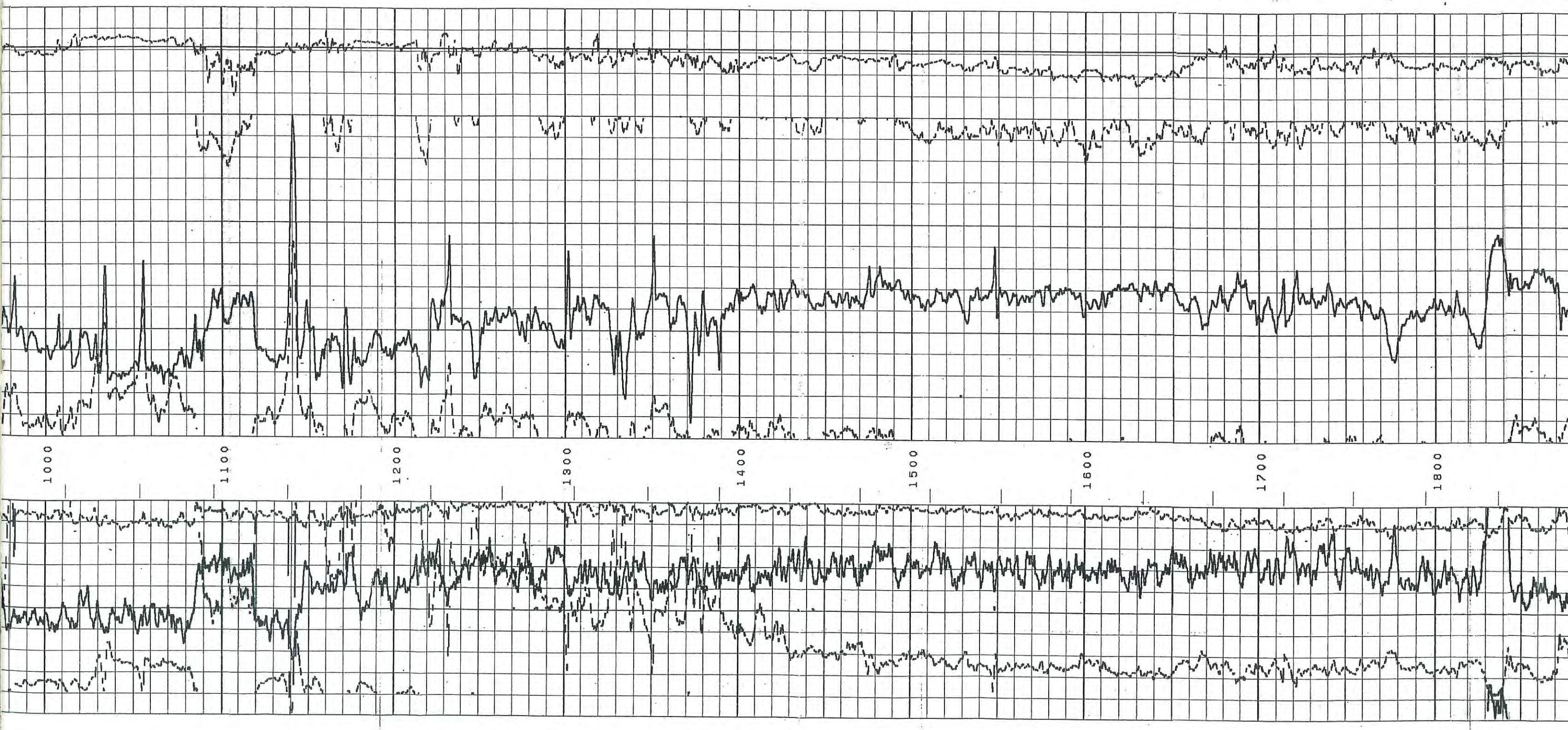
Date	20 JULY 1988			
Run No.	ONE			
Depth-Driller	3134			
Depth-Logger	3142			
Bottom Logged Interval	3138			
Top Logged Interval	900			
Casing-Driller	8 5/8 @ 167	@	@	@
Casing-Logger				
Bit Size	7 7/8			
Type Fluid in Hole	POLYMER-SALTEX			
Density / Viscosity	9.6	45	@	@
pH / Fluid Loss	8.9	4.8c	cc	cc
Source of Sample	RETURN LINE			
Rm @ Meas. Temp.	2.75 @ 92	*F	@	*F
Rmf @ Meas. Temp.	2.5 @ 90	*F	@	*F
Rmc @ Meas. Temp.	2.9 @ 90	*F	@	*F
Source of Rmf / Rmc	MEAS.			
Rm @ BHT	1.8 @ 120	*F	@	*F
Time Since Circ.	1.5 HRS			
Max. Rec. Temp. Deg. F.	120	*F	*F	*F
Equip. No. / Location	850-03	PLSN		
Recorded By	ROUNTREE			
Witnessed By	MR. MODE			

