

THE THIRST FOR WATER IN SOUTH TEXAS

A REPORT ON THE USAGE
AND DISPOSAL OF WATER
FOR OIL & GAS
DEVELOPMENT IN WEBB
COUNTY, TEXAS

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A Report on the Usage and Disposal of Water for Oil & Gas Development in Webb County, Texas

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Date: September 14, 2021

Acknowledgements

This report was made possible by the generous support of the Rockefeller Family Fund as part of the Rio Grande International Study Center's Laredo Water Security, Land, and Climate Change initiative.

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Founded in 1994, RGISC aims to protect and preserve our only source of drinking water, the Rio Grande-Rio Bravo, and our local environment for present lives and future generations. Our focus areas include: water security, habitat protection, community engagement, and climate impacts.

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Executive Summary

The Rio Grande International Study Center (RGISC) was established by citizens from Laredo, Texas and Nuevo Laredo, Tamaulipas in response to deteriorating water quality in the Rio Grande River, an endangered river that serves as the only source of drinking water for our community and millions of other people on both sides of the border.

Since its inception in 1994, RGISC has filled an important role as an environmental educator, cultural organizer, thought leader, and convening organization in the community - engaging citizens, government entities, and commercial water users to care for the local watershed. Our focus areas include: water security, river conservation, greenspace protection, community engagement, climate impacts, and sustainable development.

In 2019, RGISC held a strategy-setting workshop to establish a new vision and direction for the organization, which culminated with the launch of the “Laredo Water Security, Land, and Climate Change” initiative. The purpose of the “Laredo Water Security, Land, and Climate Change” initiative is to assemble information and scientific research that identifies and prioritizes necessary actions to restore our watershed, prepare our community for the vagaries of climate change, and develop a plan for protecting Laredo’s environmental resources while informing local and regional policy makers.

The purpose of this report is to analyze and understand how freshwater resources, primarily surface water from the Rio Grande, have been used for oil and gas development in Webb County, Texas. Additionally, this report will also analyze where and how wastewater by-products, commonly referred to as “produced water”, are disposed of during the production of oil and gas in Webb County.

By publishing this report, RGISC will attempt, for the first time, to disclose to the public and local and state legislators, the true cost of oil and gas development in Webb County as it relates to the usage surface water from the Rio Grande and the disposal of produced water from oil and gas development by an industry that heavily dominates our region.

Water requirements that are vital for oil and gas development can frequently go unseen by the public eye. While water for oil and gas development does not account for significant usage in comparison to the needs of municipal or agricultural use, its demands can have sharp impacts

on local water resources, intensifying conflicts between water users in water stressed areas and during times of drought.

In the last 12 years since the Eagle-Ford Shale oil boom forever transformed the landscape and economy of South Texas, the region experienced a significant increase in the production of oil and gas, primarily due to the advances of modern, unconventional oil and gas exploration techniques, such as hydraulic fracturing, also known as “fracking”, and horizontal drilling. Such practices revolutionized the energy industry in the United States, and since 2008, the Eagle-Ford Shale has witnessed over 24,000 oil and gas wells reach completion. Webb County in particular experienced a significant increase in oil and gas production, and it remains one of the top three natural gas producing counties in Texas. However, these industry developments have also increased concerns related to water resources, such as the large quantities of water required for fracking and the sources of freshwater used for these operations.

By the same token, these water-intensive practices have also led to considerable increases in the volume of hazardous produced water requiring disposal. In Webb County, most wastewater by-products (from oil and gas production) are trucked by operators to authorized disposal sites, where they are injected into disposal wells thousands of feet underground for permanent storage and disposal. The hazardous nature of these by-products has brought about challenges and concerns related to their disposal within local communities. These include the non-availability of disposal wells near production sites, the potential contamination of groundwater resources, induced seismic activity, and the proximity of these wells to populated areas.

Our research has revealed that in a 10-year period from 2010 – 2020, six oil and gas operators in Webb County diverted enough surface water from the Rio Grande for oil and gas development to supply an estimated 214,000 single family households in Texas with enough water for an entire year, over 19.2 billion gallons to be exact. This is a staggering amount considering that nearly all of the water used in drilling and fracking operations will rarely return to the water cycle, or to its original source, due to its hazardous nature and the lack of federal or state laws that require treatment and safe reuse. Furthermore, our detailed investigation into the number of disposal wells located in Webb County uncovered approximately 27 authorized disposal well sites where approximately seventeen oil and gas operators have historically disposed of water from oil and gas development.

Further investigations revealed that injection volume records were only available for approximately 7 out of the 27 authorized disposal well sites, and of these 7 disposal wells in

which injection volume records are available, in a 10-year period from 2010 – 2020, oil and gas operators injected over 1.79 billion gallons of produced water at sites throughout Webb County, a majority of which were found to be in close proximity to historically impoverished communities, such as colonias.

As Laredo's only environmental non-profit organization, the Rio Grande International Study Center aims to protect and preserve our only source of drinking water, the Rio Grande, and our local environment for present lives and future generations. RGISC strongly believes that there is a tremendous demand to create better informed and pro-active citizens to protect the Rio Grande, its eco-system, and to dig deeper into the science of our river system's hydrology and native habitat and propose solutions to address factors that can negatively impact our environment, water security, and public health.

Introduction

The Rio Grande River is the fourth longest river in North America. Its headwaters begin at the base of the San Juan Mountain range in the state of Colorado, about 12,000 feet above sea level. From its headwaters in Colorado, the Rio Grande flows southwards through the state of New Mexico, eventually reaching the cities of El Paso in the state of Texas and Ciudad Juárez in the Mexican state of Chihuahua. At this point, the Rio Grande forms the 1,255-mile international boundary between the United States and Mexico. From El Paso, the Rio Grande will continue to travel southward towards its final destination, the Gulf of Mexico, reaching the ocean after a roughly 1,990-mile journey.¹

For thousands of years, the river has created and brought life to incredible landscapes across Texas as a gleaming ribbon of water, marked by abundant and lush green scenery that teems with aquatic life, birds, and other forms of wildlife that rely on its life-giving flows to create rich areas of biodiversity and unique riparian ecosystems along its main stem.² In West Texas, the Rio Grande delivers life to the otherwise dry and inhospitable desert landscape of the Chihuahuan Desert. In the Lower Rio Grande Valley of South Texas, its waters (along with a year-round mild climate) provides rich and fertile farmland for agriculture.³

Today however, the Rio Grande exists in a much different state. As one of the top 10 most endangered rivers in the world, the Rio Grande has undergone significant and dramatic changes as a result of rapid human development, agricultural production, industrialization, and the regulated impoundment of its waters.⁴ These factors have resulted in the Rio Grande experiencing dramatic reductions in its flows due to the construction of dams along its main stem and the large quantity of surface water diversions required for municipal use, agricultural use, industrial use, and mining use. Such requirements have become exceptionally problematic for the Rio Grande in South Texas. A recent report by the Bureau of Reclamation to Congress describes that the Rio Grande's extremely limited water supplies have worsened in recent years

¹ Leon C. Metz, "Rio Grande," Handbook of Texas Online. Retrieved from: <https://www.tshaonline.org/handbook/entries/rio-grande>. Published by the Texas State Historical Association.

² The Rio Grande: A troubled river - Big Bend National Park (U.S. National Park Service). (2016). Retrieved from nps.gov website: <https://www.nps.gov/bibe/learn/nature/rio-trouble.htm>

³ Agriculture tells the history of the Rio Grande Valley | AgriLife Today. (2017). Retrieved from agrilife.edu website: <https://agrifetoday.tamu.edu/2017/01/03/valley-agriculture-history/>

⁴ Wong, CM, Williams, CE, Pittock, J, Collier, U and P Schelle. March (2007). World's top 10 rivers at risk. WWF International. Gland, Switzerland.

as a result of an on-going drought and increasing temperatures, leaving dwindling reservoirs on the Rio Grande struggling to maintain adequate water supplies.⁵

While the South Texas region *has* prospered thanks to modern innovations in water technologies such as the building of dams, the creation of surface water reservoirs, the generation of hydroelectric power, and methods of flood control, the Rio Grande undoubtedly remains in peril, and the implications of a burdened river system as a consequence of such prosperity have not gone unnoticed.

Historically speaking, stakeholders at the federal, state, and local levels have sought to mitigate the multitude of issues through the assemblage of numerous task forces, the publication of basin assessments, strategic planning, and public outreach. Despite these actions, the real issue has remained clear: the Rio Grande lacks sufficient water to provide for all those who depend on it.

In the past decade since the discovery of attainable shale reserves (once considered previously inaccessible) marked the beginnings of the Eagle-Ford Shale oil boom, a fierce competition has been brewing behind the scenes for water in South Texas, and the industry has left little room for nature, and the Rio Grande, to catch its breath.

Thus, it is necessary for a historically water-scarce region like South Texas to be aware of the way its current water resources are managed. In this report, we will pull back the curtain to take a closer look at the true cost of water associated with the development of oil and gas and understand the water resources that have been required to quench a near insatiable thirst by the oil and gas industry.

⁵ Reclamation (Bureau of Reclamation) 2021. Water Reliability in the West - 2021 SECURE Water Act Report. Prepared for the United States Congress. Bureau of Reclamation, Water Resources and Planning Office. Denver, Colorado.

Section I. Overview of Oil and Gas Development in the Eagle-Ford Shale

The Eagle-Ford Shale is an enormous geologic formation located in South Texas. It spans roughly 30 counties in Texas, with the upper region of the shale play beginning in Northeast Texas in Brazos County and the lower region of the shale play terminating its U.S. boundary in South Texas in Webb County and Maverick County.⁶ The formation is rich in oil and natural gas, with oil found throughout the northernmost portion of the formation, and natural gas found in the southernmost portion.⁷ In Webb County, natural gas is the most commonly extracted petroleum product.⁸

The advent of hydraulic fracturing and horizontal drilling ushered in a modern-day oil boom in South Texas, sending oil and gas production rates the Eagle-Ford shale skyrocketing, primarily due to the ability of operators to tap into shale reserves once considered previously inaccessible, with studies indicating that production is not expected to decline until about 2025.⁹ In October 2008, operators in the in the Eagle-Ford Shale reported oil production figures of less than 60,000 barrels of oil per day. However, by March 2015, the region witnessed its peak as production rose to 1.72 million barrels per day. At the same time, the region also experienced production of natural gas grow by 126% from a reported 1.68 billion-cubic feet (BCF) a day in October 2008, to a peak of 7.42 billion-cubic feet (BCF) in March 2015, according to data from the Department of Energy (DOE) and the Energy Information Administration (EIA).^{10, 11}

In 2012, the EIA estimated that the Eagle-Ford Shale holds about 7% of the nation's total oil reserves and about 4.3% of the nation's total natural gas reserves.¹² In 2020, Webb County

⁶ Eagle Ford Shale. Information and Statistics. (2020). Retrieved from rrc.texas.gov website: <https://www.rrc.texas.gov/oil-and-gas/major-oil-and-gas-formations/eagle-ford-shale/>

⁷ Energy in the 11th District: Eagle Ford Shale. (2020). Retrieved from dallasfed.org website: <https://www.dallasfed.org/research/energy11/eagleford.aspx#History>

⁸ MineralAnswers.com. (2021). Webb County, TX Oil & Gas Activity - MineralAnswers.com. Retrieved from mineralanswers.com website: <https://www.mineralanswers.com/texas/webb-county>

⁹ Arnett, Benton; Healy, Kevin; Jiang, Zhongnan; LeClere, David; McLaughlin, Leslie; Roberts, Joey; Steadman, Maxwell (2014). Water Use in the Eagle Ford Shale: An Economic and Policy Analysis of Water Supply and Demand. Available electronically from <https://hdl.handle.net/1969.1/151989>.

¹⁰ Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure. (2015). United States. Department of Energy. Retrieved from: <https://www.hsd.org/?abstract&did=764791> c

¹¹ Drilling Productivity Report - U.S. Energy Information Administration (EIA). (2018). Retrieved from eia.gov website: <https://www.eia.gov/petroleum/drilling/>

¹² U.S. EIA. Maps: Exploration, Resources, Reserves, and Production. (2012). Retrieved from eia.gov website: ftp://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm

remained the region's largest natural gas producer, and ranked 2nd amongst the top 10 natural gas producing counties by preliminary production in Texas, according to The Railroad Commission of Texas (RRC), the state's top oil and gas regulator.^{13, 14}

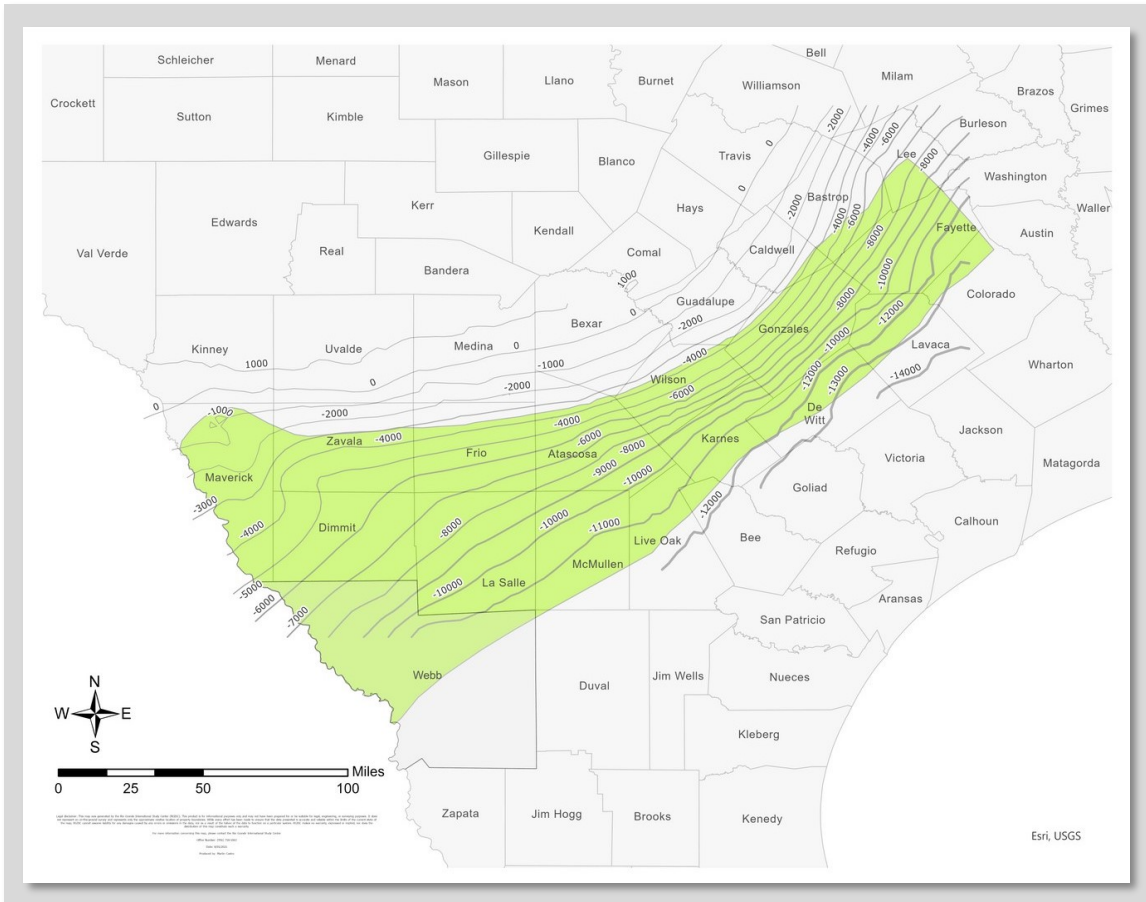


Figure 1. View of the Eagle-Ford shale boundary in South Texas¹⁵
 Data provided by the Energy Information Administration (EIA); map by RGISC

¹³ Texas Oil and Gas Production Statistics for September 2020. (2020). Retrieved from texas.gov website: <https://www.rrc.texas.gov/news/113020-september-production-statistics/>

¹⁴ Please refer to Table 1

¹⁵ Petroleum window for the Eagle-Ford Shale includes gas, condensate, and oil at depths ranging from 6,000 ft. to 12,000 ft.

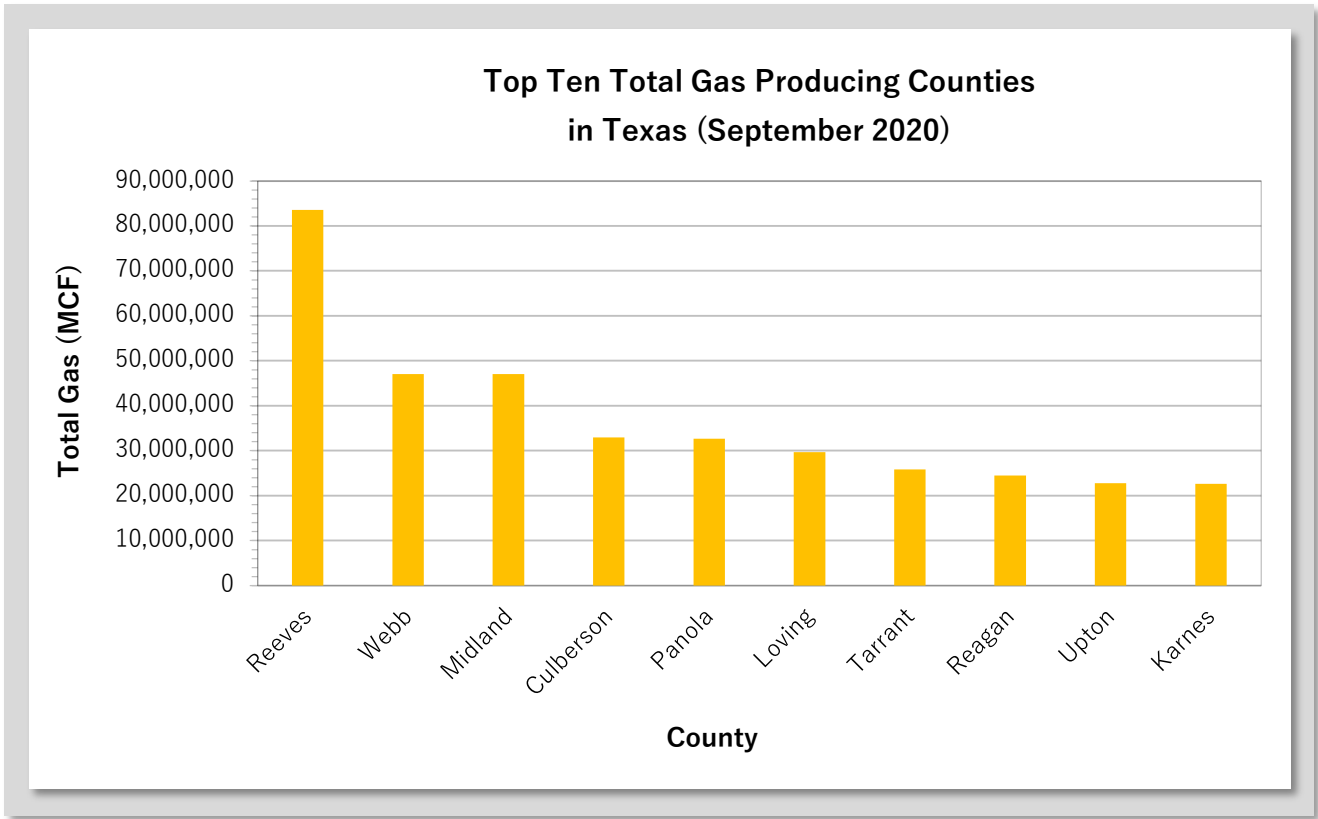


Table 1. Top ten natural gas producing counties in Texas by Million-Cubic Feet (MCF)

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

Section II. Overview of Water Usage for Oil and Gas Development in the Eagle-Ford Shale

While water and energy have always been inextricably linked, development in the oil and gas industry has tended to proceed without sufficient attention to water’s sustainability, and resources are often stretched thin to support developing communities and populations.¹⁶

Fresh water is used in a variety of stages in oil and gas operations.¹⁷ Operators may use water in a multitude of processes that include drilling, washing, re-pressuring, and fracking. The industry’s use of water, however, is dependent on several factors, such as the methods used for extraction, formation geology, terrain, petroleum products, processing requirements, and regional climate. Additionally, constraints on water resources and their availability can influence other aspects, such as site selection and the optimal technology required for development.

