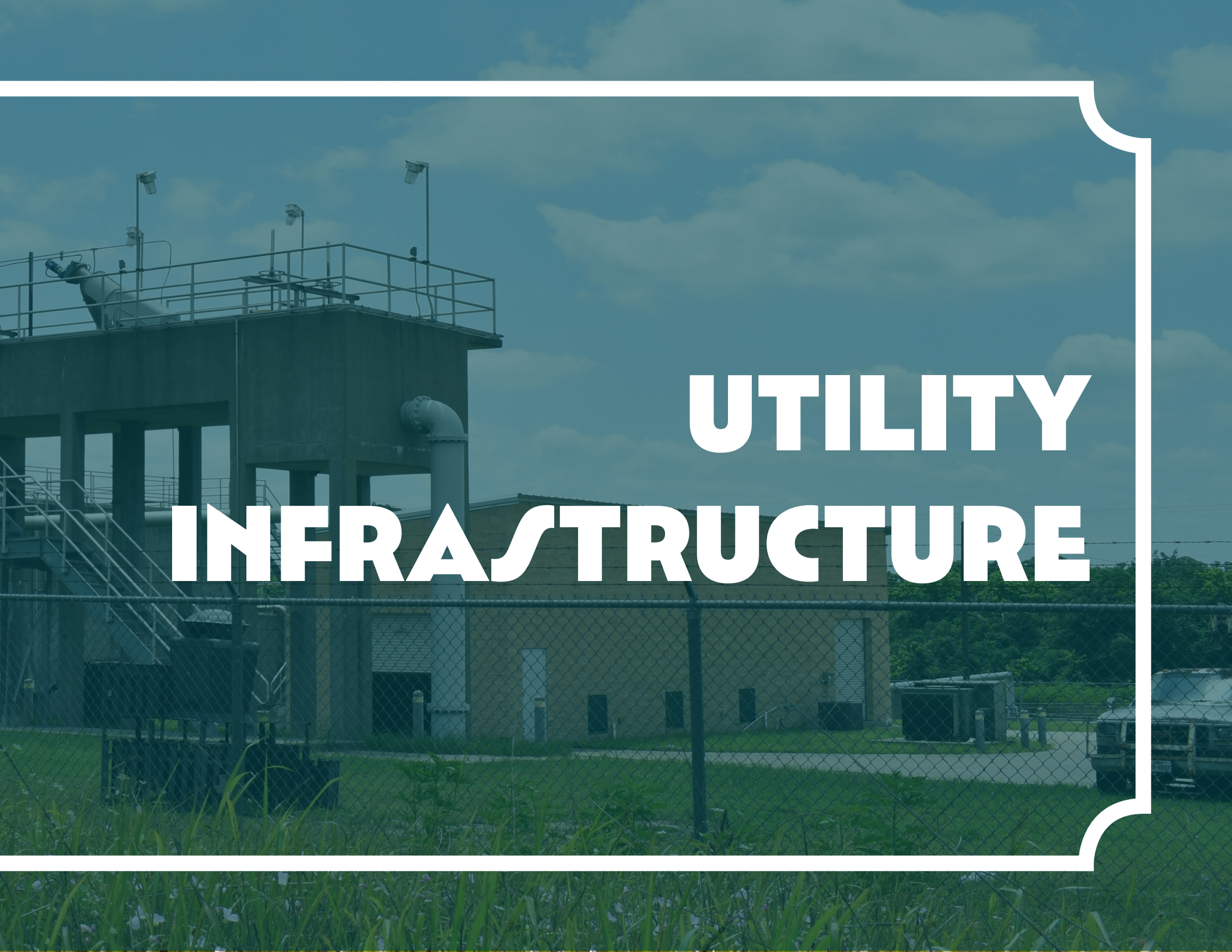






UTILITY INFRASTRUCTURE

Introduction

The Infrastructure and Utilities chapter of the Comprehensive Plan for the City of Rockdale serves as a document guiding the development, maintenance, and enhancement of essential systems that underpin Rockdale's functionality and vitality. This chapter delineates strategies, policies, and initiatives aimed at ensuring the efficient provision of infrastructure services and utilities to meet the present and future demands of residents, businesses, and visitors. Infrastructure encompasses a broad spectrum of physical assets and facilities that facilitate economic activity, public health, safety, and overall quality of life. These encompass water supply and wastewater systems, and public facilities like community centers and emergency services.