WELL FILE

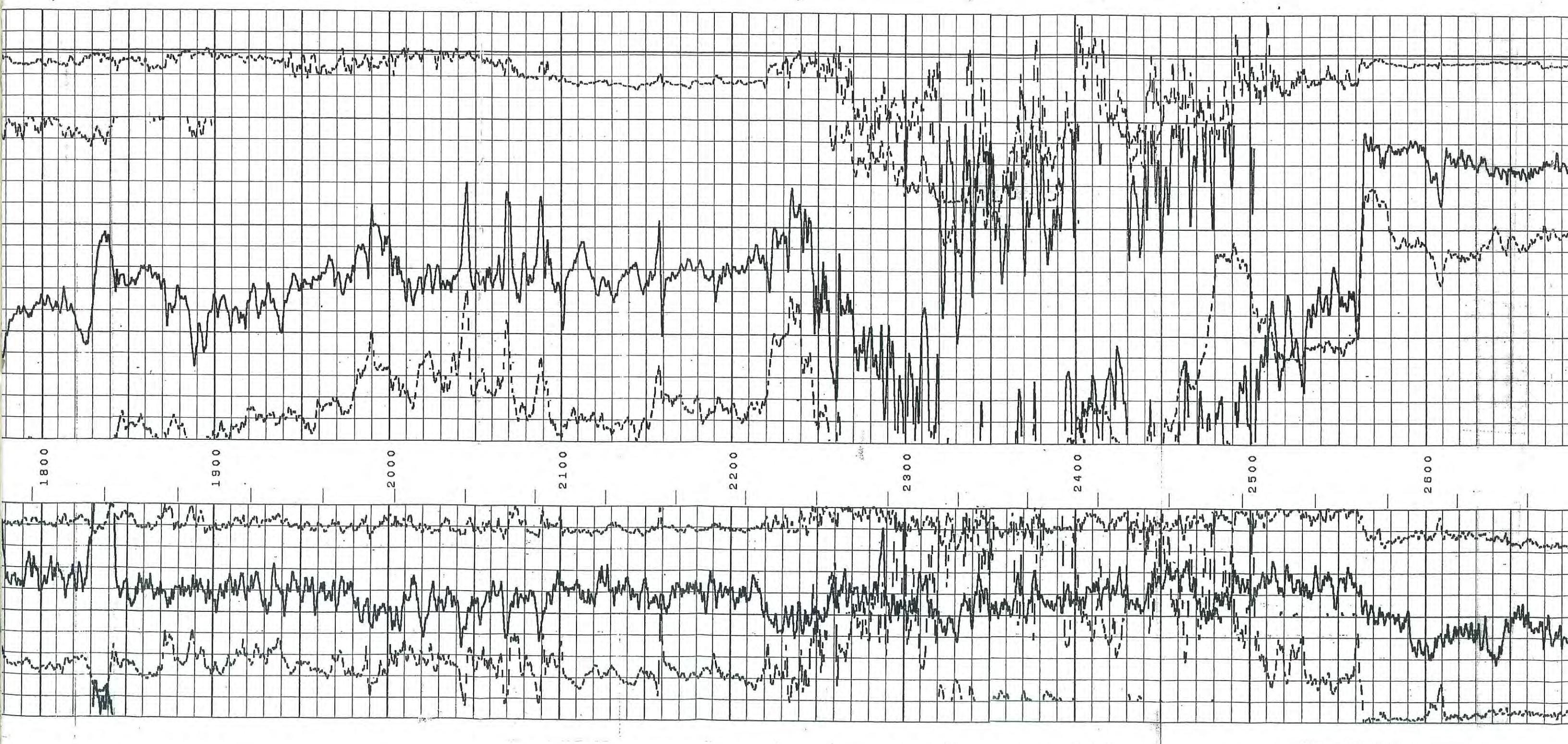
REMARKS : MATRIX DENSITY SET AT 2.71 and FLUID DENSITY SET AT 1.0 FOR REPEAT SECTION
 MATRIX DENSITY SET AT 2.65 and FLUID DENSITY SET AT 1.0 FOR LONG LOG
 m EXPONENT SET AT 2.0 and -a- FACTOR SET AT 1.0 IN ARCHIE FORMULA FOR R_{ha}



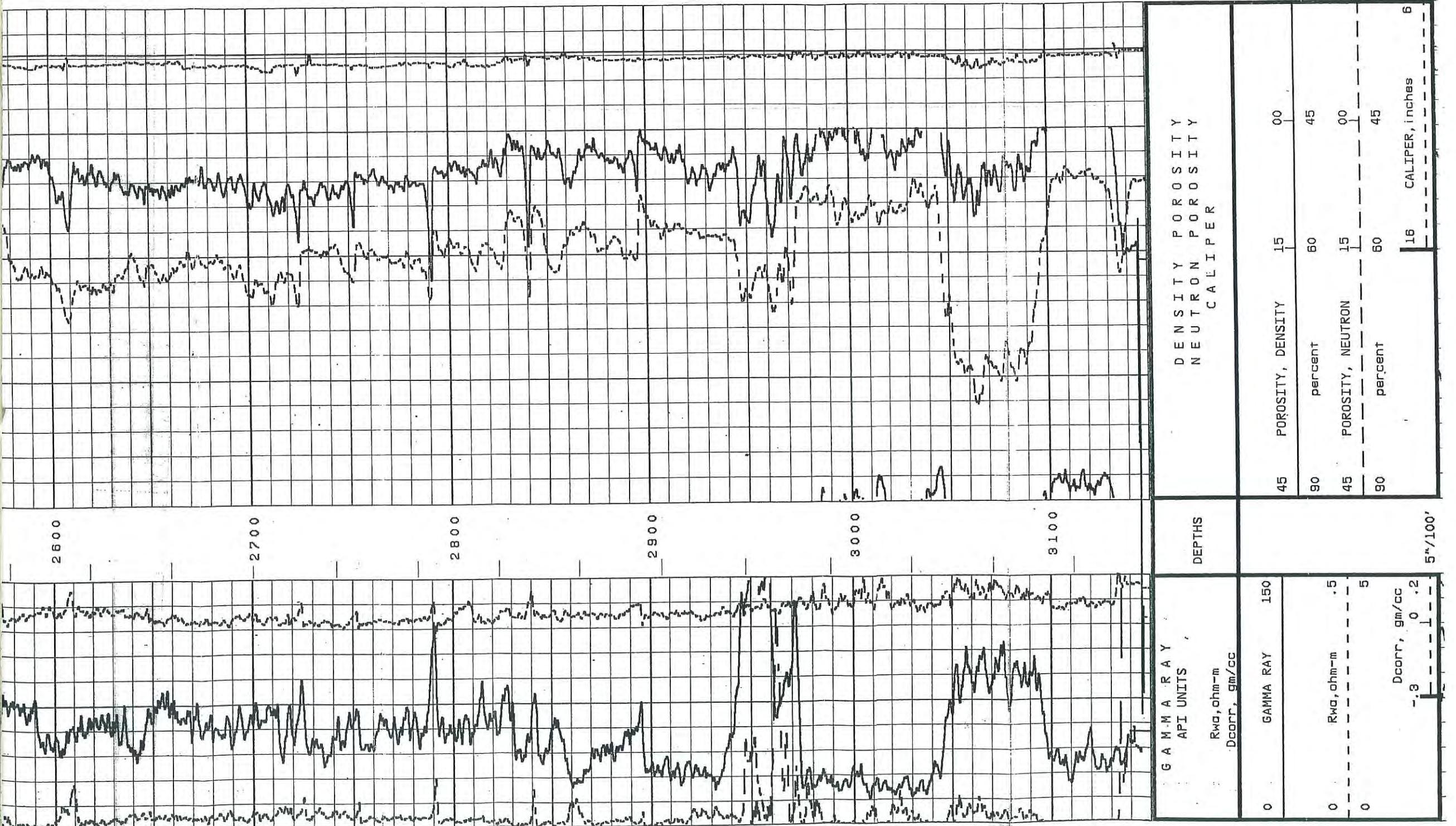
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APPENDIX D-4