¹⁶ Sohns, A., Rodriguez, D., & Martin, A. (2016). Thirsty energy (II): The Importance of Water for Oil and Gas Extraction.

¹⁷ WWAP (United Nations World Water Assessment Program). 2014. The United Nations World Water Development Report 2014: Water and Energy. Paris, UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000225741>

Hydraulic fracturing, or “fracking”, is a water intensive oil and gas well-stimulation technique involving the injection of highly pressurized fluid mixtures, comprised mostly of water, sand, and in smaller amounts, chemicals (known as frack fluids), down the well-bore and into a bedrock formation in order to enhance the recovery of hydrocarbons. The process creates “fractures”, or cracks in the formation, through which petroleum products like natural gas, crude oil, and other products can flow more freely up to the surface. This technique is regularly used in formations with low-permeability, such as the one found in the Eagle-Ford Shale.¹⁸ Due to a controversial loophole in the 2005 Energy Policy Act, also known as the “Halliburton loophole,” oil and gas operators are not required to disclose the chemical makeup of frack fluids used in fracking operations normally required under federal laws.¹⁹



Figure 2. A well undergoing fracking in northern Webb County; photo circa 2011

Original photo by RGISC

¹⁸ U.S. EPA. Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-16/236F, 2016.

¹⁹ Kosnik, Renee Lewis. (2007). The Oil and Gas Industry's Exclusions and Exemptions to Major Environmental Statutes. Retrieved from: <https://earthworks.org/assets/uploads/archive/files/publications/PetroleumExemptions1c.pdf>

The amount of water required to frack an oil and gas well can be extensive and requirements are influenced by several factors, such as the type of formation, well depth, lateral distance, and number of times that a well is fracked. The Environmental Protection Agency (EPA) has estimated that the water required to complete a hydraulically fractured well in a formation like the Eagle-Ford Shale, can range between 2 – 5 million gallons of water per well.²⁰ However, this estimate may not reveal the true quantity of water actually used by industry. In a 2018 analysis by FracFocus, oil and gas operators revealed that the average amount of water used per well in the Eagle-Ford Shale in 2016 averaged 9.7 million gallons, up from 4.5 million gallons in 2013.

In horizontal drilling, oil and gas wells are drilled through a bed-rock formation at a specific angle (typically around 90°) from the vertical well-bore. This form of directional drilling allows for the long lateral of the wellbore to increase its contact with the reservoir formation, allowing for improved rates of productivity and recovery of hydrocarbons like crude oil and natural gas. Much like fracking, horizontal drilling is a technique that is commonly used in circumstances where the shape, size, and location of the reservoir formation is irregular and difficult to access.²¹

The advances of techniques such as fracking and horizontal drilling allowed operators within the Eagle-Ford Shale to recover oil and gas in formations that were once considered too impervious to be extracted feasibly, allowing for production rates to increase ten-fold.²² Whilst many areas within the Eagle-Ford Shale, such as Webb County, had previously witnessed oil and gas production decades prior, production expanded into areas where little to no activity had occurred previously.

Consequently, many areas throughout the region encountered increased demands for water required for oil and gas exploration, with some areas already stressed for high demands in other sectors, such as municipal use or agriculture use. As the rise of wells completed via fracking has increased, so too has the pressure increased on existing water resources, particularly in an arid and drought prone area like Webb County.²³ For example, in the area surrounding the Eagle-

²⁰ U.S. EPA. Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (2011). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-11/122A, 2012.

²¹ Islam, M. Rafiqul., & Hossain, M. Enamul. (2021). Advances in directional drilling. *Drilling Engineering*, 179–316. <https://doi.org/10.1016/b978-0-12-820193-0.00003-4>

²² Cook, M., Huber, K. L., & Webber, M. E. (2015). Who regulates it? Water policy and hydraulic fracturing in Texas. *Texas Water Journal*, 6 (1), 45–63. <https://doi.org/10.21423/twj.v6i1.7021>

²³ Pacsi P, Sanders KT, Webber ME, Allen DT. (2014). Spatial and temporal impacts on water consumption in Texas from shale gas development and use. *ACS Sustainable Chemistry and Engineering*. 2 (8):2028-2035.

Ford Shale, total water consumption is anticipated to increase from 5,800 Acre-Feet (AF) in 2010, to over 44,800 Acre-Feet (AF) in 2020 due to oil and gas activity.²⁴

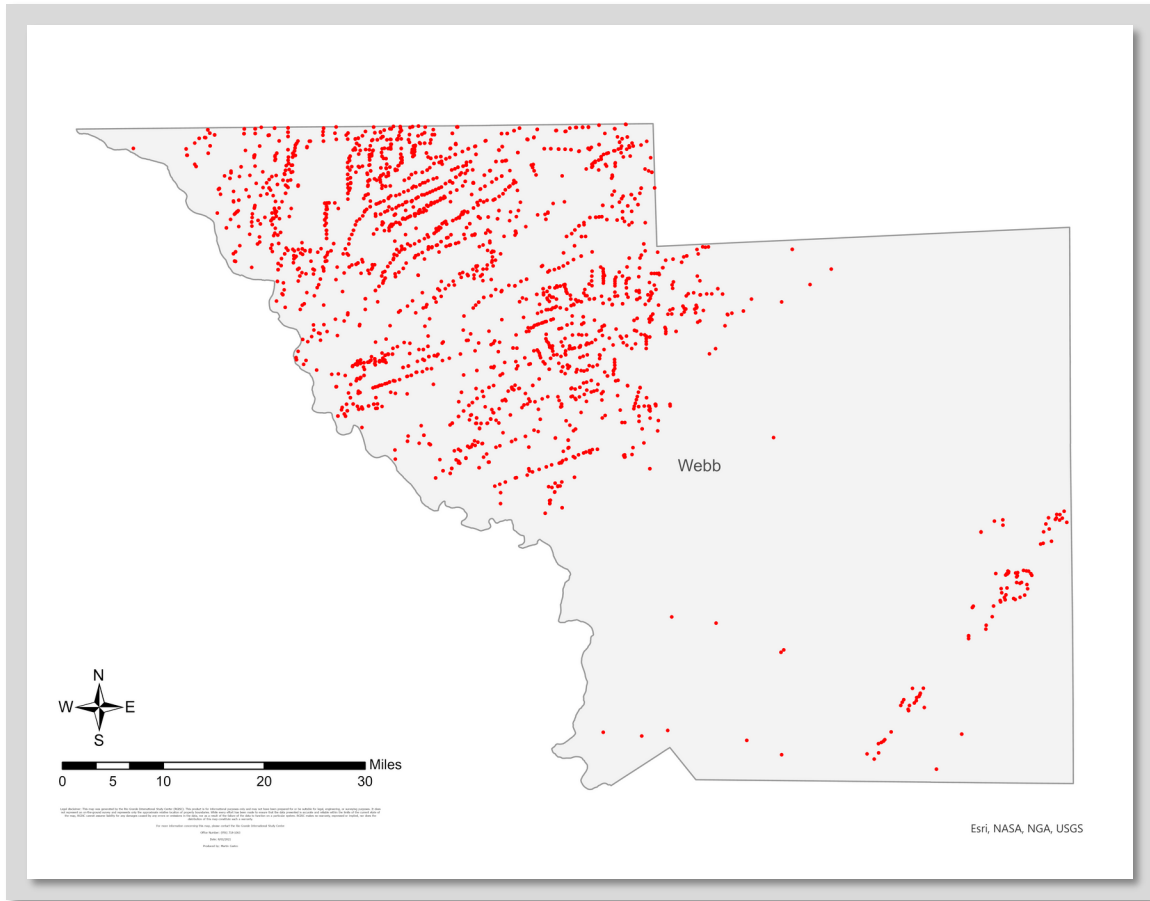


Figure 3. Wells completed via fracking in Webb County (surface locations only)

Data provided by the Railroad Commission of Texas (RRC); map by RGISC

Section III. Overview of Surface Water Ownership in Texas and Who Regulates It

Suitable access to surface water in Texas has been exacerbated in recent years due to water shortages and water allocations from policies and protocols. To understand how surface water from the Rio Grande has been used for oil and gas development in Webb County, we must first

²⁴ Cook, Margaret, and Michael Webber. (2016). Food, Fracking, and Freshwater: The Potential for Markets and Cross-Sectoral Investments to Enable Water Conservation. *Water* 8, no. 2: 45. <https://doi.org/10.3390/w8020045>

define the ownership of water in Texas and the authority under which it is regulated. The ownership of water in Texas is largely dependent on its location, but generally falls under two categories: surface water and groundwater. For the purposes of this section, we will only discuss the ownership and regulation of water in Texas and the Rio Grande as it pertains to surface water.

For information on the regulation, management, and ownership and groundwater in Texas, please refer to Section V. It is important to note, that the Rio Grande is a bi-nationally managed critical water resource. As such, the Rio Grande in Texas (U.S.) is subject to a different set of water release guidelines and allocation standards than those found in Mexico. The regulation, management, and allocation of waters from the Rio Grande and how they differ from those found in the rest of the state are discussed in detail in Section IV. Permissible uses of state water and their definitions are discussed in further detail in Section VI.

All surface water in the state of Texas is owned by the state and held by the state in trust for the citizens of the state to use appropriately as defined by Texas Water Code Section § 11.0235 (a):

“The waters of the state are held in trust for the public, and the right to use state water may be appropriated only as expressly authorized by law.”²⁵

Texas Water Code Section § 11.021 (a) defines state water as:

“The water of the ordinary flow, underflow, and tides of every flowing river, natural stream, and lake, and of every bay or arm of the Gulf of Mexico, and the storm water, floodwater, and rainwater of every river, natural stream, canyon, ravine, depression, and watershed in the state is the property of the state.”²⁶

Natural features such as streams, canyons, depressions, and other similar features defined in § 11.021 (a) are known as “watercourses”. In order to determine whether surface water *is* state water that may then fall under the regulation and ownership of the state, one must determine whether the surface water is located in one of the many watercourses described in the statutory definition. Therefore, it is essential to distinguish the characteristics of a watercourse.

²⁵ Tex. Water Code § 11.0235 (a) Water Rights (2011). Retrieved from texas.gov website: <https://statutes.capitol.texas.gov/Docs/WA/htm/WA.11.htm>

²⁶ Tex. Water Code § 11.021 (a) Water Rights (2011). Retrieved from texas.gov website: <https://statutes.capitol.texas.gov/Docs/WA/htm/WA.11.htm>

Texas Administrative Code § 291.7 (61) defines a watercourse as:

“A definite channel of a stream in which water flows within a defined bed and banks, originating from a definite source or sources. (The water may flow continuously or intermittently, and if the latter with some degree of regularity, depending on the characteristics of the sources)”²⁷

If water meets the definition of state water as defined in § 11.021 (a), it becomes subject to state regulation under the Texas Water Code and the rules of the Texas Commission on Environmental Quality (TCEQ). In accordance with Texas Water Code Section § 5.013, the TCEQ is the primary state agency with general jurisdiction and authority over:

“Water and water rights including the issuance of water rights permits, water rights adjudication, cancellation of water rights, and enforcement of water rights”²⁸

As such, the state may grant the “right” to use state water to different entities (both public and private), such as farmers, ranchers, businesses, cities, governments, industries, and other public or private interest groups. In order to use state-owned water, all entities (both public and private) must file a permit and obtain what is known as a “water right”. Under Texas Water Code Section § 11.002 (5), a water right is defined as:

“A right acquired under the laws of Texas to impound, divert or use state water.”²⁹

Such water rights are issued by the state in accordance with Texas Water Code Section § 11.022, which states:

“The right to the use of state water may be acquired by appropriation in the manner and for the purposes provided in this chapter. When the right to use

²⁷ 30 Tex. Admin. Code § 297.1 (61) (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

²⁸ Tex. Water Code § 5.013 Texas Commission on Environmental Quality (2011). Retrieved from texas.gov website: <https://statutes.capitol.texas.gov/Docs/WA/htm/WA.5.htm>

²⁹ Tex. Water Code § 11.002 (5) Water Rights (2011). Retrieved from texas.gov website: <https://statutes.capitol.texas.gov/Docs/WA/htm/WA.11.htm>

state water is lawfully acquired, it may be taken or diverted from its natural channel."³⁰

It is important to note, however, that the issuance of a water right to an entity does not transfer ownership of the water from the state to the entity. Rather, the entity is only granted a non-possessory right of use, known as a "usufructuary right".³¹ Water ownership remains with the state and is never relinquished by the state.³² Once issued, a water right permit will provide the specific parameters that must be followed by the entity, known as a "water right holder". A water right will contain the following parameters as (typically detailed in the permit) that the water right holder must follow, such as the:

- (a) Authorized Use
- (b) Diversion Point Location
- (c) Authorized Place of Use
- (d) Authorized Diversion Rate
- (e) Discharge Information

Generally speaking, a water right is limited by the amount of water that has been specifically appropriated under the permit, as well as the amount of water that is being used or can be beneficially used under the purposes specified and recognized in the permit.^{33, 34} Much like mineral rights, surface water rights are recognized as property rights in Texas. While water right holder(s) are not entitled to ownership of state water in accordance with state law, water right holders are not otherwise permitted from seeking property interests in the right to use state water.³⁵ Therefore, a water right may be bought, sold, leased, or transferred to other individuals or entities. In a property sale, a water right may be automatically conveyed with the land being sold and is so conveyed, unless it is explicitly defined (in the terms of the sale) that the water right will be reserved, and the land sold separately as defined in Texas Administrative Code § 291.81.^{36, 37}

³⁰ Tex. Water Code § 11.022 (a) Water Rights (2011). Retrieved from texas.gov website: <https://statutes.capitol.texas.gov/Docs/WA/htm/WA.11.htm>

³¹ Texas Water Rights Comm'n v. Wright, 464 S.W.2d 642, 649 (Tex. 1971).

³² Tiffany Dowell. (2013). Texas Water: Basics of Surface Water Law. Retrieved from: <https://agrilife.org/texasaglaw/2013/09/30/texas-water-basics-of-surface-water-law/>

³³ Tex. Water Code § 11.025 Water Rights (2011). Retrieved from texas.gov website: <https://statutes.capitol.texas.gov/Docs/WA/htm/WA.11.htm>

³⁴ Permissible uses of state water and their definitions are discussed in further detail in Section VI.

³⁵ Texas Water Development Board. (2003). A Texan's Guide to Water and Water Rights Marketing. Austin (Texas): Texas Water Development Board. Retrieved from: <https://www.twdb.texas.gov/publications/reports/infosheets/doc/WaterRightsMarketingBrochure.pdf>

³⁶ Gregory Klipp. (2017) Buying and Selling Water Rights. Retrieved from: <https://www.thejoneslawfirm.com/blog/2017/october/buying-and-selling-water-rights/>

³⁷ 30 Tex. Admin. Code § 297.81 (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

Section IV. Regulation, Management, and Allocation of Waters of the Rio Grande in Texas

Most surface water found throughout the state of Texas is allocated under the doctrine known as “prior appropriation”, often summed up in more general terms as “first in time, first in right”, where the authorization to divert state water is based upon the point in time in which the water right was legally acquired from the TCEQ and its predecessor agencies, known as a “priority date”.³⁸ Under this doctrine, senior water rights (those acquired first) are fulfilled before junior water rights (those acquired later or last) based on the water right’s priority date.³⁹ Priority dates are the determining factors when water rights are curtailed, or cut back, during times of water shortages, regardless of the type of use for the permitted water right. Therefore, water shortages will typically affect junior water right holders first, as they were the last to legally obtain a water right.

The TCEQ’s Rio Grande Watermaster Program, overseen by the Rio Grande Watermaster, is the primary entity responsible for the monitoring, allocation, and controlled use of surface water from the Rio Grande Basin in Texas. The program’s jurisdiction begins near Fort Quitman, Texas, located approximately 80 miles south of El Paso, Texas, and ends where the Rio Grande meets the Gulf of Mexico near Brownsville, Texas.⁴⁰ In certain areas of the Rio Grande Basin, water rights are managed under the doctrine of prior appropriation, as they are throughout other areas of Texas. These include, the Upper Rio Grande above Amistad Dam in Del Rio, Texas to Fort Quitman, Texas (including tributaries), the Nueces-Rio Grande Coastal Basin, and the tributaries of the Middle Rio Grande. Webb County, which is located in the Middle Rio Grande between Amistad Dam in Del Rio, Texas and Falcon Dam near Zapata, Texas, will be the focus of this report.⁴¹

From Amistad Dam in Del Rio, Texas to the Gulf of Mexico, however, a unique system applies. Unlike other areas throughout the state, water rights in the Middle Rio Grande (Amistad Dam-Falcon Dam) and Lower Rio Grande (Falcon Dam-Gulf of Mexico) are regulated based on their

³⁸ Am I Regulated? Water Rights in Texas. (2020). Retrieved from tceq.gov website: https://www.tceq.texas.gov/permitting/water_rights/wr-permitting/wr_amiregulated.html

³⁹ Water Rights and Water Use During Drought. (2021). Retrieved from tceq.gov website: <https://www.tceq.texas.gov/response/drought/waterrights.html>

⁴⁰ Rio Grande Watermaster Program. (2020). Retrieved from tceq.gov website: https://www.tceq.texas.gov/permitting/water_rights/wmaster/rgwr/riogrande.html

⁴¹ Please refer to Figure 4

purpose of use, which are typically divided into two major use type categories: domestic, municipal, and industrial rights, commonly referred to as DMI water rights in one category, and irrigation and mining rights, in the other. Irrigation and mining rights are further subdivided into two classes, Class A and Class B rights.⁴² When converted to a domestic, municipal, or industrial water right (DMI), Class A rights are converted to 50% of the water right per annum, while Class B rights are only converted to 40% of the water right per annum.⁴³

This tiered system of water rights prioritizes DMI water rights above the two classes of irrigation and mining rights, as only DMI water rights are guaranteed their full allocation of water each year based on their authorized water right amount; Class A and Class B water rights are allocated water on a pro-rated basis and may not necessarily receive their full authorized water right amount per year, which may carry forward into the following year.⁴⁴ This is due to the manner in which the waters of the Middle and Lower Rio Grande in Texas are treated versus those found in other river basins in the state.