As the City of Rockdale undergoes continued growth and transformation, strategic planning and investment in resilient, sustainable, and equitable infrastructure and utilities are imperative. This chapter addresses critical issues including infrastructure maintenance and modernization, expansion to accommodate growth, environmental sustainability, and ensuring equitable access to services across all neighborhoods and demographic groups.

Through collaborative efforts with stakeholders, thorough analysis of data and trends, and incorporation of best practices, this chapter outlines a visionary approach to the future of Rockdale's infrastructure and utilities. By implementing the strategies laid out herein, Rockdale can ensure that our community remains dynamic, competitive, and inclusive, with infrastructure and utilities that adequately serve the needs of all residents both now and in the years ahead.



WHAT WE'VE HEARD: Utilities and Infrastructure

"Plan conservatively and protect infrastructure with managed growth."
- Community Member

"Water Quality and reliability."
- Community Member

"Execute on water infrastructure improvements."
- Community Member

"The water system and internet systems need major upgrades."
- Community Member

"Availability of safe drinking water at a reasonable price."
- Community Member

KEY TAKEAWAYS

- Infrastructure condition was the #2 response when asked what the City of Rockdale should prioritize improving.
- Water quality is a major topic and top of mind for Rockdale residents and they are anxious to see the water line projects completed.
- Utility infrastructure will need to keep ahead of future growth, both in terms of proactive maintenance and upgrades of existing facilities as well as new service extensions.
- Internet service will be an important aspect of Rockdale's ability to keep up with future opportunities.

Approach to Infrastructure & Facilities Planning

There are some unifying themes across all infrastructure systems that create an overall approach to tackling the provision of infrastructure in Rockdale.

Multipurpose Facilities

Infrastructure and facilities can serve to support or meet multiple needs through careful coordination. Infrastructure alignments and easements can serve multiple forms of infrastructure as well as provide amenities that enhance quality of life for residents. If such plans are coordinated well, multipurpose facilities can help Rockdale efficiently make progress on a variety of goals as well as demonstrate fiscal prudence to residents. Some examples are:

- Sewer interceptors generally follow the lowest points in a watershed. These areas tend to be floodplain areas that benefit from greenspace preservation and drainage easements, and also align with key trail corridors or routes. When acquiring easements or fee-simple ownership, Rockdale can seek to address all needs simultaneously.
- Some infrastructure types may change character substantially based on long-range needs. For example, a 20-foot easement may be sufficient for an initial sewer line, but that alignment may eventually call for a much larger sewer interceptor that requires a larger easement. Rockdale should acquire easements for the ultimate infrastructure need, not just the present need, as well as

size easements to serve multiple purposes.

- Parkland dedications should include underlying permissions to accommodate utility infrastructure, especially along alignments consistent with water and sewer infrastructure.
- Facilities, like school sites, can play important roles as trail heads and their placement adjacent to parks can allow for shared benefits, such as parks that can serve both the school and the community.

Utility Planning Best Practices

Future updates to utility plans should include a risk-based assessment of all water pipelines, sewer mains, lift stations, pump stations, wells, and storage tanks to assist in the prioritization of recommended operations and maintenance improvements. The assessment should consider the condition and criticality of existing water and sewer system infrastructure, using a scoring system to provide an analytical and quantitative method to evaluate the condition and criticality of each facility, leading to a rehabilitation capital improvements plan for each system.

Because development demands are ever evolving and changing, Rockdale should develop and continually update the water and sewer system models, evaluate the CIP annually to see if critical infrastructure needs require a shift in the schedule, and engage modeling as early



Dual-purpose facilities can be utilized by combining utility and infrastructure easements or drainage channels with trails and open space. This can enhance the quality of life for residents by creating more green spaces and trail connections within the City.

as possible in the development review and feasibility process. For example, timing and commitments to capacity can be addressed in early Development Agreements to support appropriate infrastructure investments.

With growth accelerating, timing for planning and design of facilities should exceed the Texas Commission on Environmental Quality (TCEQ) minimums to avoid compliance issues, improve overall system performance and lower risk. For example, the "75/90 rule" for planning and construction of wastewater treatment plant capacity may not be sufficient, given timelines to achieve necessary permits and the potential future rates of growth in Central Texas.