Correspondence from
SAWS to CDM Smith
dated April 18, 2013

May 2014

**CDM
Smith**

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April 18, 2013

Mr. Roger E. Schenk, Jr.
Principal Scientist
CDM Smith
12357-A Riata Trace Parkway, Suite 210
Austin, Texas 78727

Subject: Research Grant Contract between CDM Smith, Inc., and the Texas Water Development Board; TWDB Contract 1004831106,

Dear Mr. Schenk;

This letter details the total commitment of the San Antonio Water System (SAWS) to CDM Smith, Inc., (CDM) on the Texas Water Development Board (TWDB) grant contract 1004831106 to investigate the potential feasibility of obtaining dual permits for Class I/Class II wells associated with disposal of municipal desalination concentrate. SAWS prior Letter of Commitment dated January 22, 2013 is hereby superseded and replaced in its entirety by this letter .

SAWS will only provide data and In-Kind Services to the extent and in the manner as follows:

Item	Status	Value (\$)
1. Drilling & Testing of a New Class I Injection Well	Complete	\$4,832,000
2. Electronic Copy of SAWS TCEQ Notice of Intent	Complete	\$198,941
3. Electronic Copy of SAWS Class I Injection Well Report	Complete	\$50,940
4. In-Kind Services	Not Started	\$10,000

- SAWS makes no monetary commitment other than those dollars already expended on the above designated projects (such dollars being expended for the benefit of SAWS, with CDM only being entitled to receive from SAWS, information derived from the completion of the projects) and the Not to Exceed amount of \$10,000, for In-Kind Services of SAWS personnel to be charged at SAWS usual and customary hourly fees for the personnel.
- The TCEQ Notice of Intent document outlines the research required by TCEQ for a new Class I Injection well under the General Permit, the engineering design of the well, and the procedures used to drill the well.
- The Class I Completion Report details the field drilling techniques, geophysical logging, pressure buildup modeling, Mechanical Integrity Testing (MIT), and testing protocols.

- SAWS desalination staff will reasonably provide In-Kind services to assist CDM in the review and development of the final TWDB report for this project in an amount not to exceed \$10,000. After this amount has been expended, SAWS shall have no further obligation to expend any time for In-Kind Services of SAWS personnel.

SAWS will provide reasonable and necessary backup for the actual costs of drilling of the Class I test Injection Well based on final contractor invoicing as may be requested by CDM and the In-Kind services using the TWDB In-Kind Services Form, provided by CDM.

Please contact Esther Harrah at (210) 233-3457 if you have any questions.

Sincerely,



Philip C. Campos, Jr., CPA
Director - Contacting

Cc: Ashok Kaji, P.E.
Esther Harrah, P.E.
Kevin Morrison, P.G.

APPENDIX E

Literature Review

May 2014

**CDM
Smith**

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1 Introduction

This literature review aims to provide supplementary material to this *Manual for Permitting Process*. Topics discussed include the applicability of desalination in Texas, desalination technology, injection wells for concentrate management, and oil and gas wells for concentrate management.

According to the Texas Water Development Board (TWDB), by 2060, the Texas population is predicted to increase by 82 percent and to need an additional 4 million acre-feet of fresh water supply compared to current levels. Existing water supplies (surface water, groundwater, and reuse water) are also projected to decrease by 1.7 million acre-feet based on current conditions. The **Figure 1-1** below from the TWDB's 2012 State Water Plan illustrates this projected change in supply and demand (TWDB, 2012).