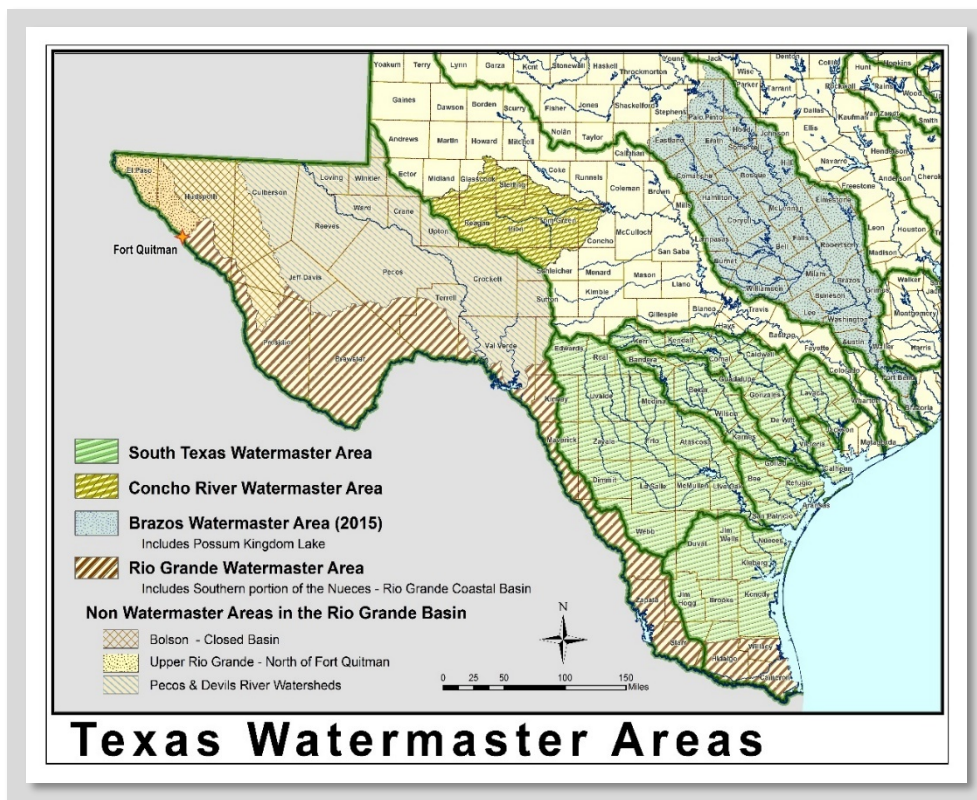


Figure 4. Map of Texas watermaster areas, including the Rio Grande

Map by the Texas Commission on Environmental Quality (TCEQ)⁴⁵

⁴² Uses of state water and appropriate definitions are discussed in further detail in Section VI.

⁴³ 30 Tex. Admin. Code § 303.2 (A) (B) (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

⁴⁴ 2021 Rio Grande Regional Water Plan, Region M (2020) Rio Grande Regional Water Planning Group

⁴⁵ Watermasters. (2020). Retrieved from tceq.gov website: https://www.tceq.texas.gov/permitting/water_rights/wmaster

Whereas waters found throughout the state are treated as a flow resource, the waters of the Rio Grande (in the Middle and Lower segments) are treated as a stock resource that can be enduringly expended and are therefore non-renewable. These waters accumulate in the Amistad-Falcon Reservoir system (managed as a storage-release system) and are released downstream from the two reservoirs when requested by water right holders in the Middle and Lower Rio Grande in accordance with their allocations of available water. Since the 1960's and 1970's, all water rights (in the U.S. share) on the Rio Grande below Amistad have been fully adjudicated such that no "unclaimed" (i.e. unappropriated) water is frequently available in the Amistad-Falcon system.⁴⁶



**Figure 5. (Left) Amistad International Dam and Reservoir in Del Rio, Texas⁴⁷
(Right) Falcon International Dam and Reservoir near Zapata, Texas⁴⁸**

It is important to note, however, that the TCEQ's Rio Grande Watermaster Program is only responsible for administering the United States' share of Rio Grande water in the Amistad and Falcon Reservoir system, which was established via the 1944 Water Treaty between the United States and Mexico and distributed the waters of the Rio Grande (in the international segment) between both countries from Fort Quitman, Texas, to the Gulf of Mexico.⁴⁹ The International

⁴⁶ Regional Facility Plan for the Lower Rio Grande Valley (2016). Black & Veatch Holding Company. RGRWA.

⁴⁷ TX-COAH-NL-TAUM | Amistad Task Force | US EPA. (2013). Retrieved from epa.gov website: <https://www.epa.gov/usmexicoborder/tx-coah-nl-taum-amistad-task-force>

⁴⁸ Falcon International Reservoir (Rio Grande River Basin) Texas Water Development Board. (2021). Retrieved from texas.gov website: <https://www.twdb.texas.gov/surfacewater/rivers/reservoirs/falcon/index.asp>

⁴⁹ Kirsten J. Anderson, A History and Interpretation of the Water Treaty of 1944, 12 Nat. Resources J. 600 (1972).

Boundary & Water Commission (IBWC) and its Mexican counterpart, the Comisión Internacional de Límites y Aguas (CILA), are responsible for the operations and maintenance of both Amistad Dam and Falcon Dam.

Under current TCEQ rules and regulations⁵⁰, all U.S. water diverted in the Middle and Lower Rio Grande by authorized diverters (DMI's/Class A's/Class B's) is accounted for by the Rio Grande Watermaster, which are then "charged", or deducted against the annual authorized water right amount, akin to a bank account with a frequently changing balance, where every individual user has an existing water account based on available storage in the Amistad-Falcon Reservoir system.⁵¹ Prior to diverting any water, water right holders are required to submit written certification from the Rio Grande Watermaster by identifying the Certificate of Adjudication (ADJ) and pump number that will be used for that specific pump; certifications to divert will only be granted for those authorized diversion points associated with the water right.⁵²

Water right holders are also responsible for submitting reports to the Watermaster on actual water used based on records kept by the water right holder or diverter. Per state statute, water right holders in the Middle Rio Grande and Lower Rio Grande are limited to a maximum diversion period of one month for diversions on the main stem, whilst water right holders in the Upper Rio Grande and all tributaries are limited to a maximum diversion period of up to one year. Additionally, the Rio Grande Watermaster is responsible for locating and identifying all authorized diversion facilities along the Rio Grande below Fort Quitman.⁵³ This accounting and record keeping will form the basis of our research, data, and analysis found in Section VII.

Furthermore, each tier of water rights (DMI's/Class A's/Class B's) has a dedicated "storage pool" in the Amistad-Falcon Reservoir storage system in accordance with Texas Administrative Code § 303.22.1.⁵⁴ At the conclusion of each month, the dead storage (approximately 4,600 AF) and the DMI reserve (approximately 225,000 AF) are deducted from the U.S.'s share of reservoir storage. The replenishment of the storage pool is done to ensure that DMI water rights can be guaranteed in full; any excess water that still remains in the system is potentially available for individual allocation(s) to Class A and Class B accounts. Lastly, an operating reserve

⁵⁰ 30 Tex. Admin. Code § 303.11 (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

⁵¹ 2021 Rio Grande Regional Water Plan, Region M (2020) Rio Grande Regional Water Planning Group

⁵² 30 Tex. Admin. Code § 303.11 (b) (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

⁵³ 30 Tex. Admin. Code § 303.1 (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

⁵⁴ 4 R. J. Brandes Company; "Evaluation of Amistad-Falcon Water Supply Under Current and Extended Drought Conditions"; Phase II, Lower Rio Grande Valley Regional Integrated Water Resources Planning Study; Lower Rio Grande Valley Development Council and the Valley Water Policy and Management Council of the Lower Rio Grande Water Committee, Inc.; Austin, Texas; (1999)

(approximately 75,000 AF) is set aside to cover water lost in both reservoirs due to various circumstances, such as seepage, evaporation, water conveyances, emergency situations, and storage adjustments.⁵⁵

Unlike Class A and Class B accounts which are permitted to carry-over unused water balances into the following year, DMI water rights are not allowed to carry-over any unused water and are strictly limited to diverting no more than the amount authorized annually each year in their water right, respectively.⁵⁶ Moreover, Class A and Class B accounts can accumulate up to 1.41 times the authorized water right amount in storage. Water right holders that do not beneficially use their allotted water in a two-year consecutive period can have their account reduced to zero.

Section V. Regulation, Management, and Ownership of Groundwater in Texas

In contrast to the ownership and direct regulation of surface water by the state, groundwater in Texas is considered property of the overlying landowner and governed under a legal doctrine known as the “rule of capture”.⁵⁷ This legal doctrine provides landowners the right to withdraw as much groundwater as the landowner may beneficially use without incurring legal liabilities, regardless if the landowner affects, inhibits, or otherwise causes the wells of adjacent or neighboring landowners to go dry.⁵⁸ Additionally, landowners are also permitted to sell the groundwater withdrawn from their land.

Nevertheless, the Texas legislature *has* established legislation for the creation of local groundwater conservation districts (GCDs) to provide some regulation and control over groundwater use. Under authorization from the Texas legislature, local groundwater conservation districts may issue permits for groundwater wells, require groundwater reporting and metering, and place restrictions on the amount of groundwater that can be withdrawn by landowners in order to reasonably manage and protect groundwater resources in a particular area.⁵⁹

⁵⁵ 30 Tex. Admin. Code § 303.21 (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

⁵⁶ 30 Tex. Admin. Code § 303.22 (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

⁵⁷ Johnson, Corwin W. (2004). What Should Texas Do About the Rule of Capture? Texas Water Development Board (TWDB). Retrieved from: https://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R361/2%20CH%20Johnson.pdf

⁵⁸ Potter, HG. (2004). History and Evolution of the Rule of Capture. Texas Water Development Board (TWDB). Retrieved from: https://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R361/1%20CH%20Potter.pdf

⁵⁹ Managing Texas' Groundwater Resources Through Groundwater Conservation Districts. Texas Agricultural Extension Service. B-1612 11-98. Retrieved from: http://publications.tamu.edu/WATER/PUB_water_Managing%20Texas%20Groundwater%20Resources.pdf

However, groundwater conservation districts are not present throughout the entire state. In areas where groundwater conservation districts are not present, groundwater withdrawals can go unregulated. As a result, landowners and communities outside of a groundwater conservation district are left with little to no alternatives in protecting or limiting local groundwater resources. Moreover, in areas where a groundwater conservation district is present, groundwater withdrawal used for oil and gas development, including fracking, is considered exempt from GCD rules and regulations.⁶⁰

The distinct regulation, management, and ownership systems governing surface water versus those of groundwater in Texas presents a controversial issue in that current groundwater policies in Texas have not incorporated permitting or legal determinations on the reasonable use of groundwater.⁶¹ Because of limited reporting requirements, lack of available groundwater usage data, and no active groundwater conservation district in Webb County⁶², RGISC was unable to complete a comprehensive analysis on the amount of groundwater used for oil and gas development in Webb County.

Section VI. Definition and Permissible use of State Water in Texas, Including Mining Use

Texas Water Code § 11.023 (a) outlines the various uses in which surface water may be appropriated, stored, and diverted, including domestic use, municipal use, industrial use, agricultural use, mining use, hydroelectric use, navigational use, recreational use, public park use, game preserve use, and any other beneficial use.⁶³ Water that has been allocated for usage for a specific purpose, such as mining use, must be used for mining purposes only. Similarly, water that has been designated for municipal use can only be used for municipal purposes, irrigation use can be only used irrigation purposes, and so on. Modifications to existing water rights, such as purpose of use, diversion rate, diversion point location, and place of use are completed via a water right amendment filed with the TCEQ.⁶⁴

⁶⁰ Tex. Water Code § 36.117(b)(2) Groundwater Conservation Districts. (2011). Retrieved from texas.gov website: <https://statutes.capitol.texas.gov/Docs/WA/htm/WA.36.htm>

⁶¹ Williams, Vanessa P. (2020). Beneath the Surface. Key Issues Underlying Groundwater Management in Texas. Environmental Defense Fund (EDF). Retrieved from edf.org website: <https://www.edf.org/beneath-the-surface-texas>

⁶² GMA Map | The Texas Alliance of Groundwater Districts. (2021). Retrieved from texasgroundwater.org website: <https://texasgroundwater.org/gma-map/>

⁶³ Tex. Water Code § 11.023 (a) Water Rights (2011). Retrieved from texas.gov website: <https://statutes.capitol.texas.gov/Docs/WA/htm/WA.11.htm>

⁶⁴ 30 Tex. Admin. Code § 303.11 (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

For the purposes of this report, however, we will only focus on the permissible use of state water as it pertains to mining use as described in Texas Administrative Code § 297.1 (32), which defines mining use as:

“The use of water for mining processes including hydraulic use, drilling, washing sand and gravel, and oil field repressuring.”⁶⁵

More specifically, the broad definition of mining use encompasses a number of sub-use categories. Whilst water right holders are required to request written certification from the Rio Grande Watermaster prior to diverting water by identifying the specific certificate of adjudication that will be used in accordance with the authorized usage^{66, 67} (i.e. mining), state statutes do not obligate that water right holders further indicate the sub-use category (i.e. hydraulic use, drilling, sand and gravel washing, etc.) when requesting authorization to divert; such information is completely non-compulsory and entirely up to the discretion of the water right holder to specify to the Rio Grande Watermaster the sub-use category when requesting authorization to divert water under the authorized usage, such as mining.

⁶⁵ 30 Tex. Admin. Code § 297.1 (31) (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

⁶⁶ 30 Tex. Admin. Code § 303.11 (b) (1986). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

⁶⁷ Please refer to Section IV

Section VII. Mining Water Use Analysis for Webb County, Texas

Now that the regulation, management, allocation, and definition of state water (as it pertains to mining use) has been appropriately characterized, we can proceed with our mining water usage analysis that has been completed to quantify the usage of surface water from the Rio Grande for mining use as it relates to oil and gas development in Webb County. In this section, we will explain the methodology and data used in our analysis and discuss key findings.

The first part of our analysis consisted of identifying oil and gas operators in the Eagle-Ford Shale that have historically diverted/used water from the Rio Grande for mining purposes in Webb County. The second part of our analysis consisted of determining the actual amount of mining water diverted by such oil and gas operators.

While the TCEQ publishes data on the amount of water diverted by water right holders in non-watermaster areas of the state⁶⁸, data on the amount of water diverted by water right holders in the Rio Grande Basin is not published nor made publicly accessible by the TCEQ. To obtain this information, a public information request (PIR)^{69, 70} was filed with the TCEQ Rio Grande Watermaster's Office, respectively.

Relevant data was requested for an approximate 10-year time period from January 1st, 2010 – December 31st, 2020. Data was then filtered and extracted in accordance with the relevant information and criteria required for the purposes of this report in order to determine the amount of surface water⁷¹ that has been diverted from the Rio Grande in Webb County (as reported by water right holders to TCEQ) and in accordance with the authorized usage (mining).

It must be noted, however, that whilst the definition of mining use also represents water used for sand and gravel washing,⁷² operators in the aggregate industry are typically considered part of the manufacturing sector and not mining.^{73, 74} For this reason, additional mining water users,

⁶⁸ Please refer to Figure 3

⁶⁹ Public Information Request No.59168

⁷⁰ Make a Public Information Request. (2020). Retrieved tceq.gov website: <https://www.tceq.texas.gov/agency/data/records-services/reqinfo.html>

⁷¹ All data reported in Acre-Feet (AF); 1 Acre-Foot (AF) is equal to 325,851 Gallons (GAL)

⁷² Please refer to Texas Administrative Code § 297.1 (32)

⁷³ 2021 Rio Grande Regional Water Plan, Region M (2020) Rio Grande Regional Water Planning Group

⁷⁴ Water Use of Texas Water Utilities (2020) Biennial Report Water Use of Texas Water Utilities. 87th Texas Legislative Session

such as sand and gravel operators, were not identified as diverters/users of mining water used for oil and gas development and have therefore not been included in this section.

Based on available mining water use data from TCEQ⁷⁵, our analysis identified the following six operators (in the oilfield services and oil and gas exploration and production industries) as users/diverters of mining water from the Rio Grande in Webb County:

Operator	Industry	Corporate Headquarters
Kingsley Constructors, Inc.	Oilfield Services (OFS) ⁷⁶	25250 Borough Park Drive, Suite 106 The Woodlands, TX 77380
SM Energy, Inc.	Oil and Gas E&P ⁷⁷	1775 Sherman St., Suite 1200 Denver, CO 80203
Segundo Navarro Drilling, Ltd. ⁷⁸	Oil and Gas E&P	10101 Reunion Place, Suite 1000 San Antonio, TX 78216
Select Energy Services, LLC	Oilfield Services (OFS)	1233 West Loop South, Suite 1400 Houston, TX 77027
Silverbow Resources, Inc.	Oil and Gas E&P	920 Memorial City Way, Suite 850 Houston, TX 77024
Fasken Oil and Ranch, Ltd.	Oil and Gas E&P	6101 Holiday Hill Rd, Midland, TX 79707

Table 3. Identified users/diverters of mining water from the Rio Grande in Webb County⁷⁹

Operator names provided by the Texas Commission on Environmental Quality (TCEQ);
Additional information such as industry and company headquarters sourced from company websites; table by RGISC

Our analysis has revealed that in a 10-year period from January 1st, 2010 – December 31st, 2020, oil and gas operators diverted nearly 59,000 acre-feet, or 19.2 billion gallons of water from the Rio Grande for mining purposes.

In a 2015 report to the Texas Legislature, the Texas Water Development Board (TWDB) analyzed approximately 304 Texas water utilities that reported single-family residential water use amounts and estimated that the average water use per single-family residential connection

⁷⁵ Please refer to Table 2

⁷⁶ Oilfield services (OFS) industry refers to all product and services associated with oil and gas exploration, development, transportation, and production; operators are generally engaged in manufacturing, repair, and maintenance of equipment used in such stages and processes

⁷⁷ Oil and gas exploration and production industry refers to the portion of the petroleum industry responsible for the exploration of petroleum products, drilling of wells, and the extraction of such products to the surface

⁷⁸ Segundo Navarro Drilling, Ltd. is a subsidiary of Lewis Energy Group, LP

⁷⁹ Data based on mining water usage provided by TCEQ to RGISC

per day equated to 246 gallons; this estimate equates to over 89,000 gallons consumed per single-family household per year.⁸⁰ Our analysis indicates that operators diverted enough mining water from the Rio Grande to supply an estimated 214,000 single-family households with enough water for an entire year.