This same philosophy applies to drainage, as Rockdale has the opportunity to be proactive, where so many other cities have been reactive and ultimately been forced to undertake expensive stormwater retrofits. Rockdale has the opportunity now to avoid that future for itself.

In a related manner, the design, timing and placement of developments can drastically affect short- and long-term operations and maintenance, as well as capital investment. Rockdale has an opportunity to advocate for compact, interconnected development patterns that foster efficiency and high fiscal performance in terms of both tax revenue per acre and number of connections per linear foot of infrastructure. More connections per linear foot results in more utility fees collected without having to add more infrastructure, and ultimately can help lower overall utility rates.



The “One Water” Approach

The idea of an integrated systems approach to water is not new. Its full-scale implementation, however, has yet to be realized. All around the country, and particularly within areas that frequently encounter drought and flood risks, there are increasing examples of integrated and inclusive approaches to water resource management that touch multiple infrastructure systems. These approaches exemplify the view that all water has value and should be managed in a sustainable, inclusive, integrated way. From nature to tap, from farms to food, from toilet back to river, there is just one water cycle. While nature provides water, it takes pipes, pumps, reservoirs, treatment plants, and people working around the clock to deliver clean water to homes and businesses, and to remove and treat wastewater so it can safely be reused or returned to the environment. Public facilities and utilities serve as opportunities to demonstrate design that recognizes One Water in a similar way that a private development project might, as well as providing the opportunity for community education.

Central Texas is an area that experiences significant extremes when it comes to water. Recurringly, cities and service providers must grapple with both how communities will be provided water in the peak of drought season and what to do with too much water in the peak of rainy season. The One Water way of thinking can help communities address and mitigate these concerns.

A One Water approach can take many different forms, but has some unifying characteristics as shown in Figure 46.

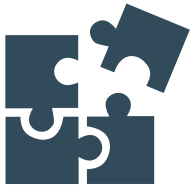
Figure 46. Elements of a One Water Approach





Watershed-scale Thinking and Action

Water does not respect geo-political boundaries. It is within the context of a natural watershed that communities have either too much water, too little water or poor quality water. Watershed-level management brings together regional partners for collaborative action and greater impacts.



Right-sized solutions

The scale of interventions should be proportional to achieving the desired outcome. For example, water quality can be addressed at a hyperlocal scale based on particular issues, but the root of the problem may require watershed-wide action.



Partnerships are Essential for Progress

All sectors are part of the solution, not just public entities and utility providers. No single stakeholder has the control, responsibility, expertise, political support or legal authority to manage issues like pollution, climate impacts or water consumption rates.



Inclusion and Engagement of All

When all people have a voice in ensuring a water-secure future, best results are achieved. Low-income people and communities of color are often disproportionately impacted by environmental justice and equity issues, including clean, safe, and reliable water.

Water and Wastewater Systems

Existing Systems - Water

The City of Rockdale owns and operates both water distribution and wastewater collection systems providing service to approximately 2,200 customers. The systems consist of a network of underground pipelines and above grade facilities including groundwater wells, elevated storage tanks, pump and lift stations, and treatment plants. The extensive infrastructure detailed below is required to provide water and wastewater service to City of Rockdale customers.

The existing water distribution system is shown in Map 18. The distribution system consists of two pressure planes, the High-Pressure Plane and the Low-Pressure Plane. The Low-Pressure Plane is shown in Figure 47 and includes three groundwater wells and the Mills Street Water Treatment Plant, which includes treatment facilities, a pump station, a ground storage tank, and an elevated storage tank. The High-Pressure Plane is shown on Figure 48 and includes two groundwater wells, the Texas Street treatment facilities, pump station, and ground storage tank, and the Allday Elevated Storage Tank. An accounting of the water distribution system pipelines and facilities are shown in the tables of Figures 49 and 50, respectively. In all, the City maintains approximately 320,000 linear feet (60 miles) of distribution pipeline, with 1.54 million gallons (MG) of storage and nearly 8,000 gallons per minute (gpm) of total pumping capacity. The total groundwater well production capacity is approximately 2,500 gpm. The total water treatment plant capacity is just over 5 million gallons per day (MGD).