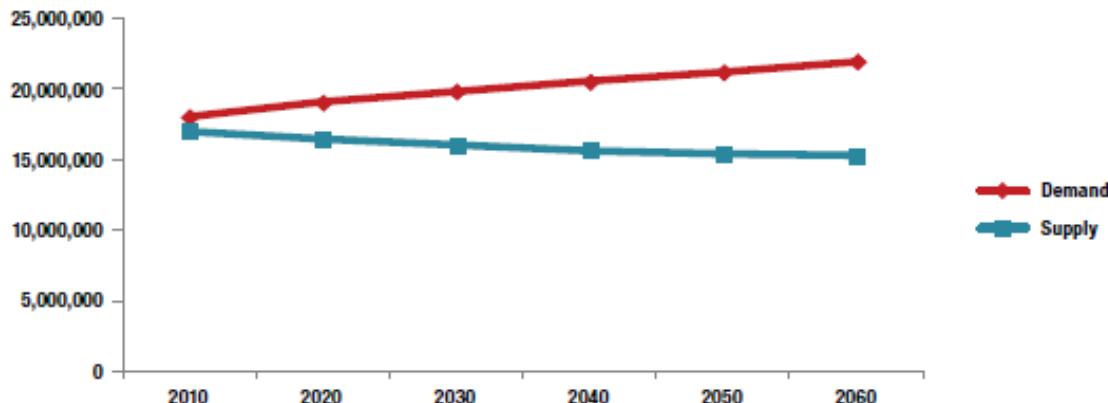


Figure 1-1. Projected Water Demand and Existing Supplies (Acre-feet Per Year) (TWDB, 2012).

To address future water needs, especially during times of drought, Texas has to find ways to increase water supply and/or maximize efficiency for managing existing water supply. One important method, to increase water supply, that has received significant attention statewide is coastal and inland desalination.

As desalination technology continues to become more available and economically favorable, many have considered desalination as an important drought-tolerant solution to address impending water shortages and increased demands in regions of Texas. The State Water Plan lists groundwater and seawater desalination at 2% and 1.4%, respectively, of the relative volumes of water management strategies for the 2060 planning horizon (TWDB, 2012).

2 Desalination in Texas

There have been few large-scale seawater desalination projects in the United States (U.S.); as such projects are often significantly more expensive than other potable water supply options. Most of the desalination projects have been located in the southeastern and southwestern regions, with the first large seawater desalination projects in Florida (R.W. Beck, 2004). In California, a 50 million gallon per day (MGD) plant is planned for construction in Carlsbad, which will be the

Western Hemisphere's largest seawater desalination plant (Associated Press, 2012). Texas seeks to join these states in implementing seawater desalination, backed heavily by Governor Perry. In 2002, TWDB began working on an initiative for the first large-scale seawater desalination in Texas; this has led to the construction of the Brownsville pilot facility that became operational in 2007. Other coastal desalination projects TWDB considered were at Corpus Christi and Freeport.

In the U.S. and Texas, brackish water desalination has been utilized more than seawater desalination, primarily due to its greater versatility, its and its lower cost. Brackish groundwater desalination technology also has a relatively short construction time and allows for simple and quick upgrades (NRS Consulting Engineers, 2008). There are currently 45 municipal desalination facilities in Texas, and the TWDB has lists these facilities on its Desalination Plant Database, found at <http://www.twdb.state.tx.us/apps/desal/ChoosePlant.aspx>. In fact, the El Paso Water Utilities brackish desalination facility was completed in 2006 and it represented the largest inland desalination plant (27.5 MGD) in the world at plant startup.

Texas, in particular, has a large reserve of brackish groundwater potentially suitable for desalination; a 2003 investigation by LBG-Guyton Associates for the TWDB estimates a volume of 2.7 billion acre-feet of brackish groundwater in Texas aquifers. The greatest amount of brackish water available is in, by region, the South Central Texas region (Region L of the Texas Water Planning Regions) and, by aquifer, the Gulf Coast aquifer. The Rio Grande region (Region M), the San Angelo region (Region F), and the Coastal Bend region (Region N) are also characterized by relatively high volumes of brackish groundwater (Kalaswad, 2004). Brackish water is characterized as “slightly saline,” or “moderately saline.” Slightly saline water has a concentration from 1,000 to 3,000 milligrams per liter (mg/l) total dissolved solids (TDS) concentration, and moderately saline water has a concentration of 3,000 to 10,000 mg/l TDS. Slightly saline waters qualify under the state definition as “usable quality waters” for having less than 3,000 mg/l TDS, while all brackish waters qualify as federal underground sources of drinking water (USDW) for having less than 10,000 mg/l TDS. Throughout Texas, there is approximately twice the volume of slightly saline water than that of moderately saline water (Kalaswad, 2004).

Of course, using brackish groundwater desalination for a water supply source highly depends on the region’s need, in addition to the availability of brackish groundwater. The 2012 State Water Plan shows the greatest need for water supplies in the Llano Estacado region (Region O), the Dallas-Fort Worth region (Region C), and the Houston region (Region H).

2.1 Desalination Technology

There are four major processes used for desalination, which include multiple-effect distillation, multi-stage flash distillation, electro-dialysis reversal (EDR), and reverse osmosis (RO). The first two are evaporation-based processes, while the latter two are membrane-based processes. The evaporation processes use heating and distillation to evaporate off steam and to condense back as water. Membrane processes use membranes to physically separate salts and water, and EDR involves applying electric forces, while RO involves applying pressure. RO is the most widely used technology for desalination in the U.S., as it can be used in a variety of applications; though internationally, some very large-scale facilities use evaporation processes, in places where energy costs are low. **Table 2-1**, adapted from NRS Consulting Engineers, compares the different characteristics of each desalination technology (2008).