Historically speaking, the rapid and sudden increase of oil and gas development from water intensive practices such as fracking, generated a tremendous demand for mining water and water supplies in the Middle Rio Grande, opening up a new water market for fracking in Webb County. As a result, many operators were left scrambling to acquire water rights (mining) for purchase or lease to be used in a hotly contested area like Webb County.

From a period between 2010 – 2020, operators in Webb County bought or leased such water rights from major agricultural users in the Lower Rio Grande. Hidalgo County Irrigation District No. 2 (HCID No. 2), an irrigation district in the Lower Rio Grande Valley, amended its diversion points authorized under its water right to include diversion points in the Lower Rio Grande (where water is primarily delivered to agricultural producers) and the Middle Rio Grande (where water can be delivered to oil and gas operators).⁸¹

The following mining water use data has been broken down as follows: Rio Grande mining water usage by operator per calendar year from 2010 – 2020,⁸² total overall amount of mining water usage from the Rio Grande by operators from 2010 – 2020,⁸³ and a comprehensive list of information by operator, including certificates of adjudication and total amounts of water used in Acre-Feet (AF) and Gallons (GAL).⁸⁴

⁸⁰ Texas Water Development Board (TWDB). (2015). Water Use of Texas Water Utilities. A Biennial Report to the Texas Legislature.

⁸¹ Doherty, T.; Smith, R. (2012) Water Transfers in the West: Projects, Trends, and Leading Practices in Voluntary Water Trading. Western Governors' Association: Denver, CO. Retrieved from: http://www.westernstateswater.org/wp-content/uploads/2012/12/Water_Transfers_in_the_West_2012.pdf

⁸² Please refer to Tables 4 - 9

⁸³ Please refer to Table 10

⁸⁴ Please refer to Table 11

**Kingsley Constructors, Inc.
Rio Grande Mining Water Usage (2010 - 2020)**

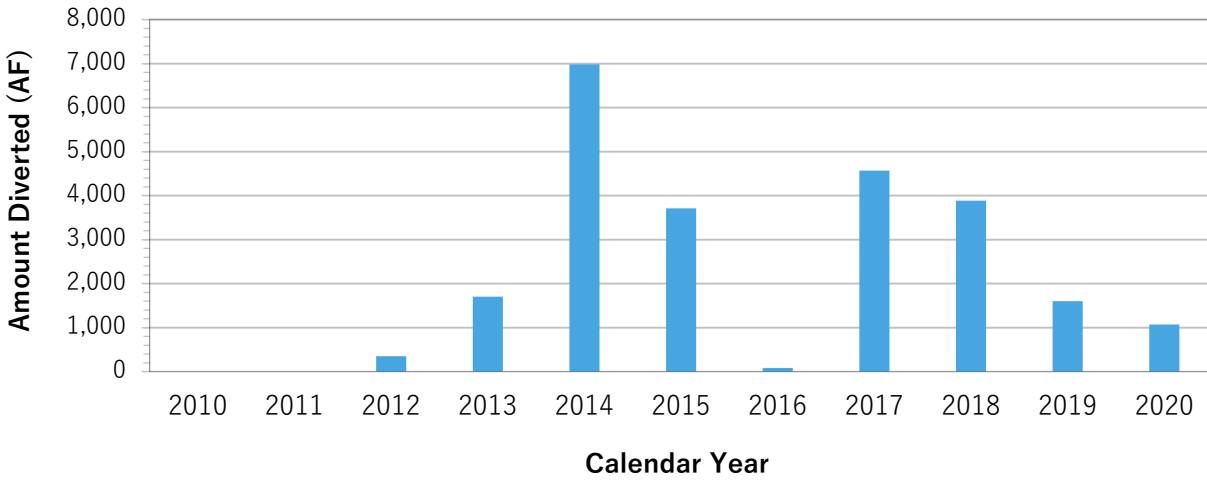


Table 4. Rio Grande mining water usage for Kingsley Constructors, Inc. in Webb County⁸⁵; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

**SM Energy, Inc.
Rio Grande Mining Water Usage (2010 - 2020)**

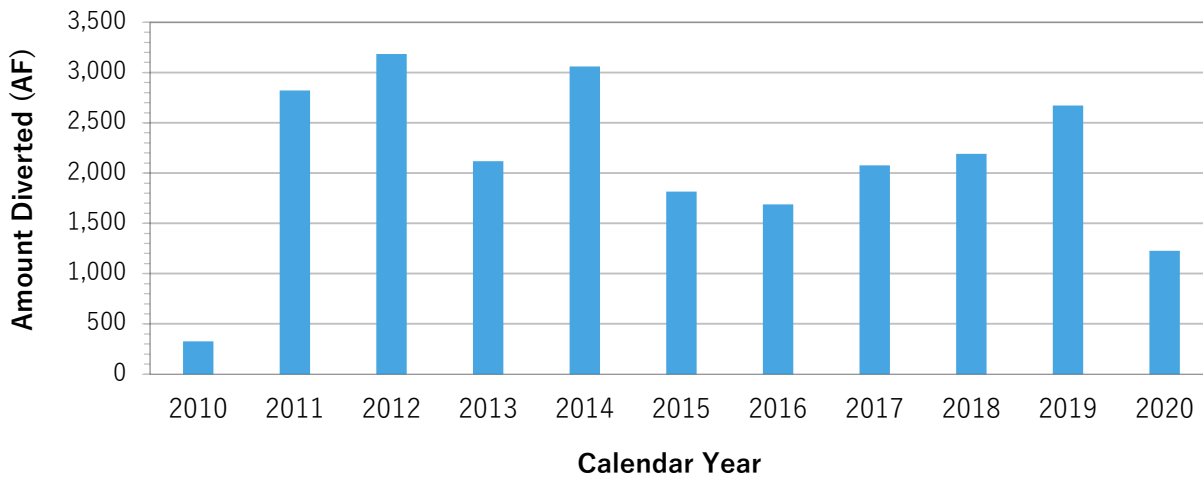


Table 5. Rio Grande mining water usage for SM Energy Inc. in Webb County; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

⁸⁵ Missing data indicates operator did not report water usage for the calendar year

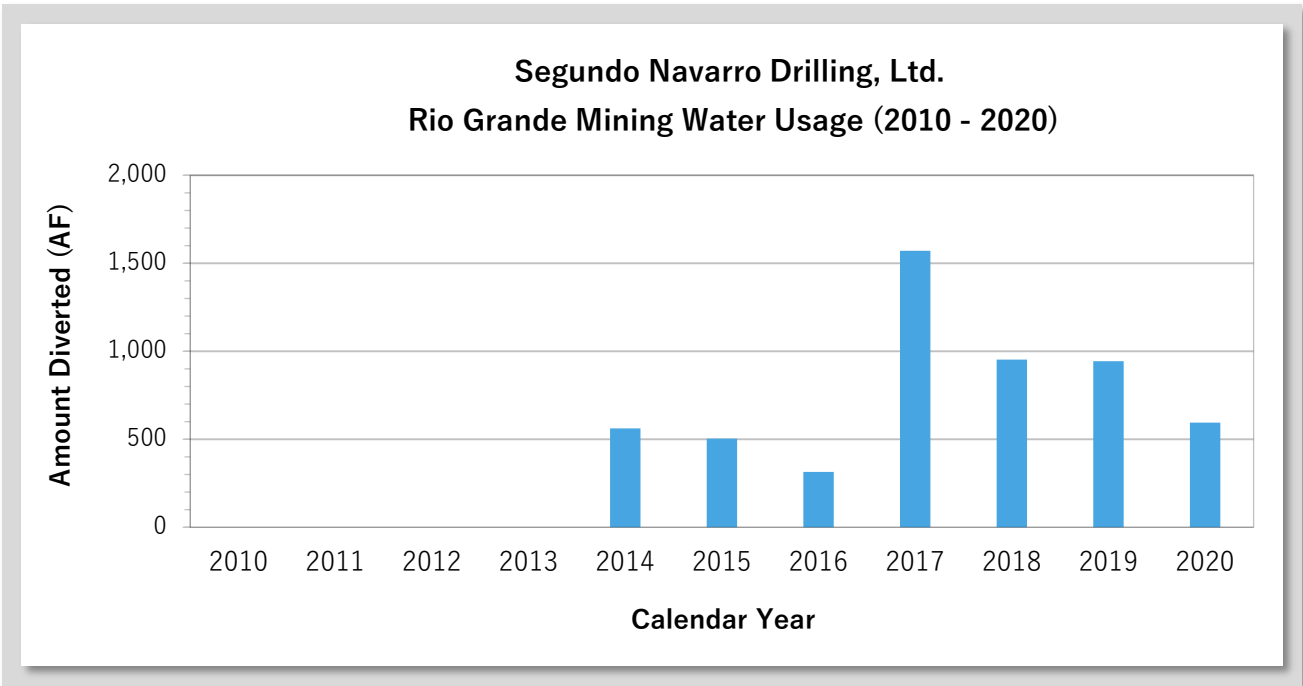


Table 6. Rio Grande mining water usage for Segundo Navarro Drilling, Ltd. in Webb County⁸⁶; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

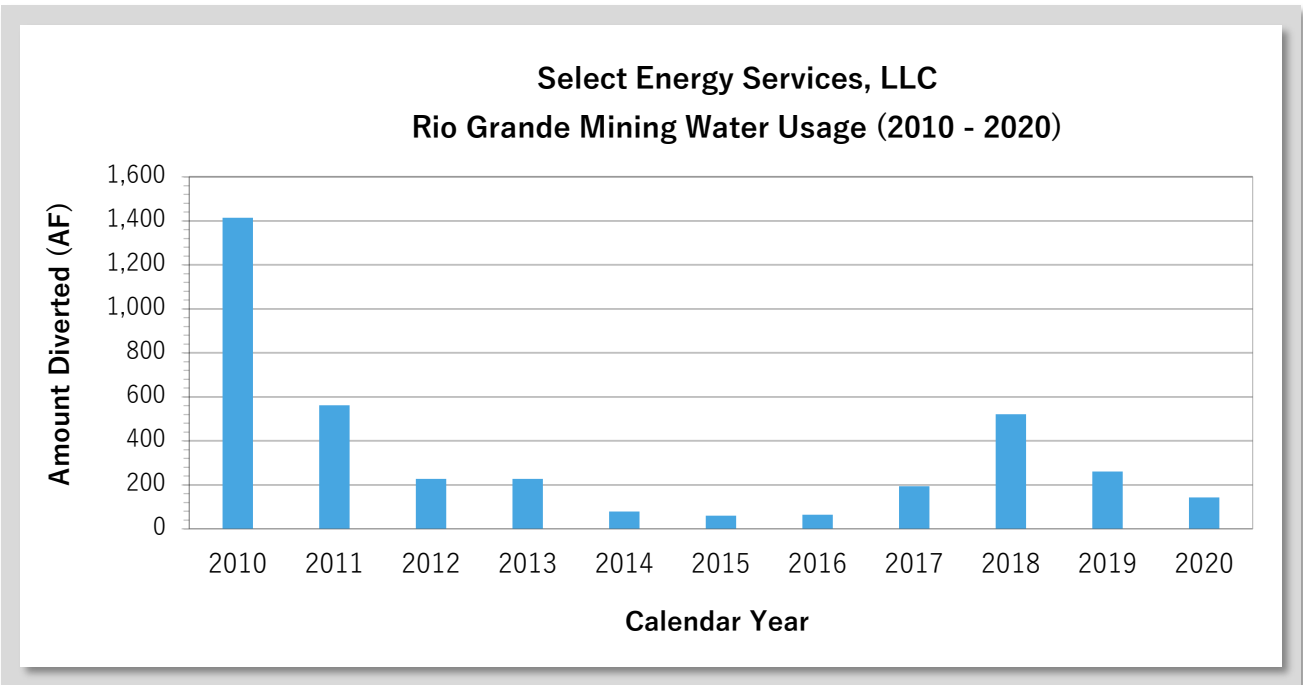


Table 7. Rio Grande mining water usage for Select Energy Services, LLC in Webb County; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

⁸⁶ Missing data indicates operator did not report water usage for the calendar year

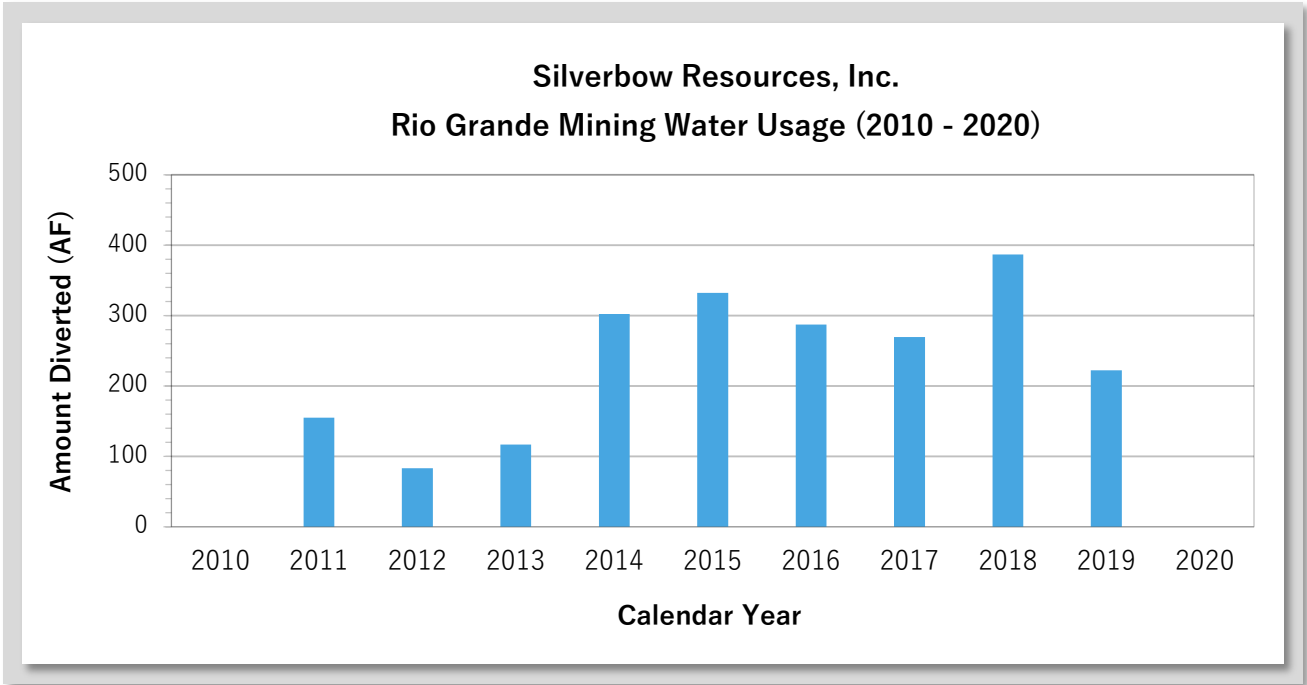


Table 8. Rio Grande mining water usage for Silverbow Resources, Inc. in Webb County⁸⁷; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

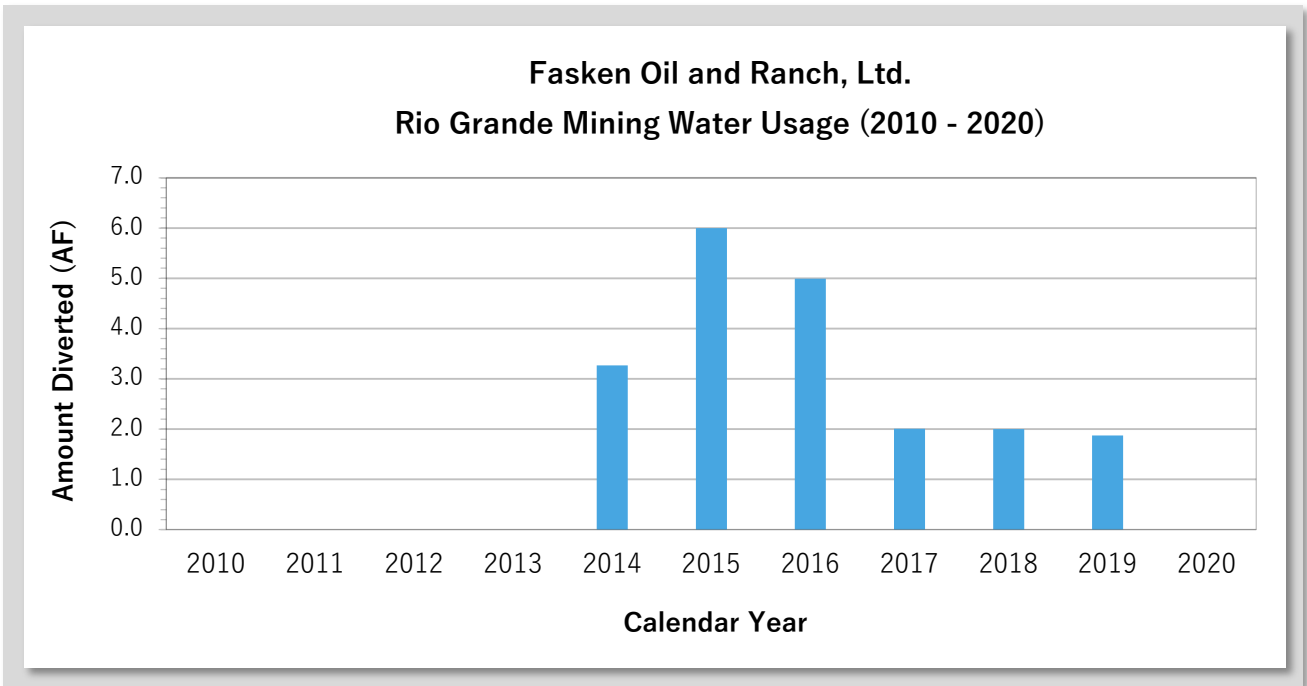


Table 9. Rio Grande mining water usage for Fasken Oil and Ranch, Ltd. in Webb County⁸⁸; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

⁸⁷ Missing data indicates operator did not report water usage for the calendar year

⁸⁸ Missing data indicates operator did not report water usage for the calendar year

Total Amount of Mining Water Diverted from the Rio Grande by Operators (2010 - 2020)