Rockdale Water Treatment Facility

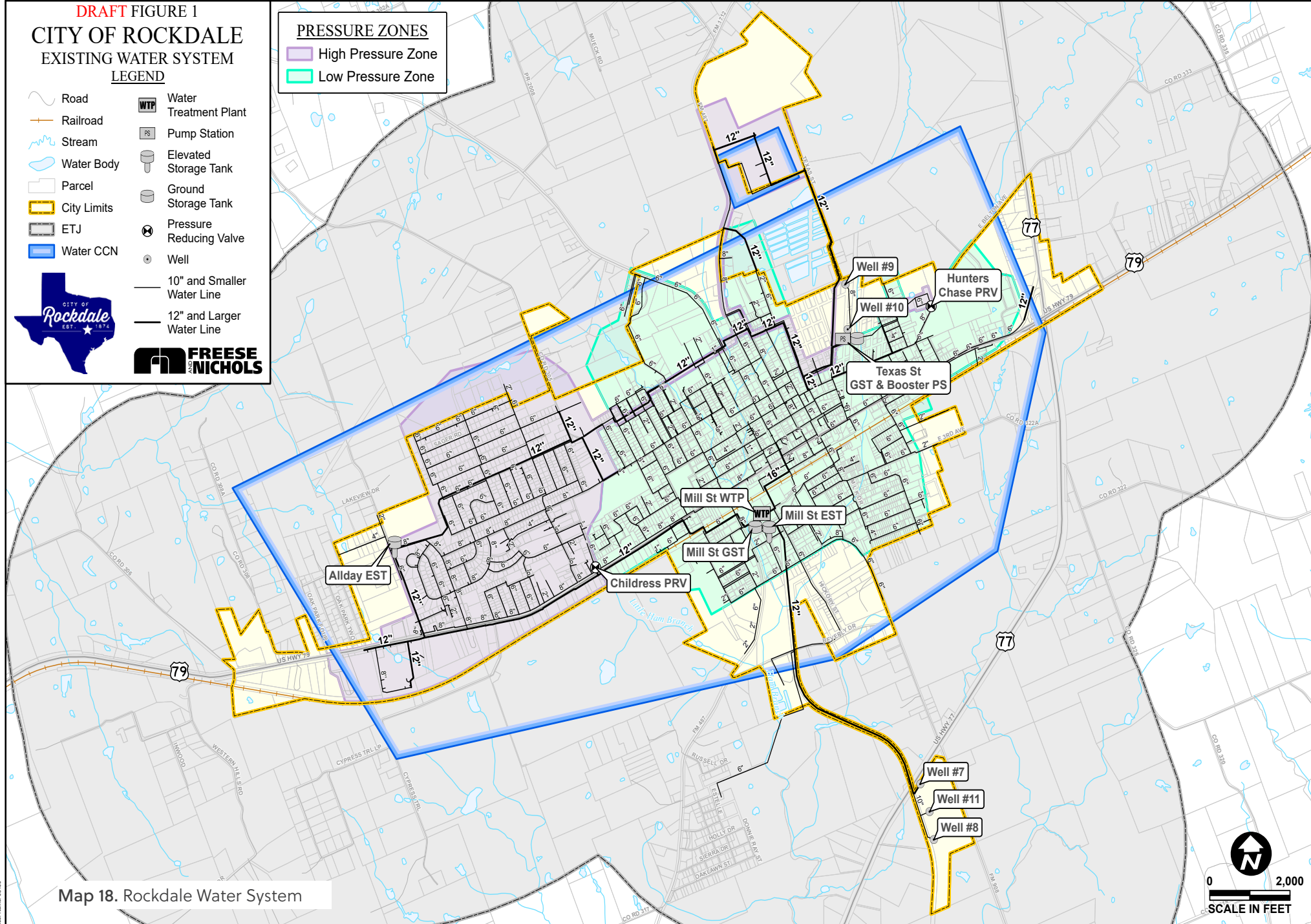
DRAFT FIGURE 1
CITY OF ROCKDALE
 EXISTING WATER SYSTEM
 LEGEND

- Road
- Railroad
- Stream
- Water Body
- Parcel
- City Limits
- ETJ
- Water CCN
- Water Treatment Plant
- Pump Station
- Elevated Storage Tank
- Ground Storage Tank
- Pressure Reducing Valve
- Well
- 10" and Smaller Water Line
- 12" and Larger Water Line