RO desalination facilities are typically comprised of the following components:

- Raw water intake system
- Pretreatment process: Conditioning of feed water to protect RO membrane.
 - Chemical addition to prevent scaling
 - Disinfection to prevent biofouling
 - Prefiltration such as microfiltration, ultrafiltration, or cartridge filtration
- RO membrane process
- Concentrate Disposal System
 - Direct or blended sewer discharge
 - Direct or blended surface water discharge (blending with discharges from power plants or wastewater treatment plants)
 - Deep well injection
 - Enhanced oil recovery (EOR) injection
 - Evaporation ponds
 - Land application (spray irrigation, percolation ponds, or rapid infiltration)
- Post-treatment process
 - Lime or recarbonation to raise alkalinity and adjust pH
 - Disinfection to prevent microbial growth
 - Degasification to remove dissolved gases naturally found in brackish groundwater source, such as hydrogen sulfide
- Ancillary features
 - Membrane cleaning systems
 - Backup power generation
 - Supervisory Control and Data Acquisition Systems (SCADA)

Desalination technology has advanced greatly within the last decade, but how to address concentrate management still remains a major challenge. Globally, direct discharge to oceans is the predominant method for concentrate disposal; although, direct discharge to seawater does not prove useful for inland brackish water desalination, and any type of discharge to surface waters also has environmental effects on water ecosystems and must meet the water quality standards for TDS of the receiving water. Similarly, land application methods can cause a significant buildup of salinity in soils. Evaporation ponds, though simple in concept, are usually associated with high costs, especially as plants increase in size. Underground injection, however, has received considerable attention as a viable option for concentrate disposal in regards to its applicability, cost, and environmental impact. Injection wells for concentrate management are described in the subsequent section.

Table 2-1. Summary of Characteristics of Major Desalination Technologies.

Characteristics	Multiple-Effect Distillation	Multi-Stage Flash Distillation	Electro-Dialysis Reversal	Reverse Osmosis
Energy Cost	Very high	High	High	Moderate
Energy/Salinity	Independent of salinity	Independent of salinity	Increases fast with salinity	Increases with salinity
Applicable To	Seawater- brine	Seawater- brine	Brackish and Seawater	Brackish and Seawater
Plant Size	Large	Large	Modular	Modular
Bacterial Contamination	Unlikely	Unlikely	Post-treatment always needed	Possible
Final Product Salinity	Can be < 10 mg/l TDS	Can be < 10 mg/l TDS	On demand	On demand
Complexity	Only large, complex plants	Only large, complex plants	Easy to operate; Small facility footprint	Easy to operate; Small facility footprint
Susceptibility to Scaling	Low	Low	Low	High
Recovery	Low, but better than multi-stage flash	Poor (10 to 25 percent)	High, but little to no silica removal	Moderate for seawater (30 to 50 percent); High for brackish water (up to 90 percent)

Source: NRS Consulting Engineers, 2008

2.2 Concentrate Management: Injection Wells

Maliva et al. describes the benefits of underground injection for concentrate disposal, especially for brackish groundwater systems with high recoveries (2011). Those benefits may include:

- Minimal surface footprint
- May be located close to or even at water treatment plant sites
- Less environmental impacts than other options
- Less expensive than other options
- Potential improvement and/or stabilization of underground water quality

The use of injection well disposal depends heavily on hydrogeologic factors, (whether the formation can accept the fluid) and operational capability (well design and concentrate pretreatment). Improper well system design can lead to undesirable fluid and clay interactions and downhole clogging, which can lead to significant mechanical and structural weakening. Consequently, design and construction should carefully consider aquifer characterization, clogging potential, and corrosion potential (Maliva et al., 2011).

There are three primary types of injection wells, characterized by depth: shallow, deep high-capacity and deep high-pressure. Shallow wells (typically less than 300 feet deep) are usually

located in coastal areas with formation fluids similar to or that are mixed with seawater. Deep high-capacity wells (typically less than 1,600 feet deep) have injection zones with high transmissivity that can accept larger amounts of fluid. Deep high-pressure wells (typically less than 5,000 feet deep) have injection zones with low permeability and thus require high pressures for injection (Maliva et al., 2011).

Although usually less expensive than other concentrate management options, drilling a new injection well can be expensive, especially for a small or medium size water utility that plans to implement a brackish groundwater desalination program. In Texas, however, there is a significant number of existing oil and gas wells potentially available to accept desalination concentrate. In some cases, oil and gas formations have been depleted of pressure and have not been restored to their original pressure. Oil and gas fields use for concentrate disposal are discussed in more depth subsequently.

2.3 Oil and Gas Wells for Desalination Concentrate Disposal

Within the last decade, the TWDB has investigated the feasibility of using oil fields for concentrate disposal in Texas. Mace et al. specifically evaluated the ability of oil and gas fields to physically and chemically accept concentrate from desalination plants (2005). The study focused on six areas which included the Anadarko, Permian, East Texas, Fort Worth, Maverick, and Southern Gulf Coast areas and analyzed their oil and gas fields, brackish water sources, and need for fresh water supply. This process involved characterizing formation pressures, concentrate and formation fluid interaction, clay sensitivity to water, and overall injectivity. Injectivity depends on the injection flow rate, the formation's physical and chemical characteristics (porosity, permeability, and compressibility), and the system's pressure requirements (surface pressure, well depth, and headloss). The study's results are summarized below in **Table 2-2**.

Table 2-2. Ability of Oil and Gas Fields to Accept Desalination Concentrate.

Item	Formation Pressure	Concentrate and Formation Fluid Interaction	Clay Sensitivity to Water	Injectivity
Result	<ul style="list-style-type: none"> - Pressures found in oil and gas formations generally have much less pressure than the lowest USDW. - Minimal hydraulic potential for fluids to move into overlying aquifers. 	<ul style="list-style-type: none"> - Mixing of formation fluids and desalination concentrate does not generally cause mineral precipitation. - Pretreatment may be used to prevent potential precipitation. 	<ul style="list-style-type: none"> - Clays have the potential to deflocculate and expand with concentrate injection. - Pretreatment and operational strategies can prevent this issue. 	<ul style="list-style-type: none"> - Median injection rate for single well: 10 gallons per minute (gpm) in Anadarko, Permian, Fort Worth and Maverick basins; 280 gpm for the Southern Gulf Coast; 470 gpm for the East Texas Basin.