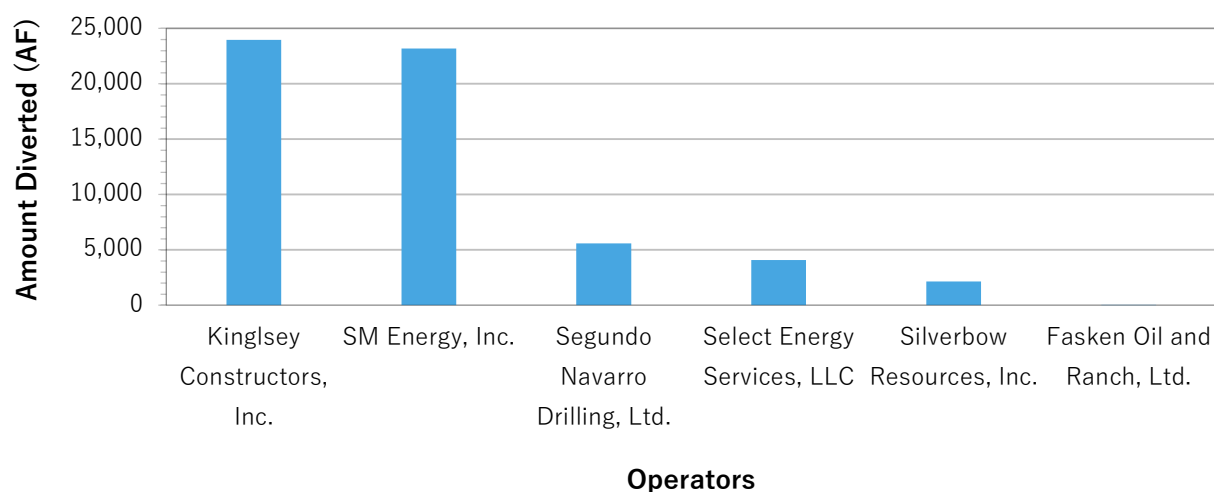


Table 10. Total overall amount of Rio Grande mining water usage by operator; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

Certificate of Adjudication (ADJ)	County	Use Type	Reporting Period	Operator	Amount Used (AF)	Amount Used (GAL) ⁸⁹
B804-000 0297-000 0297-001	Webb	Mining	01/01/2010 – 12/31/2020	Kingsley Constructors, Inc.	23,959	7,807,170,597
0423-001 0812-011 0810-002	Webb	Mining	01/01/2010 – 12/31/2020	SM Energy, Inc.	23,185	7,554,999,689
0812-010	Webb	Mining	01/01/2010 – 12/31/2020	Segundo Navarro Drilling, Ltd. ⁹⁰	5,593	1,822,578,162
2747-A03 2747-B03	Webb	Mining	01/01/2010 – 12/31/2020	Select Energy Services, LLC	4,072	1,326,766,735
CP-12640	Webb	Mining	01/01/2010 – 12/31/2020	Silverbow Resources, Inc.	2,156	702,374,177
2714-001	Webb	Mining	01/01/2010 – 12/31/2020	Fasken Oil and Ranch, Ltd.	20	6,560,293

Table 11. Comprehensive list of mining water usage information by several categories, including certificates of adjudication (ADJ) and amounts of water used in Acre-Feet (AF) and Gallons (GAL).

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

⁸⁹ Conversion factor: multiply the volume value (AF) by 325,851

⁹⁰ Segundo Navarro Drilling, Ltd. is a subsidiary of Lewis Energy Group, LP

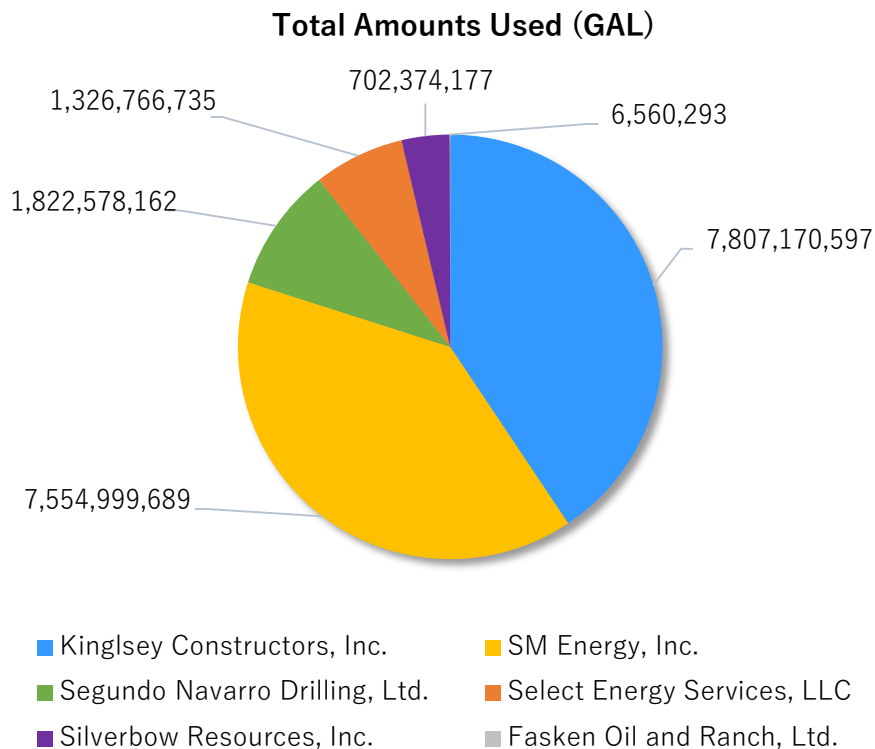


Figure 6. Total amounts of mining water diverted in gallons from the Rio Grande by operators from 2010-2020

Data provided by the Texas Commission on Environmental Quality (TCEQ); figure by RGISC

Section VIII. Locations of Mining Water Diversion Points on the Rio Grande in Webb County

To identify the geographic locations of mining water diversion points on the Rio Grande in Webb County, a spatial analysis was completed using geographic information system (GIS) software and correlated with the data and information obtained for specific mining water users as described in Section VII.

GIS data used in this spatial analysis was obtained from the TCEQ’s list of publicly available Water Availability Model (WAM) resources for the Rio Grande Basin, including legal representations of all water right features, such as permitted reservoirs, authorized diversion points (including latitude & longitude coordinates), and authorized discharge points as authorized in the water right.⁹¹ Additional visual representations (photos) were also provided to RGISC for the purposes of this section.⁹²

⁹¹ Water Availability Model (WAM). (2020). Retrieved from tceq.gov website: https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/wam.html

⁹² Please reference Figure 9

Our spatial analysis found that many of these diversion points were found within close proximity to wells that were completed via fracking. Additionally, information such as certificates of adjudication, authorized usage (mining), and authorized diversion point locations as reported from operators and obtained from TCEQ, coupled with our spatial analysis strongly indicates that water diverted (for mining purposes) from the identified diversion points was used to supply nearby oil and gas development in Webb County. Furthermore, all diversion points were also found to be located in remote locations (relative to nearby towns and cities) and on private property.

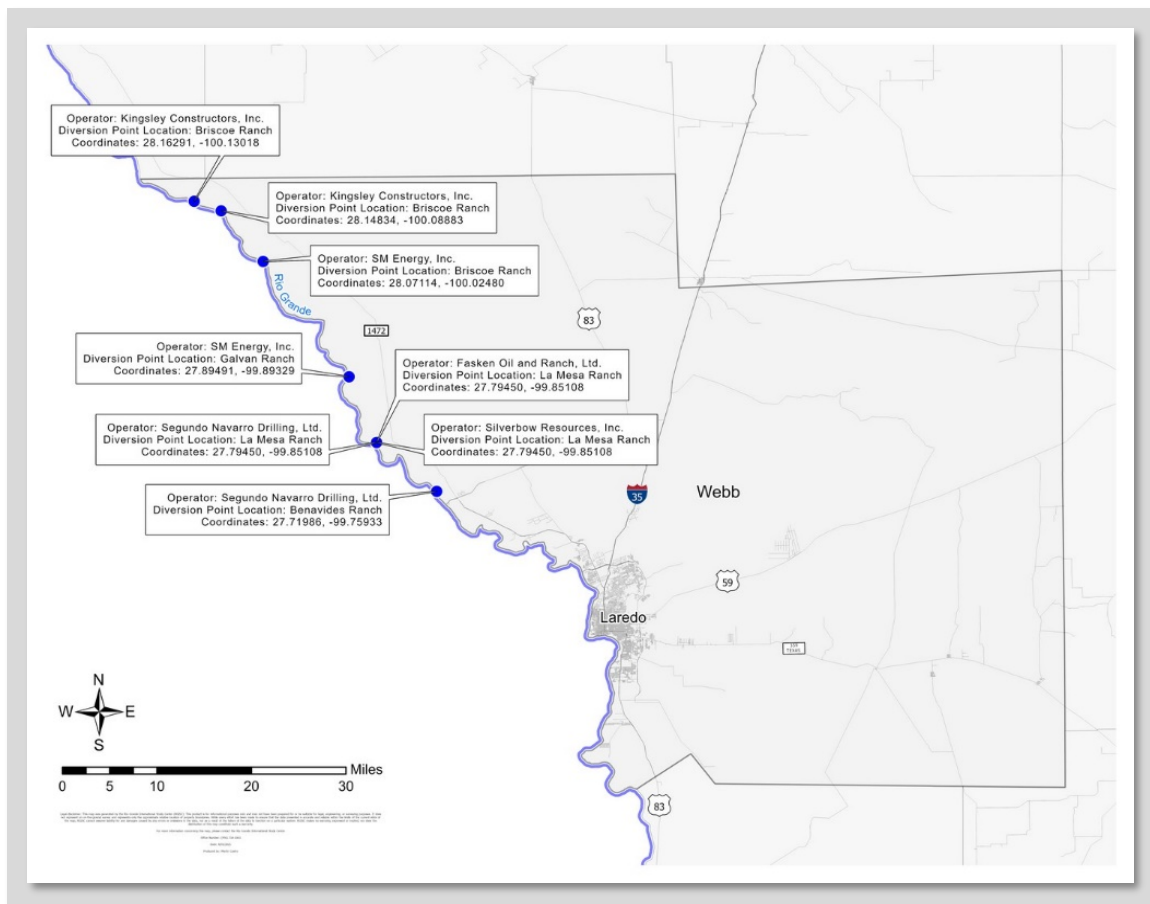


Figure 7. Identified mining water diversion points from oil and gas operators in Webb County⁹³

Data provided by the Texas Commission on Environmental Quality (TCEQ); map by RGISC

⁹³ Additional information such as diversion point location names sourced from Webb County CAD and RRC Public GIS viewer

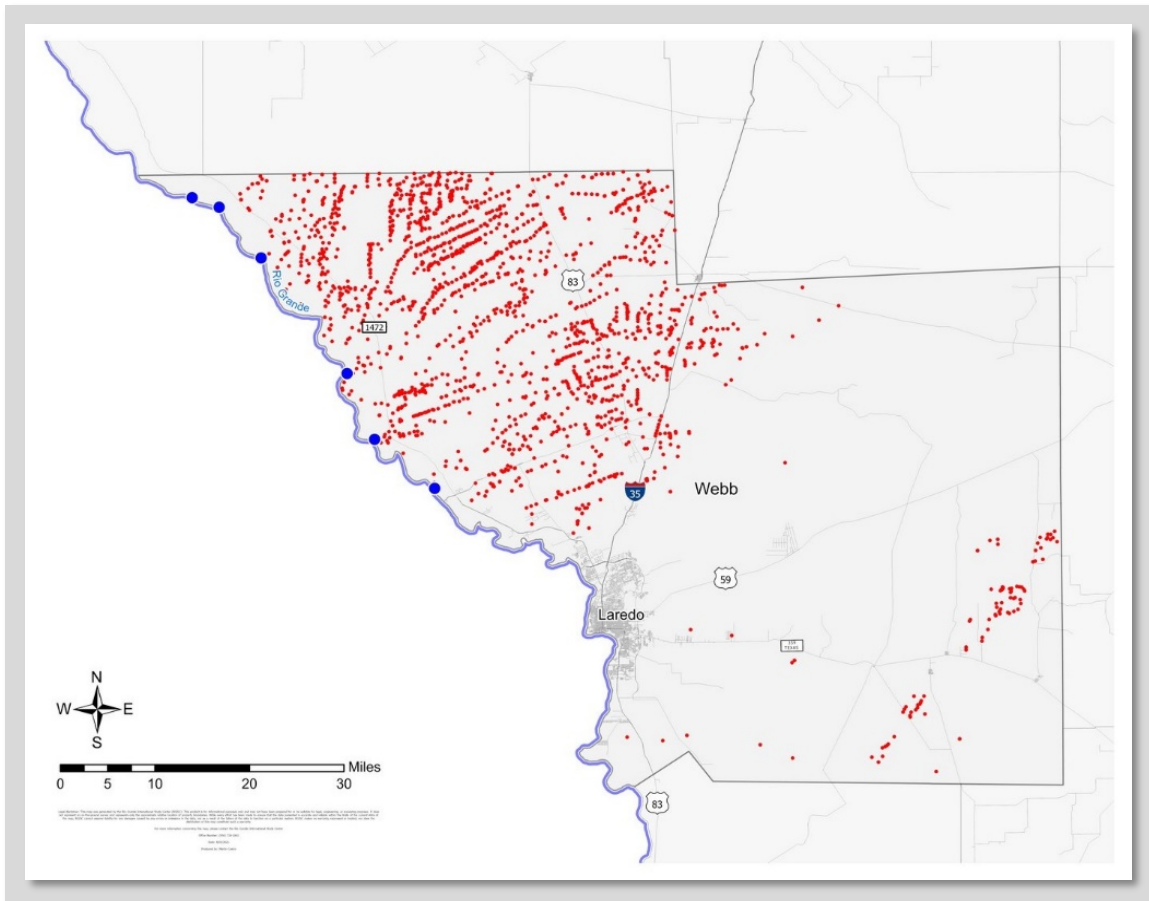


Figure 8. Identified mining water diversion points (blue) in proximity to wells (red) completed via fracking in Webb County

Data provided by the Texas Commission on Environmental Quality (TCEQ) and the Railroad Commission of Texas (RRC); map by RGISC

Operator	Lease Name	Latitude (DD)	Longitude (DD)
Kingsley Constructors, Inc.	Briscoe Ranch	28.16291	-100.13018
Kingsley Constructors, Inc.	Briscoe Ranch	28.14834	-100.08883
SM Energy, Inc.	Briscoe Ranch	28.07114	-100.02480
SM Energy, Inc.	Galvan Ranch	27.89491	-99.89329
Fasken Oil and Gas, Ltd.	La Mesa Ranch	27.79450	-99.85108
Silverbow Resources, Inc.	La Mesa Ranch	27.79450	-99.85108
Segundo Navarro Drilling, Ltd.	La Mesa Ranch	27.79450	-99.85108
Segundo Navarro Drilling, Ltd.	Benavides Ranch	27.71986	-99.75933
Select Energy Services, LLC	Various Locations ⁹⁴	Various Locations	Various Locations

Table 12. List of mining water diversion points by operator; includes lease names

Data provided by the Texas Commission on Environmental Quality (TCEQ); table by RGISC

⁹⁴ Authorized usage for Select Energy Services, LLC includes usage in Webb County, Zapata County, Hidalgo County, Starr County, Willacy County, and Cameron County



Figure 9. Diesel pumps⁹⁵ operating on the Rio Grande to extract water for mining purposes in Webb County; photos courtesy of Colin McDonald⁹⁶

Section XI. Definition and Overview of Produced Water and Disposal in Texas

In the energy industry, produced water⁹⁷, a by-product of oil and gas production, is water that is brought to the surface during the extraction of petroleum products such as oil and gas where well stimulation techniques, such as hydraulic fracturing, simultaneously transport this product (along with these petroleum products) to the surface during normal production operations. Chemically speaking, produced water is comprised of mineral salts (from dissolution in geologic formations), naturally occurring radioactive materials, toxic metals, and proprietary chemicals

⁹⁵ Diesel pumps are commonly used by operators in remote areas of Webb County due to mobility and lack of available infrastructure such as electricity

⁹⁶ Part of the Disappearing Rio Grande Expedition originally published in the Texas Tribune. (2015). Retrieved from Texas Tribune website: <https://riogrande.texastribune.org/>

⁹⁷ 40 CFR § 435.11 (bb)

used by operators which are added during drilling and fracking operations.⁹⁸ Whilst produced water is primarily composed of water found in the same geologic formations that produce oil and gas, small, assorted amounts of other materials, such as drilling muds, frack fluids, and well fluids used in drilling, completion, and production operations may also be mixed into these wastewater by-products. Within the industry, it is commonly referred to as “saltwater” or “brine water”, and contains varying levels of salinity, usually in high to very high concentrations depending on the geologic formation.^{99, 100} Due to the hazardous nature of produced water and its contents, treating produced water for potential reuse in oil and gas operations can be costly and economically unfeasible for some oil and gas operators.

As such, nearly all produced water is injected into deep underground wastewater disposal wells by operators for permanent storage and disposal. Typically, produced waters that are injected into disposal wells are disposed of into underground intervals that are not productive of oil and gas. However, in some cases, intervals for disposal may include injection into production zones from which oil and natural gas was historically produced or that is in active production.

Regardless of the source, produced water that returns to the surface during oil and gas production represents a complex waste stream that requires proper waste management from operators. Federal regulations require that the management and proper disposal of produced water must be done in a manner that safeguards surface water and groundwater resources.¹⁰¹

Production and non-production zones are designated under the RRC’s application forms that operators are required to complete in order to inject fluids into productive or non-productive zones, respectively. Productive zones are designated by Form No. H-1 and non-productive zones designated under Form No. W-14.¹⁰² In Texas, the proliferation of oil and gas production techniques such as fracking brought about increased volumes of produced water requiring disposal. In 2017, the total volume of produced water generated in Texas was estimated to be

⁹⁸ Wastewater from fracking: Disposal challenge or resource? (2019). Retrieved from chemical & engineering news website: <https://cen.acs.org/environment/water/Wastewater-fracking-Growing-disposal-challenge/97/i45>

⁹⁹ Ground Water Protection Council. (2019). Produced Water Report: Regulations, Current Practices, and Research Needs.