PRESSURE ZONES

- High Pressure Zone
- Low Pressure Zone



Map 18. Rockdale Water System

Figure 47. Low-Pressure Plan Schematic

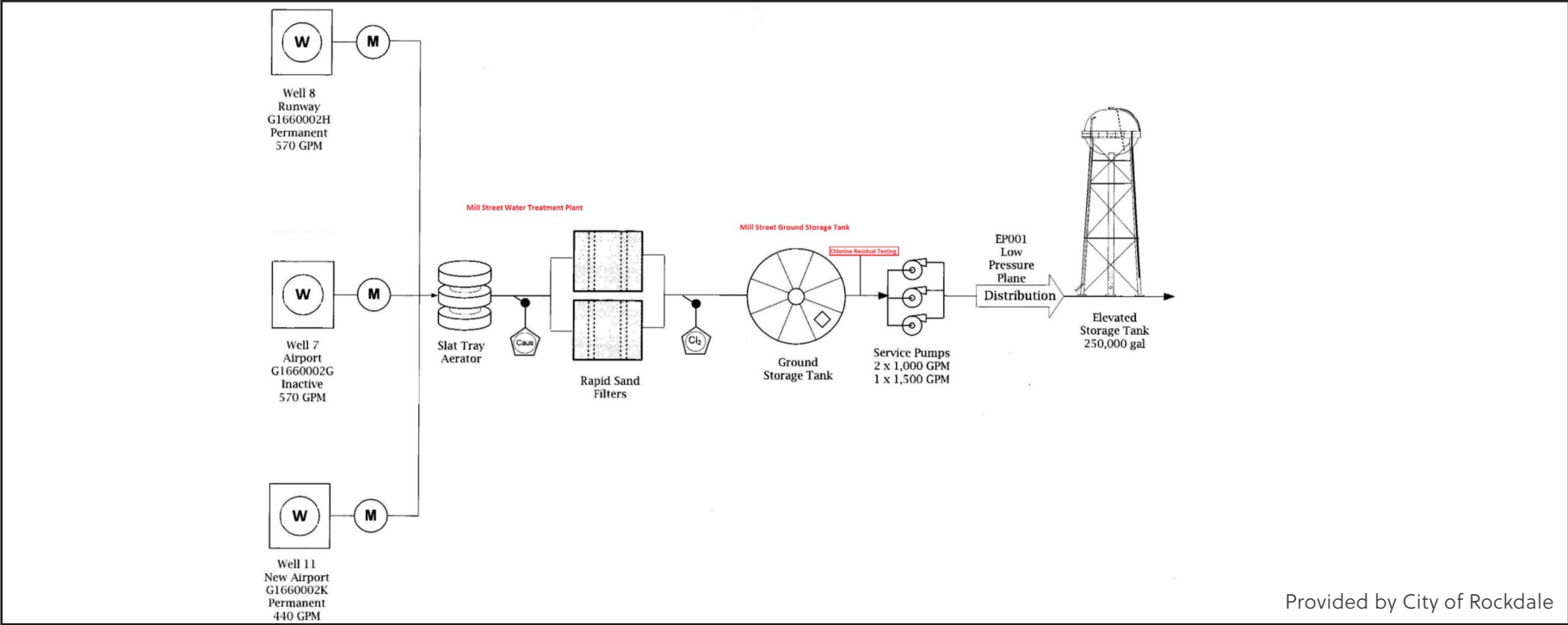


Figure 48. High-Pressure Plan Schematic

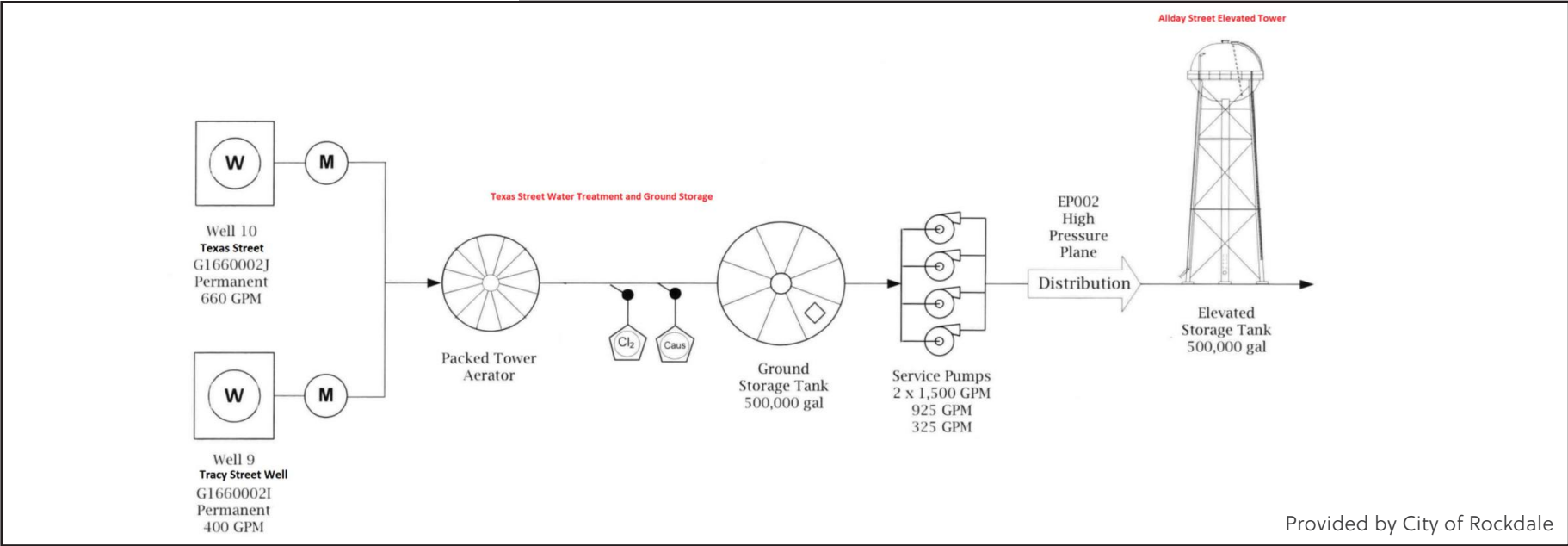


Figure 49. Water Pipelines Table

Diameter (inch)	Length (linear feet)	Percent of System
1	2,317.4	0.7%
1.25	267.2	0.1%
2	33,278.9	10.5%
2.5	481.0	0.2%
4	5,968.6	1.9%
6	180,322.3	56.7%
8	44,287.0	13.9%
10	1,361.7	0.4%
12	47,164.4	14.8%
16	2,480.2	0.8%
Unknown	31.6	0.0%
Total	317,960.3	100.0%

Figure 50. Water Facilities Table

Facility Name	Type	Address	Capacity	Unit
Mill Street	WTP	301 Mill Street	3.66	MGD
	EST	301 Mill Street	0.25	MG
	GST	301 Mill Street	0.29	MG
	PS	301 Mill Street	1,000	gpm
		301 Mill Street	1,000	gpm
		301 Mill Street	1,500	gpm
Texas Street	WTP	710 Texas Street	1.58	MGD
	GST	710 Texas Street	0.50	MG
	PS	710 Texas Street	325	gpm
		710 Texas Street	925	gpm
		710 Texas Street	1,500	gpm
		710 Texas Street	1,500	gpm
Allday	EST	534 Allday Street	0.50	MG
Well 7	Well	2443 US 77	420	gpm
Well 8	Well	2443 US 77	570	gpm
Well 9	Well	710 Texas Street	400	gpm
Well 10	Well	710 Texas Street	660	gpm
Well 11	Well	2443 US 77	440	gpm

Existing Systems - Wastewater

The existing wastewater collection system is shown in Map 19. The collection system consists of one wastewater basin served by one wastewater treatment plant and three lift stations. The City's wastewater treatment plant, located on Beverly Street, is permitted to treat up to 1.25 MGD. In addition, the City has about 220,000 linear feet (about 42 miles) of wastewater lines ranging in size from 4 to 21 inches. An accounting of the wastewater collection system pipelines and facilities are shown in the tables of Figures 51 and 52, respectively.