Source: Mace et al., 2005

Perhaps the most convincing argument to show that oil and gas fields can accept desalination concentrate is that historically, operators have been injecting fresh and brackish water for decades into oil and gas wells in Texas. Less than half of the fluid injected into oil and gas wells was actually produced from oil and gas operations (Mace et al., 2005).

Despite the technical and economic feasibility of utilizing oil and gas (Class II) wells for concentrate disposal, there had not been any permitting options for such an application in Texas, until recently. Mace et al. outlines key permitting options proposed after discussions with United States Environmental Protection Agency (USEPA), USEPA Region 6, Texas Commission of Environmental Quality (TCEQ), and the Railroad Commission (RRC) of Texas officials (2005). As a result of these efforts, the passing of the 2007 House Bill 2654 promulgated some of these permitting options into law, as described in the subsequent section.

Still, the regulatory framework for these permitting options is new and complex. The Permitting Roadmap (see **Appendix C** of the *Manual for Permitting Process*) of this document provides detailed guidance for water providers to better understand their permitting options and the potential steps required to exercise such options. A brief regulatory review is summarized in the following section.

2.4 Regulatory Review for Desalination Concentrate Disposal in Class I and Class II Wells

First, injection wells are regulated by underground injection control classes. This *Manual for Permitting Process* focuses on Class I and Class II wells, which, under the authorization of House Bill 2654, may legally accept nonhazardous desalination concentrate and/or nonhazardous drinking water treatment residuals (DWTR). On its website, the USEPA defines Class I and Class II wells as follows:

- Class I: Industrial and Municipal Waste Disposal Wells: Class I wells inject hazardous and nonhazardous wastes into deep, isolated rock formations that are thousands of feet below the lowermost underground source of drinking water (USDW).
http://water.epa.gov/type/groundwater/uic/wells_class1.cfm
- Class II: Oil and Gas Related Injection Wells: Class II wells inject fluids associated with oil and natural gas production. Most of the injected fluid is salt water (brine), which is brought to the surface in the process of producing (extracting) oil and gas. In addition brine and other fluids are injected to enhance (improve) oil and gas production.
<http://water.epa.gov/type/groundwater/uic/class2/index.cfm>

Official well classifications for Class I and Class II wells are found under Title 40 Code of Federal Regulations (CFR) Part 144.6(a)-(b): [40 CFR Part 144](#). A key difference between Class I and Class II wells is that Class I wells, by definition, must inject below the lowermost USDW. Under the Safe Drinking Water Act (SDWA), all wells must protect USDW formations, though other wells, such as Class II wells, may in practice be ruled exempt. (Note that the RRC has proposed changes to its UIC rules as described at the end of this Literature Review which may make current exemptions and exceptions more difficult to obtain in the future).

As discussed in the previous section, the 2007 House Bill (HB) 2654 authorizes the disposal of nonhazardous desalination concentrate and DWTR into Class I and Class II wells. Specifically, HB 2654 amended the Texas Water Code (27.021 and 27.0511, at

<http://www.statutes.legis.state.tx.us/Docs/WA/htm/WA.27.htm>) to allow the disposal of nonhazardous desalination concentrate into:

- Class I wells, under a TCEQ General Permit (30 TAC 331, Subchapter L); this General Permit provides a streamlined permitting process for Class I wells
- Class II wells, by dually permitting a Class II well as a Class I-Class II well under a TCEQ General Permit.
- Class II enhanced recovery wells, for the purpose of extracting and recovering oil and gas; this process requires an amendment to the well's existing permit under the RRC.

When considering these permitting options, one must understand the applicable regulatory requirements for each well. For example, for TCEQ to dually permit a Class II well as a Class I-Class II well, the well must meet Class I well requirements as outlined within the General Permit and the Texas Administrative Code. The following paragraphs summarize Class I and Class II well regulatory standards.

In Texas, Class I wells must adhere to:

- Federal Underground Injection Control (UIC) program: [40 CFR Part 144](#)
- TCEQ regulation under Title 30 of the Texas Administrative Code (TAC), Chapter 331 (TCEQ General Permit): [Title 30 Chapter 331](#)
- TCEQ permit guidance regulation:
http://www.tceq.texas.gov/permitting/waste_permits/uic_permits/UIC_Guidance_Class_1.html

Construction standards for Class I wells are found specifically in: [30 TAC 331.62](#). For Class I and Class II wells (dually permitted as Class I-Class II wells) that dispose of nonhazardous desalination brine and other DWTR, 30 TAC 331.62(b) applies. This section allows less stringent requirements than for that of a standard Class I well.

In Texas, Class II wells must meet the requirements outlined in:

- Federal Underground Injection Control (UIC) program: [40 CFR Part 144](#)
- RRC regulation under: [16 TAC Ch 3](#)
- RRC permit regulation: <http://www.rrc.state.tx.us/forms/publications/HTML/index.php>

Class II wells are regulated differently depending on the type of Class II well. The types applicable to this manual are listed below; please note that though RRC uses this classification within its computer database, such terms are not readily referenced and presented online.