¹⁰⁰ Shale Research & Development. (2021). Office of Fossil Energy and Carbon Management Retrieved from energy.gov website: <https://www.energy.gov/fe/science-innovation/oil-gas-research/shale-gas-rd>

¹⁰¹ Produced Water: From a Waste to a Resource. (2020). Office of Fossil Energy and Carbon Management Retrieved from energy.gov website: <https://www.energy.gov/fe/articles/produced-water-waste-resource>

¹⁰² Railroad Commission of Texas Oil & Gas Forms. (2021). Retrieved from rrc.texas.gov website: <https://www.rrc.texas.gov/oil-and-gas/oil-and-gas-forms>

more than 357 billion gallons. By 2023, that volume is expected to increase to over 630 billion gallons.¹⁰³



Figure 10. A salt-water disposal (SWD) facility located in the Permian Basin, West Texas; photo courtesy of the Houston Chronicle

Due to the remote locations of many fracking operations, most wastewater by-products are typically trucked to and from production sites to disposal well sites, sometimes located several miles away.¹⁰⁴ Historically speaking, the explosion of oil and gas activity saw wastewater disposal sites, such as the one pictured above, become common landmarks in regions like the Eagle-Ford Shale. However, such disposal well sites also brought about challenges and concerns related to the disposal of such waste to local communities, including the non-

¹⁰³ Lyons, Blythe; Tintera, John; Wright S. Kylie. (2019). Sustainable Produced Water Policy, Regulatory Framework, and Management in the Texas Oil and Natural Gas Industry: 2019 and Beyond. Retrieved from Texas Alliance of Energy Producers website: <https://texasalliance.org/white-paper>

¹⁰⁴ Summary of Input on Oil and Gas Extraction Wastewater Management Practices Under the Clean Water Act Final Report | US EPA. (2020). Retrieved epa.gov website: <https://www.epa.gov/eg/summary-input-oil-and-gas-extraction-wastewater-management-practices-under-clean-water-act-final>

availability of disposal wells near production sites, the potential contamination of groundwater resources, induced seismic activity. and the proximity of these wells to populated areas.

In the following section, we will discuss the regulation and management of produced water to understand how and where wastewater by-products resulting from oil and gas development (throughout a 10-year period) have been disposed of in Webb County.

Section X. Regulation and Management of Produced Water in Texas

In Texas, the authority over the disposal of produced water as a by-product of oil and gas production falls under the responsibility of the Railroad Commission of Texas (RRC), as delegated (to the RRC) by the United States Environmental Protection Agency (EPA) under the federally approved Underground Injection Control (UIC) program found in the provisions of the Federal Safe Drinking Water Act (SDWA).¹⁰⁵

Federal requirements under the UIC program were designed to protect underground sources of drinking water such that the established criteria and requirements for specific well classes ensures that drinking water resources (i.e. underground aquifers) are not rendered unusable as a result of the underground injection of such fluids.¹⁰⁶

Specifically, this section concerns regulation and management for the injection of fluids into wells identified as Class II wells. Class II wells are wells that are only used to inject fluids strictly associated as by-products of oil and gas production, such as fracking.¹⁰⁷ In accordance with Texas Administrative Code § 3.9, § 3.13, and § 3.46, the RRC may grant permits for disposal well permits for UIC Class II wells that have met the requirements under the provisions of the commission's UIC program.¹⁰⁸ Such matters addressed in the statutes also include the appropriate filing of applications, instructions regarding monitoring and reporting of such wells, records maintenance, well testing, and plugging.

¹⁰⁵ 40 CFR § 144.1 (2008). Retrieved from govinfo.gov website: <https://www.govinfo.gov/app/details/CFR-2008-title40-vol22/CFR-2008-title40-vol22-sec144-1/summary>

¹⁰⁶ Class II Oil and Gas Related Injection Wells | US EPA. (2015). Retrieved from epa.gov website: <https://www.epa.gov/uic/class-ii-oil-and-gas-related-injection-wells>

¹⁰⁷ General Information About Injection Wells | US EPA. (2015). Retrieved from epa.gov website: https://www.epa.gov/uic/general-information-about-injection-wells#well_classes

¹⁰⁸ For a complete list of completion requirements, please refer to 16 Tex. Admin. Code § 3.13 (1976). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

Operators that are granted permits for UIC Class II disposal wells are required to comply with the following guidelines in accordance with the monitoring and reporting requirements found in Texas Administrative Code § 3.9¹⁰⁹ (11) (A), (B), and (C), which states:

“The operator shall monitor the injection pressure and injection rate of each disposal well on at least a monthly basis, or on a more frequent basis as required by the commission under conditions described in paragraph (3)(C) of this section.”

“The results of the monitoring shall be reported annually to the commission on the prescribed form, or on a more frequent basis as required by the commission under conditions described in paragraph (3)(C) of this section.”

“All monitoring records shall be retained by the operator for at least five years.”

Monitoring is typically reported via the filing of an annual disposal/injection well monitoring report (Form H-10), a standardized report required by the RRC for well monitoring. This accounting and record keeping will form the basis of our research, data, and analysis found in Section XI.

Lastly, according to the RRC, commercial¹¹⁰ disposal wells in Texas are inspected at least once per year. For non-commercial disposal wells, there is no “scheduled” inspection basis. Non-commercial disposal wells are typically only inspected based various factors, including disposal well locations (relative to environmentally sensitive and or public areas), and operator compliance records.¹¹¹

Section XI. Disposal Water Analysis for Webb County, Texas

Now that the regulation, management, and definition of produced water (as it pertains to produced water disposal) has been appropriately characterized, we can proceed with our disposal water analysis that has been completed to quantify the amount of produced water that has been disposed as it relates to oil and gas development in Webb County. In this section, we will explain the methodology and data used in our analysis and discuss key findings.

¹⁰⁹ 16 Tex. Admin. Code § 3.9 (11) (A)(B)(C) (1976). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

¹¹⁰ 16 Tex. Admin. Code § 3.9 (4) (1976). Retrieved from texas.gov website: [https://texreg.sos.state.tx.us/public/readtac\\$ext.viewtac](https://texreg.sos.state.tx.us/public/readtac$ext.viewtac)

¹¹¹ Injection and Disposal Wells FAQs. (2015). Retrieved rrc.texas.gov website: <https://www.rrc.texas.gov/about-us/faqs/oil-gas-faqs/injection-and-disposal-wells-faqs/>

The first part of our analysis consisted of identifying all authorized oil/gas UIC disposal wells and associated operators that have disposed of produced water at authorized disposal well sites within Webb County. The RRC regularly publishes data on authorized UIC disposal wells through the agency’s publicly available online oil and gas data query for UIC injection and disposal wells. To obtain this information, information was entered and then queried using the search criteria available for the injection and disposal well database.^{112, 113}

The second part of our analysis consisted of determining the amount of produced water disposed of into known UIC disposal wells as reported by operators. To obtain this information, data was queried using identical search criteria available for the injection and disposal well database for UIC wells. Disposal well volume data was then filtered and extracted in order to determine the amount of produced water that has been disposed of as a result of oil and gas development in Webb County. Available injection volume records were extracted for an approximate 10-year time period from January 1st, 2010 – December 31st, 2020.

Based on available UIC disposal well data, our analysis identified approximately 27 UIC disposal wells (and 17 associated operators) that have historically and/or are currently disposing of produced water from oil and gas development in Webb County:

UIC No. ¹¹⁴	API No. ¹¹⁵	Oil/Gas	Permitted Fluid	Zone	County	Field Name	Lease Name	Operator
3651	47903646	Oil	Salt Water	H-1	Webb	Aviators	Bruni	Herschap Bros.
3716	47930805	Oil	Salt Water	H-1	Webb	Bruni, SE. (Queen City)	Benavides, Rosa	Pearl, Bill H. Productions, Inc.
40148	47903306	Oil	Salt Water	H-1	Webb	Aviators	Murc-Kennedy	Herschap Bros.
40883	47930779	Oil	Salt Water	H-1	Webb	Jasper-Webb (Yegua 3500)	Benavides, Rosa	Magnum Engineering Company
63973	47902394	Oil	Salt Water	H-1	Webb	Killam	Garcia, F.G.	Outline Oil Company, LLC
66558	47904705	Oil	Salt Water	H-1	Webb	Mirando City	Wheatley	Herschap Bros.
88903	47901206	Oil	Salt Water	H-1	Webb	De Spain, SE. (Bruni)	Frost Mineral Fee	Herschap Bros.
91779	47936859	Gas	Salt Water	H-1	Webb	Aviators	Aviator "B"	Herschap Bros.
95261	47937460	Gas	Salt Water	H-1	Webb	Gold River, North (Olmos)	Palafox Exploration Co. - 15-	Fasken Oil and Ranch, Ltd.
97004	47938954	Gas	Salt Water	H-1	Webb	Hughes (5200)	Garcia 608	Killam Oil Co., Ltd.

¹¹² Railroad Commission Online System. Underground Injection Control Query. (2021). Accessed from rrc.texas.gov website: <http://webapps2.rrc.state.tx.us/EWA/uicQueryAction.do>

¹¹³ Please refer to Table 13 for search criteria

¹¹⁴ Numeric identifier assigned to wells under the federal UIC program

¹¹⁵ An API no. is a unique, permanent, numeric identifier assigned to oil and gas wells in the United States

101158	47940664	Oil	Salt Water	H-1	Webb	Oilton (Bruni)	Vaquillas	Hilcorp Energy Company
109545	47937181	Gas	Salt Water	H-1	Webb	Gold River, North (Olmos)	Palafox Exploration Co. - 20B-	Fasken Oil and Ranch, Ltd.
112526	47940021	Oil	Salt Water	H-1	Webb	Presa de Oro (Yegua -B-)	Killam, O.W.	Killam Oil Co., Ltd.
116057	47937230	Gas	Salt Water	H-1	Webb	Gold River, North (Olmos)	Palafox Exploration Co. - 20A-	Fasken Oil and Ranch, Ltd.
39427	47930619	Gas	Salt Water	W-14	Webb	Malo Sueno (3500)	Perez, Amado	Wallis Energy, Inc.
58291	47932938	Gas	Salt Water	W-14	Webb	Vaquillas Ranch-A1	Vaquillas Ranch-A1	Hilcorp Energy Company
72668	47934721	Gas	Salt Water	W-14	Webb	Becerro Creek (7000 Wilcox)	South Callaghan Ranch	White Oak Operating Company, LLC
72885	47931354	Oil	Salt Water	W-14	Webb	Malo Sueno (3500)	Perez, Amado	Tristar Oil & Gas
77784	47932594	Gas	Salt Water	W-14	Webb	Vaquillas Ranch (Lobo)	Vaquillas 136	Columbus Energy, LLC
77845	47933065	Oil	Salt Water	W-14	Webb	Mirando City	Guerra, F.	Herschap Bros.
78333	47935469	Oil	Salt Water	W-14	Webb	David, S. (2600)	Puig	El Gato SWD, Inc.
79232	47930612	Gas	Salt Water	W-14	Webb	Mancho Prado (Wilcox, LO. 7050)	Webb County School Land	Key Energy Services, LLC
83109	47934741	Gas	Salt Water	W-14	Webb	McKendrick (Lobo 7100)	McKendrick, W.H.	TX Energy Services, LLC
87516	47936854	Gas	Salt Water	W-14	Webb	Agua Roja (Lobo)	E.G. Ranch, Ltd.	AMDSJ2, LLC
95343	47934030	Gas	Salt Water	W-14	Webb	Vaquillas Ranch (Lobo Cons.)	Lundell	TX Energy Services, LLC
96160	47939503	Oil	Salt Water	W-14	Webb	Oilton (Bruni)	Botello-Killam	Kasper Disposal, LLC
105415	47941955	Gas	Salt Water	W-14	Webb	Encinal-Webb (Escondito)	Lewis-Janco Ranch	Lewis Petro Properties, Inc.

Table 13. Comprehensive list of all UIC disposal wells (in productive and non-productive zones) and their operators in Webb County; information based on annual H-10 operator filing reports from 2010 – 2020

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

Out of approximately 27 UIC disposal wells identified in our analysis, injection volume records were only available for approximately 7 wells. The following tables break down those UIC disposal wells identified in our analysis and lists the availability of records based on annual H-10 filing reports (as reported to the RRC) by operators. Injection volume data is presented only for

those authorized UIC disposal wells in which records were available.^{116, 117} Our analysis has revealed that in a 10-year period from January 1st, 2010 – December 31st, 2020, seven oil and gas operators disposed of over 42.7 million barrels (BBL), or 1.79 billion gallons (GAL) of produced water¹¹⁸ from authorized UIC disposal wells from oil and gas development in Webb County.

UIC No.	API No. ¹¹⁹	Records Available ¹²⁰	Operator
3651	47903646	No records found	Herschap Bros.
3716	47930805	No records found	Pearl, Bill H. Productions, Inc.
40148	47903306	No records found	Herschap Bros.
40883	47930779	No records found	Magnum Engineering Company
63973	47902394	No records found	Outline Oil Company, LLC
66558	47904705	No records found	Herschap Bros.
88903	47901206	No records found	Herschap Bros.
91779	47936859	No records found	Herschap Bros.
95261	47937460	No records found	Fasken Oil and Ranch, Ltd.
97004	47938954	No records found	Killam Oil Co., Ltd.
101158	47940664	No records found	Hilcorp Energy Company
109545	47937181	No records found	Fasken Oil and Ranch, Ltd.
112526	47940021	No records found	Killam Oil Co., Ltd.
116057	47937230	No records found	Fasken Oil and Ranch, Ltd.
39427	47930619	No records found	Wallis Energy, Inc.
58291	47932938	No records found	Hilcorp Energy Company
72668	47934721	No records found	White Oak Operating Company, LLC
72885	47931354	No records found	Tristar Oil & Gas
77784	47932594	No records found	Columbus Energy, LLC
77845	47933065	No records found	Herschap Bros.
78333	47935469	Yes	El Gato SWD, Inc.
79232	47930612	Yes	Key Energy Services, LLC
83109	47934741	Yes	TX Energy Services, LLC
87516	47936854	Yes	AMDSJ2, LLC
95343	47934030	Yes	TX Energy Services, LLC
96160	47939503	Yes	Kasper Disposal, LLC
105415	47941955	Yes	Lewis Petro Properties, Inc.

Table 14. List of available injection volume records for identified UIC disposal wells in Webb County; information based on annual H-10 operator filing reports from 2010 – 2020

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

¹¹⁶ Under RRC rules and regulations, operators that did not report injection volumes (for UIC wells) during an H-10 cycle are considered inactive wells

¹¹⁷ All injection volume data reported in Barrels (BBL); 1 Barrel (BBL) is equal to 42 US Gallons (GAL)

¹¹⁸ Please refer to Table 23

¹¹⁹ An API no. is a unique, permanent, numeric identifier assigned to each well drilled for oil and gas in the United States

¹²⁰ Unavailability of records indicates operator did not report injection volumes during the H-10 cycle

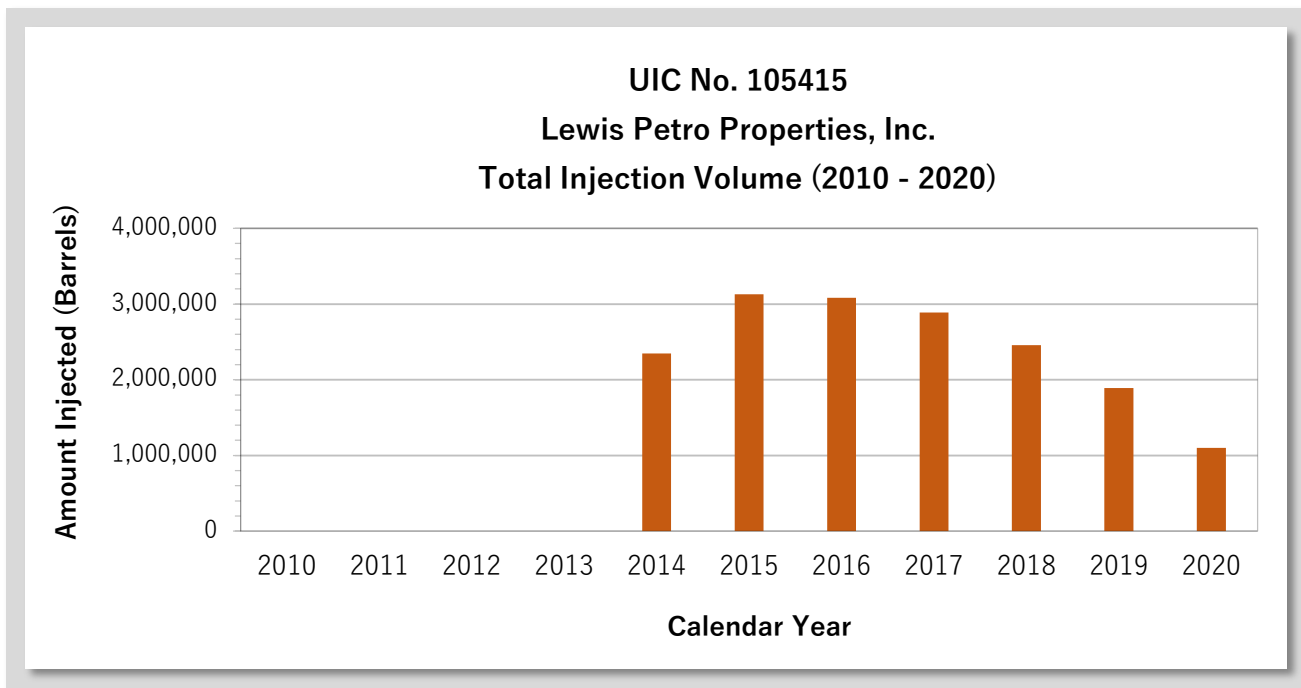


Table 15. Total amount injected by Lewis Petro Properties, Inc. for UIC No. 105415¹²¹;
reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

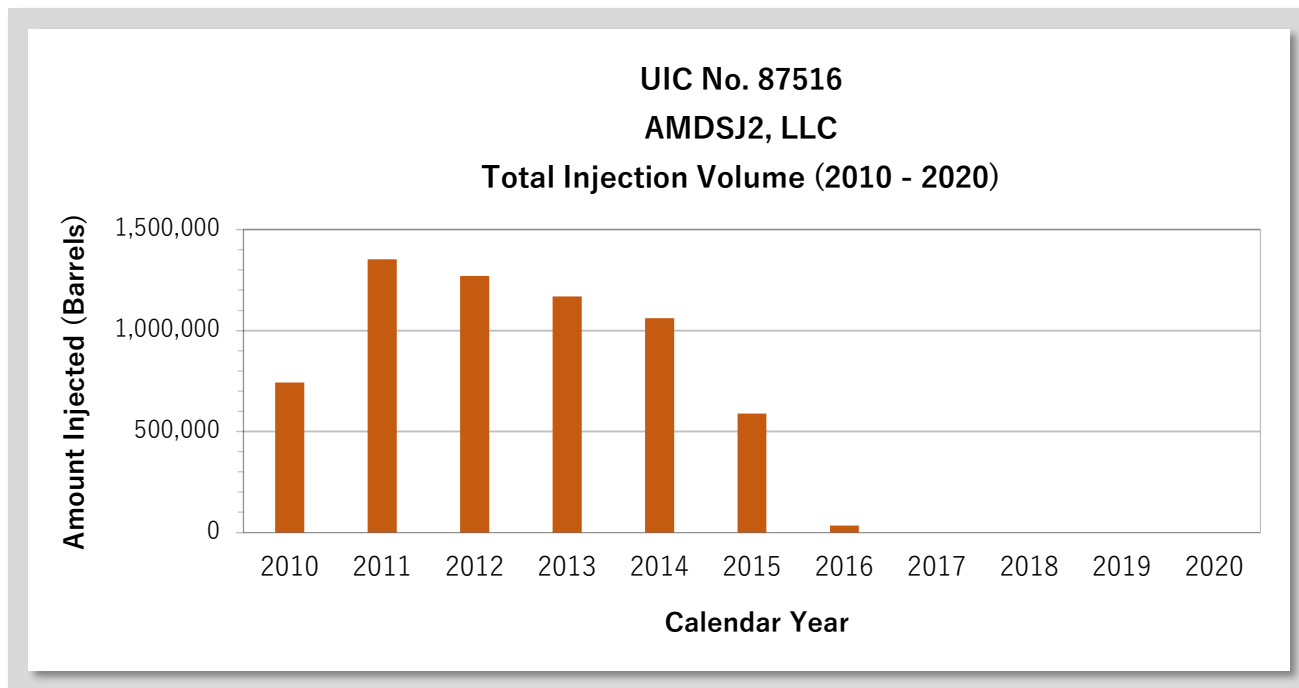


Table 16. Total amount injected by AMDSJ2, LLC for UIC No. 87516¹²²;
reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

¹²¹ Missing data indicates operator did not report injection volumes during the H-10 cycle

¹²² Missing data indicates operator did not report injection volumes during the H-10 cycle

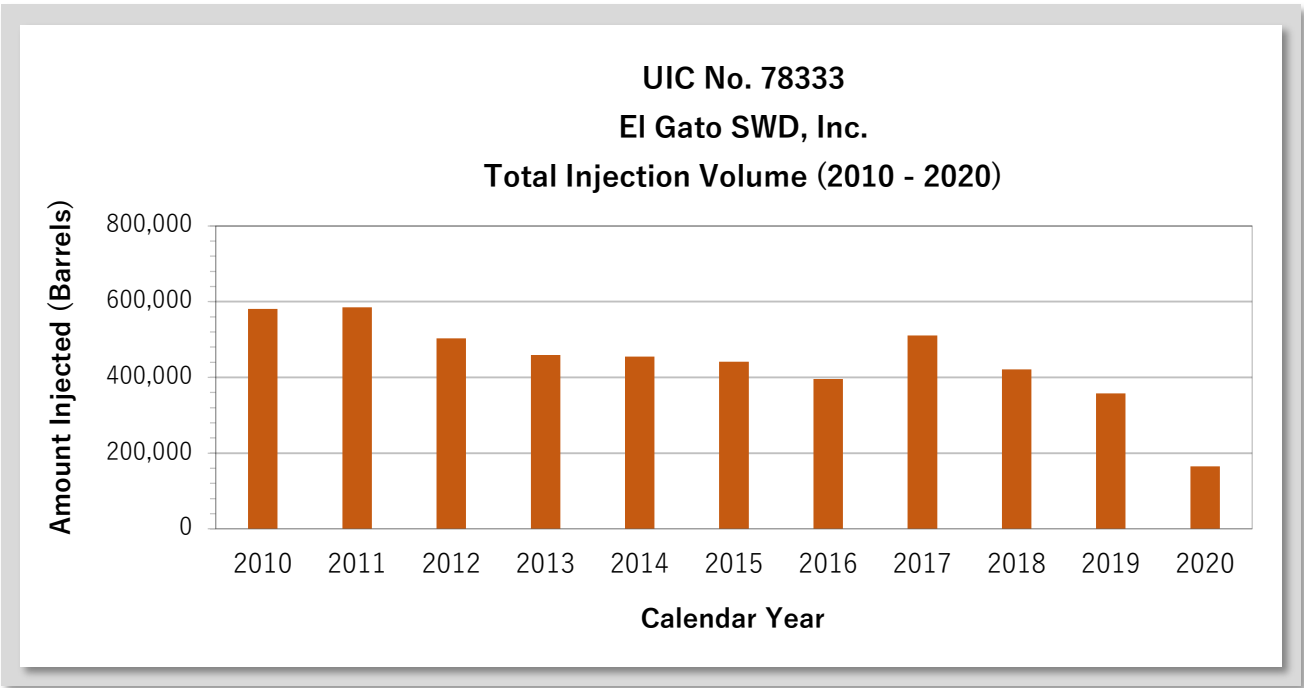


Table 17. Total amount injected by El Gato SWD, Inc. for UIC No. 78333;
reporting period from January 1st, 2010 – December 31st, 2020
Data provided by the Railroad Commission of Texas (RRC); table by RGISC

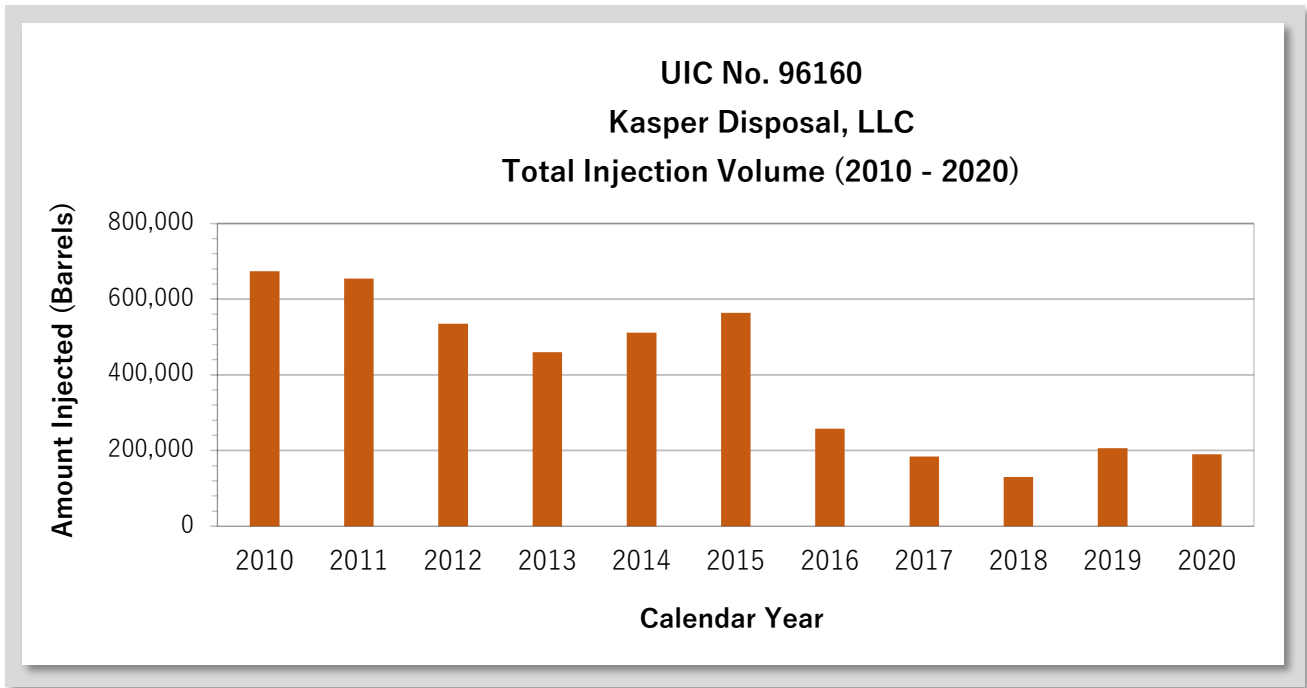


Table 18. Total amount injected by Kasper Disposal, Inc. for UIC No. 96160;
reporting period from January 1st, 2010 – December 31st, 2020
Data provided by the Railroad Commission of Texas (RRC); table by RGISC

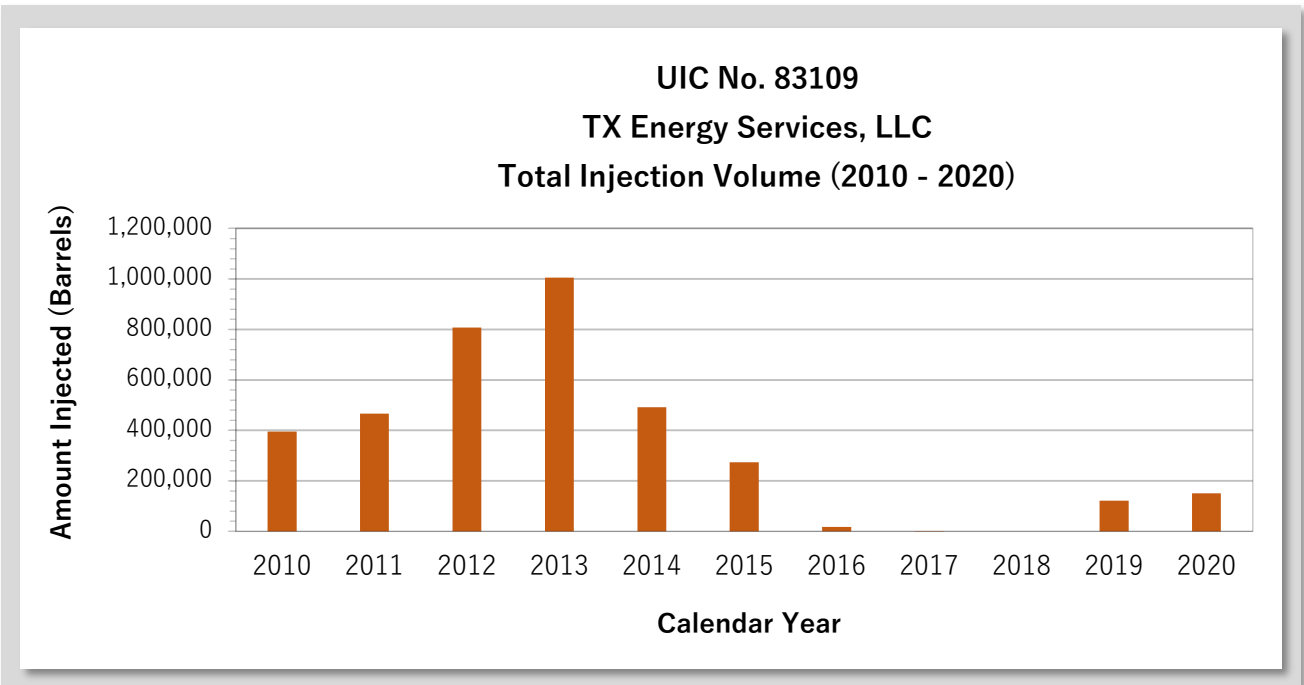


Table 19. Total amount injected by TX Energy Services, LLC for UIC No. 83109¹²³; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

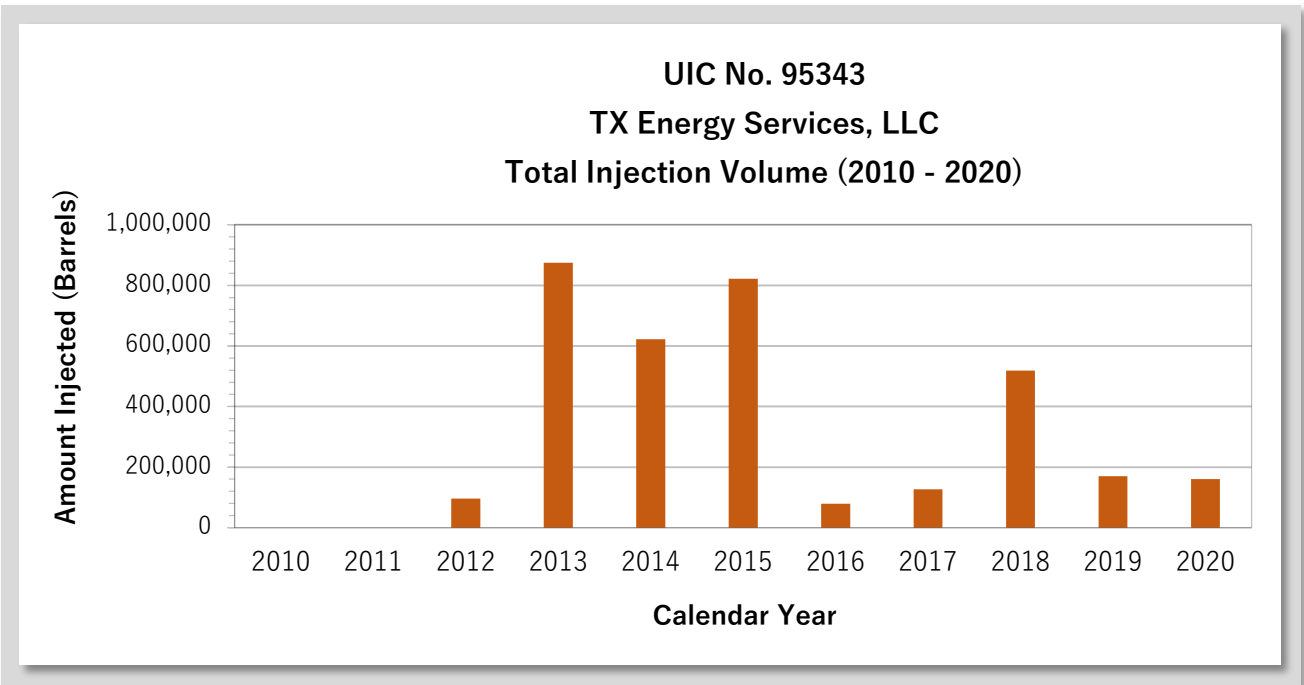


Table 20. Total amount injected by TX Energy Services, LLC for UIC No. 95343¹²⁴; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

¹²³ Missing data indicates operator did not report injection volumes during the H-10 cycle

¹²⁴ Missing data indicates operator did not report injection volumes during the H-10 cycle

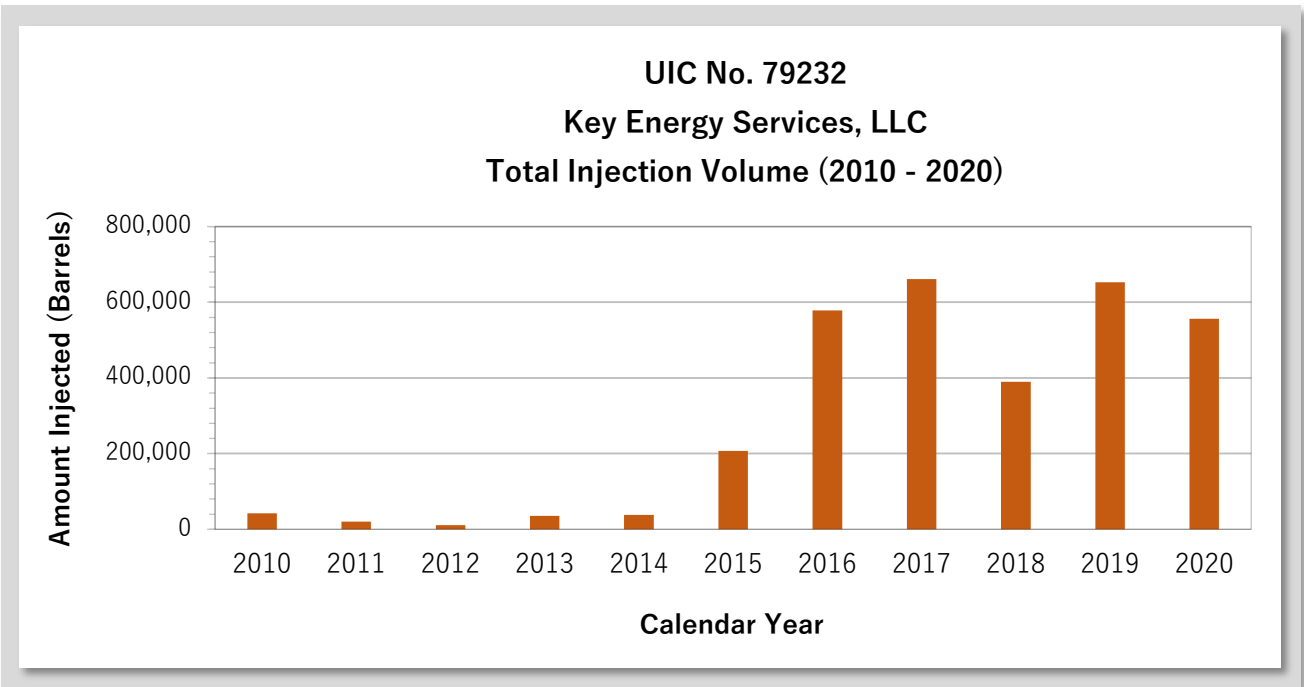


Table 21. Total amount injected by Key Energy Services, LLC for UIC No. 79232; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

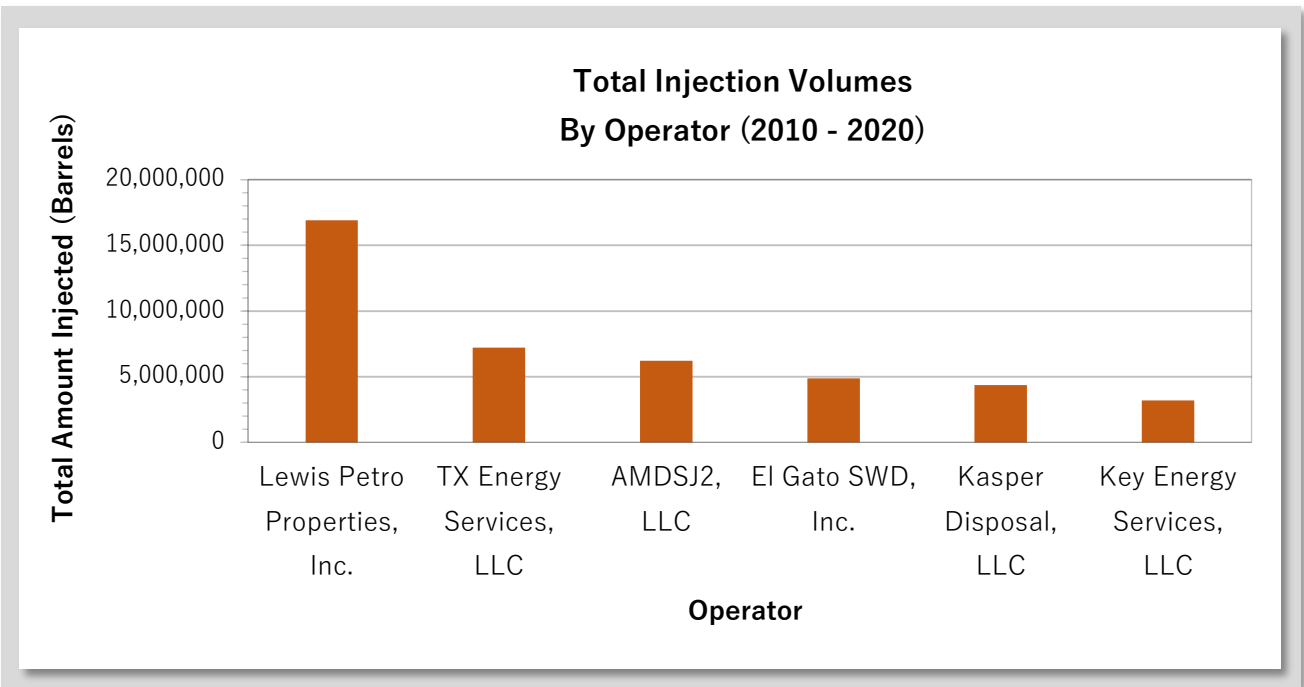


Table 22. Total amounts of injection volumes by operator; reporting period from January 1st, 2010 – December 31st, 2020

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

UIC No.	Permitted Fluid	Operator Name	Amount Injected (BBL)	Amount Injected (GAL) ¹²⁵
105415	Salt Water	Lewis Petro Properties, Inc.	16,897,201	709,682,442
87516	Salt Water	AMDSJ2, LLC	6,219,584	261,222,528
78333	Salt Water	El Gato SWD, Inc.	4,874,964	204,748,488
96160	Salt Water	Kasper Disposal, LLC	4,365,771	183,362,382
83109	Salt Water	TX Energy Services, LLC	3,732,218	156,753,156
95343	Salt Water	TX Energy Services, LLC	3,470,300	145,752,600
79232	Salt Water	Key Energy Services, LLC	3,193,480	137,319,640

Table 23. Comprehensive list of injection volume data by several categories, including amount injected in Barrels (BBL) and Gallons (GAL).