- Class II Type 1: Disposal well into a nonproductive oil and gas zone/ interval
- Class II Type 2: Disposal well into a productive oil and gas zone/ interval
- Class II Type 3: Enhanced recovery injection well

In contrast to Class I wells, some types of Class II wells in certain circumstances do not have to inject below the lowermost USDW formation. Specifically, Type 2 and Type 3 wells may inject above the lowermost USDW formation because oil and gas reserves may exist above that point. According to RRC staff, Class II Type 1 wells, however cannot inject above the lowermost USDW formation since the well does not inject into a productive reservoir. Construction standards for Type 1 wells fall under [16 TAC 3.9](#) and [16 TAC 3.13](#), while construction standards

for Type 2 and 3 wells fall under [16 TAC 3.46](#) and [16 TAC 3.13](#). (Again, please refer to the proposed amendments to RRC rules as described at the end of this Literature Review would make Class II requirements more strict with regards to USDW formations).

With regards to permitting options, Class II wells may accept desalination concentrate, depending on the type of Class II well, as listed below:

- Class II Type 1: The well can be dually permitted as a Class I well under the TCEQ General Permit. The well must meet all applicable construction standards of a Class I well under [30 TAC 331.62](#).
- Class II Type 2: The well can be dually permitted as a Class I well under the TCEQ General Permit. The well must meet all applicable construction standards of a Class I well under [30 TAC 331.62](#).
- Class II Type 3: The enhanced recovery well can receive a permit amendment under the RRC; this method does not require any interaction with TCEQ.

Table 2-3 provides a comprehensive summary of the permitting options for nonhazardous desalination concentrate disposal into Class I or Class II wells.

Table 2-3. Summary of Options for the Disposal/Injection of Nonhazardous Desalination Concentrate and DWTR into Class I and Class II Wells in Texas

Well Type	Class I	Class II, Type 1	Class II, Type 2	Class II, Type 3
Definition	Industrial or municipal waste disposal well	Oil and gas waste disposal well in a non-productive zone	Oil and gas waste disposal well in a productive zone	Enhanced recovery injection well
Regulator of Permit Option	TCEQ	TCEQ regulates desalination waste streams; RRC regulates oil and gas activities	TCEQ regulates desalination waste streams; RRC regulates oil and gas activities	RRC
Regulation	30 TAC 331.62(b)	16 TAC 3.9, 3.13	16 TAC 3.46, 3.13	16 TAC 3.46, 3.13
Injection Depth Requirement	Beneath the lowermost USDW	Beneath the lowermost USDW	Beneath the lowermost base of usable quality water (BUQW) formation ^(a)	Beneath the lowermost base of usable quality water (BUQW) formation ^(a)
Casing and Cement Requirement	Prohibit any movement of fluids into or between USDW formations	Protect all usable quality water strata	Protect all usable quality water strata	Protect all usable quality water strata

Well Type	Class I	Class II, Type 1	Class II, Type 2	Class II, Type 3
Permit Option	TCEQ General Permit or individual permit	TCEQ General Permit or individual permit depending on waste streams – Dually permitted if well meets Class I standards	TCEQ General Permit or individual permit depending on waste streams – Dually permitted if well meets Class I standards	RRC Permit Amendment
Regulator of Permit Option	TCEQ	TCEQ regulates desalination waste streams; RRC regulates oil and gas activities	TCEQ regulates desalination waste streams; RRC regulates oil and gas activities	RRC
Permit Option Regulation	30 TAC 331.62(b)	30 TAC 331.62(b); 30 TAC 305	30 TAC 331.62(b); 30 TAC 305	16 TAC 3.46, 3.13
Potential Issues with Existing Well and New Permit Requirements	- Minimal issues	- Not required to have surface/intermediate casing from surface to USDW ^(c) - Not required to have long string casing from shoe to surface ^(c)	- May not have been required to inject below USDW ^(b) - Not required to have surface/intermediate casing from surface to USDW ^(c) - Not required to have long string casing from shoe to surface ^(c)	- Minimal issues
Permit Application Cost	\$100 for General Permit; \$100 - \$2,000 for individual permit	\$100 for General Permit; \$100 - \$2,000 for individual permit	\$100 for General Permit; \$100 - \$2,000 for individual permit	\$500
Permit Application Timeline	90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	90 days from receipt of NOI to issuance for General Permit; 390 days from receipt of application to issuance/denial of individual permit	45 days from receipt of form to permit amendment

- (a) There are exceptions where Class II wells may inject above the BUQW formation if oil and gas reserves exist above such formations; (this exception may be affected by proposed changes to RRC rules).
- (b) Injecting below the lowermost USDW is an explicit requirement of the General Permit rules - 30 TAC 331.62(b)(1)
- (c) This is not an explicit requirement under the General Permit rules - 30 TAC 331.62(b)(1). This may be required depending on TCEQ's interpretation of the rules. (Current Class II well requirements may be revised by proposed changes to RRC rules).

3 Proposed Draft Amendments to Railroad Commission Rules for Class II Wells

During the 2011 82nd Texas Legislative Session, TCEQ’s role in Class II well permitting for issuing groundwater protection determination letters was transferred to the RRC. This transition included a transfer of some staff from TCEQ UIC Section to the RRC’s Groundwater Advisory Unit. The official transfer became effective in September 1, 2011 and has since influenced policy making at the RRC.

In 2012, the integrated RRC Oil and Gas Division Staff requested to amend 16 TAC Chapter 3, including Rule 9 (disposal wells) and Rule 46 (fluid injection into productive reservoirs). The proposed draft amendments include requirements regarding the protection of usable quality waters and USDWs, affecting Class II - Type 1, 2, and 3 wells. Consequently, these draft amendments would provide stricter requirements for Type 1 and 2 wells that would make new wells have greater eligibility for the TCEQ General Permit for the injection of nonhazardous desalination concentrate and DWTR. The latest draft amendments for informal comment were dated August 12, 2013, and any updates can be found under the Proposed Rules page on the RRC website: <http://www.rrc.state.tx.us/rules/proposed.php>.