Data provided by the Railroad Commission of Texas (RRC); table by RGISC

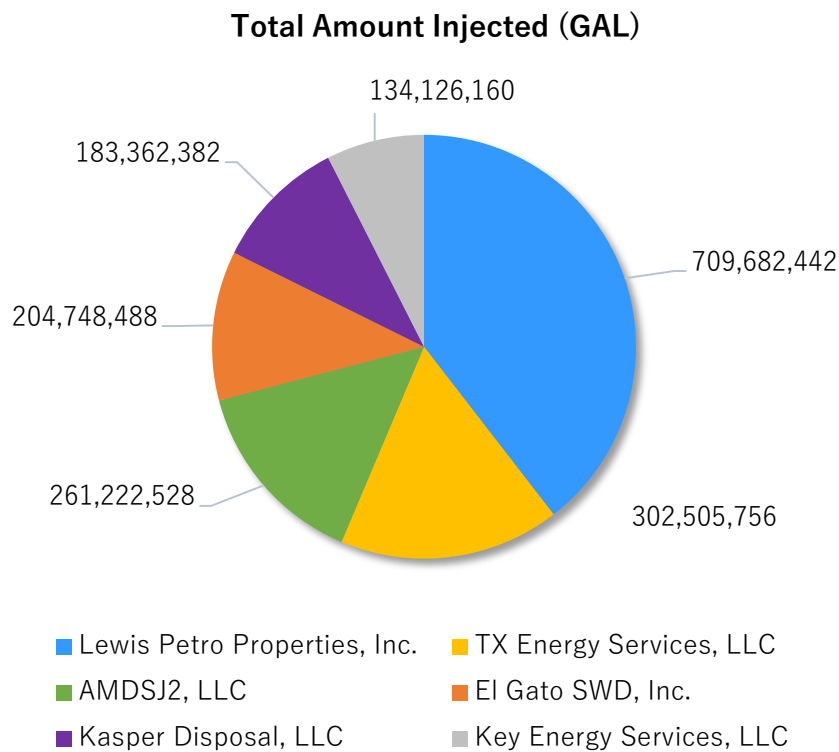


Figure 11. Total amounts of produced water injected (gallons) by operators into authorized UIC disposal wells in Webb County from 2010-2020

Data provided by the Railroad Commission of Texas (RRC); figure by RGISC

¹²⁵ Conversion factor: multiply the volume value (BBL) by 42

In recent years, the amount of produced water being disposed of as a result of fracking in Texas has risen from 46 million barrels (BBL) of wastewater disposed of in 2005, to over 5.3 billion barrels (BBL) of wastewater disposed of in 2017.^{126, 127} Each barrel of produced water that cannot be re-used typically requires an additional barrel of freshwater as a replacement.

The production, transportation, storage, reuse, and disposal of produced water involves high environmental risks. Due to its high saline content and other hazardous constituents, produced water that is exposed to native soils, nearby water bodies, native wildlife, and surrounding ecosystems (via spills, leaks, or residual accumulation) can have devastating environmental impacts. The environmental challenges of this handling this hazardous waste requires the minimization and proper remediation of spills, leaks, residual accumulation, and exercising proper waste management strategies to protect environmentally sensitive areas.

Section XII. Disposal Well Locations in Webb County, Texas

To identify the geographic locations of authorized UIC disposal wells sites in Webb County, a spatial analysis was completed using geographic information system (GIS) software and correlated with the data and information obtained for authorized UIC disposal wells sites as described in Section X. GIS data used in this spatial analysis was publicly obtained using the RRC's Public GIS Viewer and the RRC's online oil and gas data query for UIC injection and disposal wells, including GPS coordinates and lease locations.^{128, 129}

¹²⁶ Veil, J. (2017). U.S. Produced Water Volumes and Management Practices in 2017. Ground Water Research and Education Foundation. Retrieved from: https://www.gwpc.org/sites/gwpc/uploads/documents/publications/pw_report_2017___final.pdf

¹²⁷ Galbraith, K., & Henry, T. (2013). As Fracking Proliferates in Texas, So Do Disposal Wells. Retrieved from Texas Tribune website: <https://www.texastribune.org/2013/03/29/disposal-wells-fracking-waste-stir-water-concerns/>

¹²⁸ RRC Public GIS Viewer (Map). (2021). Retrieved from rrc.texas.gov website: <https://www.rrc.texas.gov/resource-center/research/gis-viewer/>

¹²⁹ Railroad Commission Online System. Underground Injection Control Query. (2021). Accessed from rrc.texas.gov website: <http://webapps2.rrc.state.tx.us/EWA/uicQueryAction.do>

Our spatial analysis revealed that many of these authorized UIC disposal well sites were found within close proximity to populated areas, specifically near colonias, primarily in southeastern Webb County. Colonias are un-incorporated communities, typically found along the Texas-Mexico border. These low-income communities are often developed from substandard housing where residents often lack basic services and utilities such as potable drinking water, adequate forms of wastewater treatment, and paved roads.¹³⁰

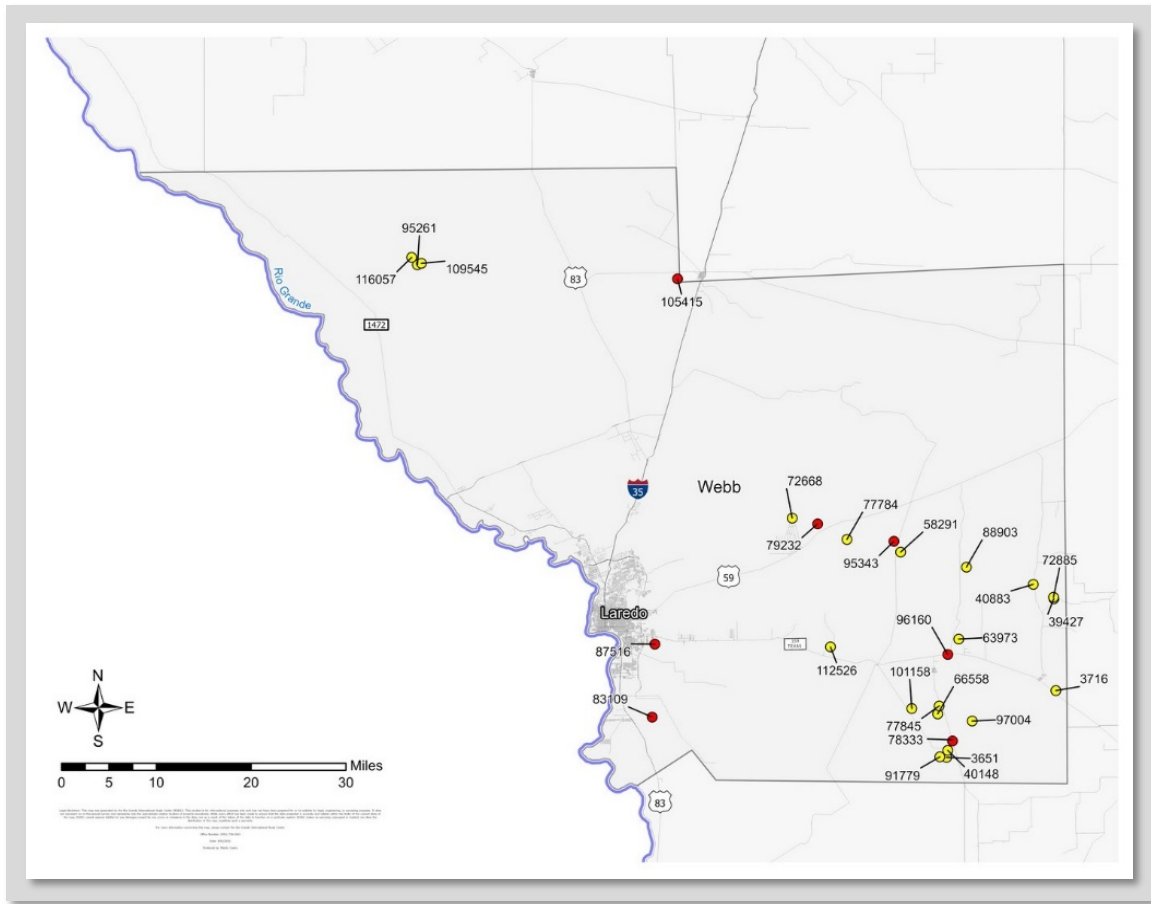


Figure 12. Authorized disposal well sites in Webb County; active sites (red) and inactive sites (yellow); sites identified according to UIC No.¹³¹

Data provided by the Railroad Commission of Texas (RRC); map by RGISC

¹³⁰ Colonias | Office of the Attorney General. (2019). Retrieved from [texasattorneygeneral.gov](https://www.texasattorneygeneral.gov/divisions/colonias) website: <https://www.texasattorneygeneral.gov/divisions/colonias>

¹³¹ Please refer to Table 13 for more information

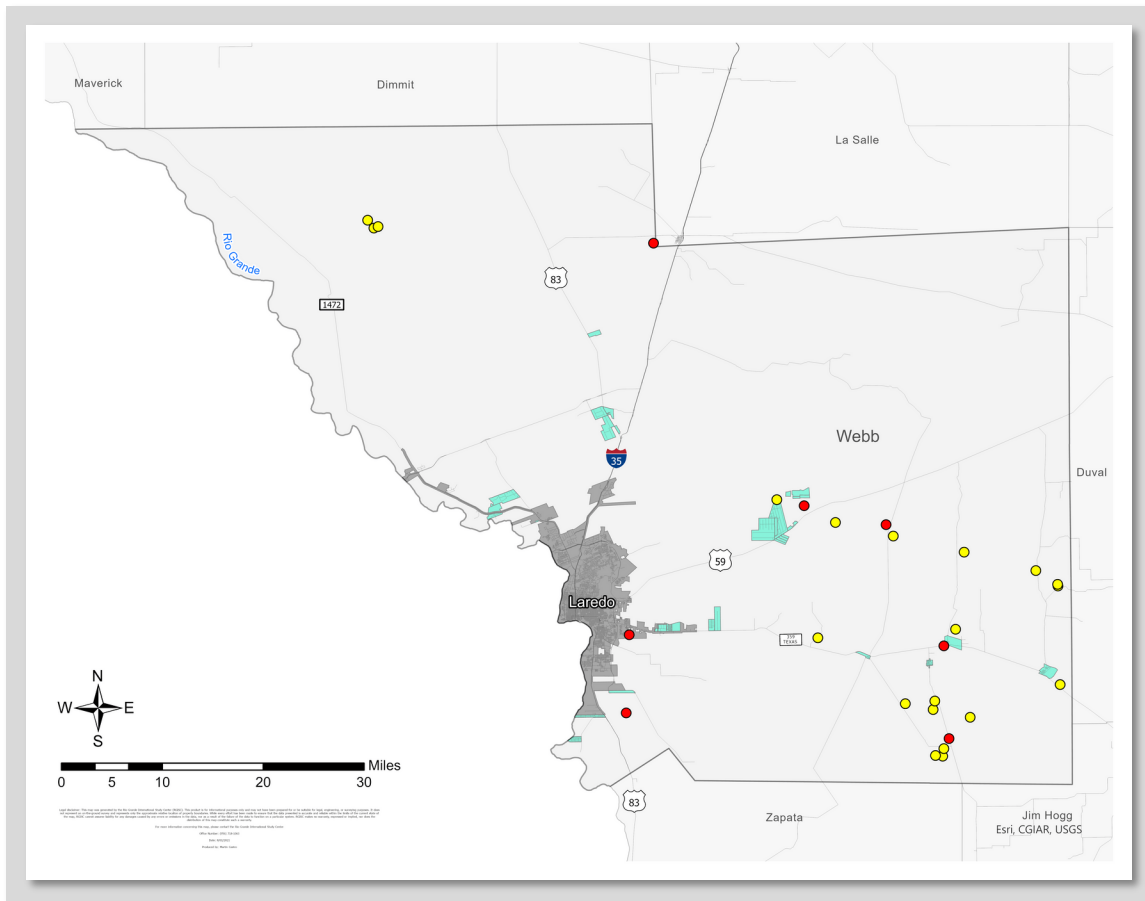


Figure 13. Authorized disposal well sites in proximity to colonias (teal) in Webb County; City of Laredo highlighted in grey

Data provided by the Railroad Commission of Texas (RRC) and Texas Office of the Attorney General; map by RGISC

Section XIII. Discussion and Recommendations

As the region continues to face significant water resource problems, regional water planning groups predict that over the next 50 years, several water user groups will face supply deficits.¹³² As a result of such shortages and constraints, competition between specific water user groups is expected to intensify.

In other Texas shale plays, such as the Barnett Shale Play in North Texas, frequent droughts have found to not be significant parallel drivers for fracking in comparison to other drivers, such as economic activities and gas prices.¹³³ As such, when water supplies and resources become restricted, oil and gas operators will turn to alternative sources to supply demand. In areas of

¹³² 2021 Rio Grande Regional Water Plan, Region M (2020) Rio Grande Regional Water Planning Group

¹³³ Cook, Margaret, and Michael Webber. (2016). Food, Fracking, and Freshwater: The Potential for Markets and Cross-Sectoral Investments to Enable Water Conservation. *Water* 8, no. 2: 45. <https://doi.org/10.3390/w8020045>

Texas where water supplies have not yet been fully allocated, operators may apply for new water rights permits from the TCEQ provided suitable availability of water supplies.

However, because water rights purchases and leases in the Middle and Lower Rio Grande involve water rights that have already been fully allocated, operators have no choice but to purchase or lease previously allocated water rights from water right holders in other water use sectors rather than acquiring new permits to access it; such activity has already been observed in the Eagle Ford Shale, particularly concerning water rights purchases and leases for mining use in Webb County.

Furthermore, in the midst of such water shortages and possible water curtailments from political or regulatory entities, lack of available access to freshwater resources required by operations may not fully impede operators from continued oil and gas development. Such water rights purchases or leases by oil and gas operators in historically water scarce regions like the Eagle-Ford Shale could potentially obstruct access to water right holders in other water use sectors like municipal and irrigation use. Consequently, water rights purchases and leases by operators intending to stockpile water supplies for practices such as fracking will play important roles in the future market availability for water use in water pressured areas like South Texas.

Historically speaking, the rising concerns of water availability and supply for oil and gas development practices like fracking saw some cities in Texas restrict or fully ban the practice of fracking. In 2014, the citizens of Denton, Texas, a city in the Barnett Shale in North Texas, voted to ban fracking within city limits. This ban was partially triggered by worries of adequate water supply and groundwater contamination. However, this ban was short lived. Shortly after the ban was enacted, the state of Texas passed legislation that prohibited local cities from regulating or banning a wide variety of drilling-related activities, including fracking and gave the state exclusive control over the regulation of oil and gas development; House Bill 40 was subsequently passed due to immense pressure from energy lobbyists and lawmakers.¹³⁴

In the 2021 Regional Water Plan Report for Region M by the Rio Grande Regional Water Planning Group, the municipal water demand for the City of Laredo is expected to increase by 63% by 2070. However, by 2040, the City of Laredo is expected to exhaust the available supply of municipal water from the Rio Grande that is allocated to the city per year. This is primarily due to a projected population increase for the City of Laredo from 301,124 people in 2020, to over

¹³⁴ Malewitz, J. (2015, May 18). Abbott Signs "Denton Fracking Bill." Retrieved from Texas Tribune website: <https://www.texastribune.org/2015/05/18/abbott-signs-denton-fracking-bill/>

440,247 people by 2040, which represents a 46.2% increase in less than 20 years. In other words, this implies that the Rio Grande's supply of water for municipal use (for the City of Laredo) will only be sustainable for only 19 more years, until around 2040. At this point, municipal demand(s) for surface water from the Rio Grande (estimated at 58,812 Acre-Feet/Year for 2040) will reach or eclipse the city's current available supply of 61,825 Acre-Feet/Year.¹³⁵

While the City of Laredo has begun studying options for new sources of freshwater, as part of its 50-year Water & Wastewater Master Plan, the issue still remains: the Rio Grande will not sustain an adequate future water supply for municipal, domestic, industrial, agricultural, and mining needs, and any reductions of the river's water supply, when coupled with recurring droughts, will have disastrous consequences for Webb County and South Texas.

As an environmental advocacy leader for Laredo, surrounding communities, and for the purposes of transparency, public understanding, independent analysis, and to address the often unseen costs of oil and gas development, RGISC makes the following recommendations based on the critical findings of this report:

1. Urge the TCEQ to publish and make self-reported water usage data for all users in the Rio Grande Basin publicly available as it already does for non-Watermaster areas of the state
2. Urge the TCEQ and state legislators to change the rules regarding the reporting of mining water usage for the appropriate sub-usage as defined in the Texas Administrative Code to clearly indicate the specific water usage for oil and gas development
3. Urge the RRC to investigate the lack of available injection volume records from operators for the approximately 20 disposal wells in Webb County identified in our analysis
4. Urge to the RRC to investigate and confirm the activity (or inactivity) of those approximately 20 disposal wells identified in our analysis
5. Urge for the creation of a new groundwater conservation district (GCD) for Webb County to provide for the monitoring, conservation, preservation, protection, recharging, and the prevention of groundwater contamination for groundwater resources

¹³⁵ 2021 Rio Grande Regional Water Plan, Region M (2020) Rio Grande Regional Water Planning Group

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