The following list summarizes key draft changes to Chapter 3 Rule 9 (Type 1 wells) and Rule 46 (Type 2 and 3 wells) related to usable quality water and USDW protection (RRC, 2013):

- Rule 9 and Rule 46: Permit applicants must demonstrate that “(i) the injected fluids will be confined to the permitted injection interval; (ii) all usable-quality water will be isolated and sealed off to effectively prevent contamination and harm from the migration of injected fluids or displaced formation fluids; (iii) all potentially productive zones and potential flow zones will be isolated and sealed off to prevent vertical migration of fluids or gases behind the casing; and (iv) the injection of fluids will not endanger underground sources of drinking water or human health and safety”
- Rule 9: Geological requirements include that approved formations must be “separated from underground sources of drinking water by impervious beds which will give adequate protection to such usable-quality water underground sources of drinking water.”
- Rule 9: The applicant must submit a “Groundwater Protection Determination from the Groundwater Advisory Unit stating that the use of such formation will not endanger the usable-quality water in that area and that the formations to be used for disposal are not underground sources of drinking water... In addition the applicant shall show that there is a minimum of 100 feet of continuous impermeable strata between the base of the deepest underground source of drinking water and the top of the injection interval.”
- Rule 9: “Injection wells shall be cased and the casing cemented in compliance with §3.13 of this title in such a manner that the injected fluids will not endanger oil, gas or geothermal resources and will not endanger formations that contain underground sources of drinking water”
- Rule 46: Geological requirements include: “(1) Injection into a productive zone above the base of the underground source of drinking water shall be limited to fluids produced from that zone. (2) Commercial or of-lease disposal of oil and gas waste above the base of the deepest underground source of drinking water is prohibited.”

- Rule 46: Other requirements include: “If the purpose of the injection well is disposal of oil and gas waste, the applicant must submit a “Groundwater Protection Determination stating that the use of such formation will not endanger the usable-quality water in that area and that the formations to be used for disposal are not underground sources of drinking water”
- Rule 46: “Injection wells shall be cased and the casing cemented in compliance with §3.13 of this title in such a manner that the injected fluids will not endanger oil, gas or geothermal resources and will not endanger formations that contain underground sources of drinking water not productive of oil, gas, or geothermal resources”

These proposed regulatory changes reflect language from the federal UIC program which requires all wells to adequately protect USDW formations. Such proposed draft amendments may have profound benefits for the ability to dually permit a new Class II well as a Class I well under the TCEQ General Permit for nonhazardous desalination concentrate and DWTR disposal. The proposed geologic separation requirements would require the majority of Class II wells to inject into formations below the lowermost USDW. This requirement, along with stricter surface casing and cementing requirements, may provide the necessary technical requirements to qualify most new Class II wells for eligibility under the TCEQ General Permit.

To highlight important language under the proposed Rule 46, as listed above: “Injection into a productive zone above the base of the underground source of drinking water shall be limited to fluids produced from that zone.” This statement allows an exception for wells that inject into oil and gas reservoirs that are located above USDW formations, as long as the fluid originates from that zone. However, this statement still seems to impose stricter requirements than present practices. Recall that currently, Class II wells that inject into reservoirs productive of oil and gas can receive practical exemptions to protecting USDW and BUQW formations if the reservoir exists above such injection formations.

Again, this discussion refers to drafted amendments that have not been finalized. Many of the proposed rules are subject to change. The RRC is currently reviewing comments from other State agencies for internal review.

4 References

All websites accessed in April 2014.

Associated Press, 2012, California: Desalination Clears Hurdle: The New York Times, 1 p.

Available at <http://www.nytimes.com/2012/09/28/us/california-desalination-clears-hurdle.html>.

Kalaswad, S., B. Christian, and R. Petrossian, 2004, Brackish Groundwater in Texas: Texas Water Development Board, 1-13 p.

Mace, R. E., J.-P. Nicot, A. H. Chowdury, A. R. Dutton, and S. Kalaswad, 2005, Please Pass the Salt: Using Oil Fields for the Disposal of Concentrate from Desalination Plants: Texas Water Development Board, 1-16 p.

Maliva, R. G., T. M. Missimer, and R. Fontaine, 2011, Injection Well Options for Sustainable Disposal of Desalination: Injection Well Options for Sustainable Disposal of Desalination Concentrate, 17-23 p.

NRS Consulting Engineers, 2008, Guidance Manual for Brackish Groundwater Desalination in Texas: Texas Water Development Board, 1-95 p.

R. W. Beck, Inc., 2004, Guidance Manual for Permitting Requirements in Texas for Desalination Facilities Using Reverse Osmosis Processes: Texas Water Development Board, 1-1 – 7-21 p.

RRC, 2012, 16 TAC Chapter 3 – Oil and Gas Division Draft for Informal Comment: Railroad Commission of Texas, 1-67 p. Available at <http://www.rrc.state.tx.us/rules/inf-comment-rule-text-only-3-9-and-3-36-and-3-46-Nov2012.pdf>.

RRC, 2013, 16 TAC Chapter 3 – Oil and Gas Division Draft for Informal Comment: Railroad Commission of Texas, 1-65 p. Available at: <http://www.rrc.state.tx.us/rules/2013-08-12-SWR9-36-46-Proposed-wording-Informal-Comment.pdf>

Texas Register, 2012, Texas Administrative Code: Texas Register. Available at [http://info.sos.state.tx.us/pls/pub/readtac\\$ext.viewtac](http://info.sos.state.tx.us/pls/pub/readtac$ext.viewtac).

Texas Water Development Board, 2012, Water for Texas 2012 State Water Plan: Texas Water Development Board, 1-3, 191 p.



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