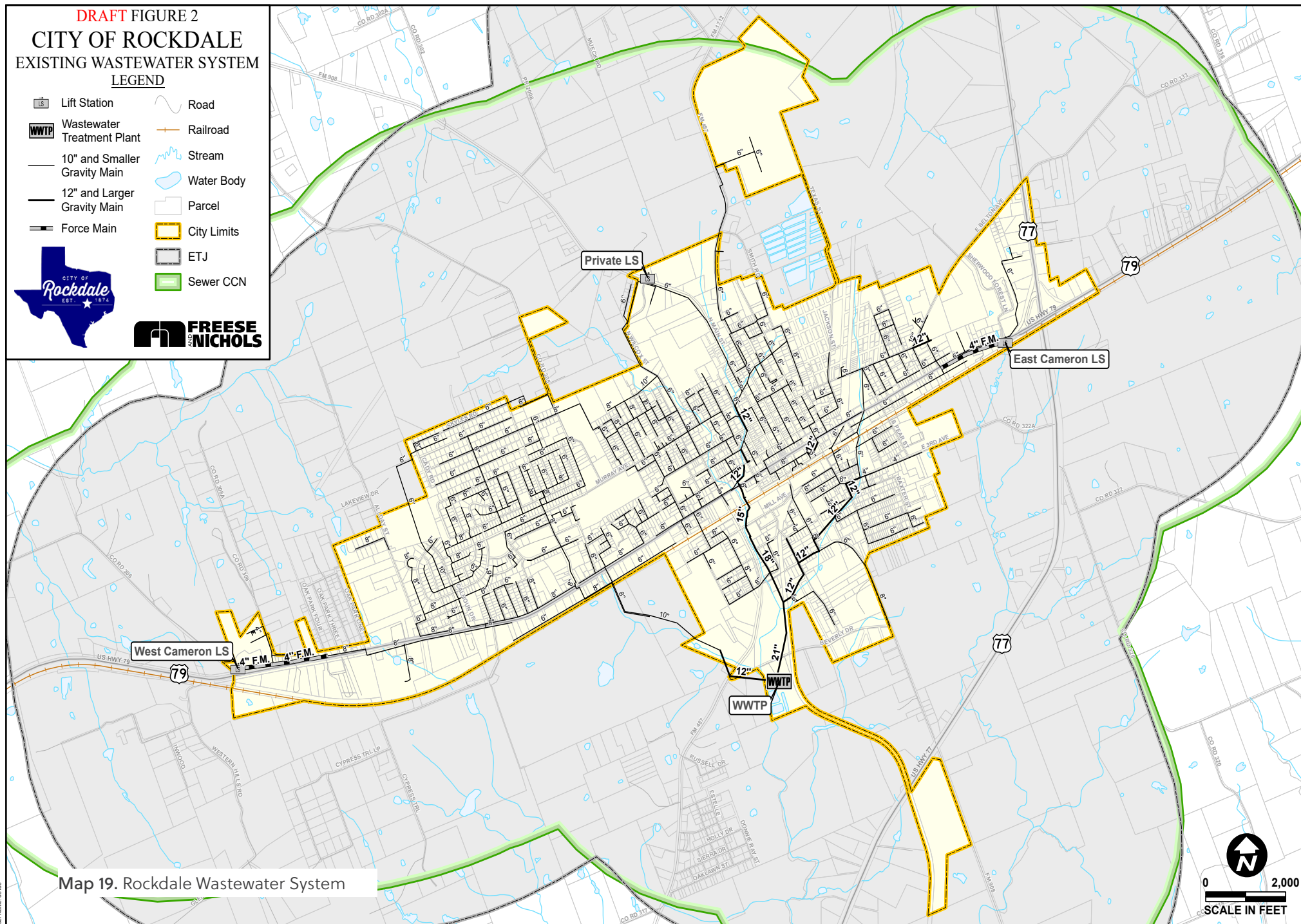
Figure 51. Wastewater Pipelines Table

Diameter (inch)	Length (linear feet)	Percent of System
4	2,700.1	1.2%
6	161,657.9	73.4%
8	36,973.7	16.8%
10	5,749.8	2.6%
12	8,159.7	3.7%
15	1,058.7	0.5%
18	2,023.0	0.9%
21	1,863.1	0.8%
Total	220,185.9	100.0%

Figure 52. Wastewater Facilities Table

Facility Name	Type	Address	Capacity	Unit
WWTP	WWTP	290 Beverly Drive	1.25	MGD
East Cameron	LS	100 CR 306	-	-
West Cameron	LS	1601 E Cameron Avenue	-	-
Private	LS	FM 908 and Cordova Drive	-	-

DRAFT FIGURE 2
CITY OF ROCKDALE
EXISTING WASTEWATER SYSTEM
LEGEND

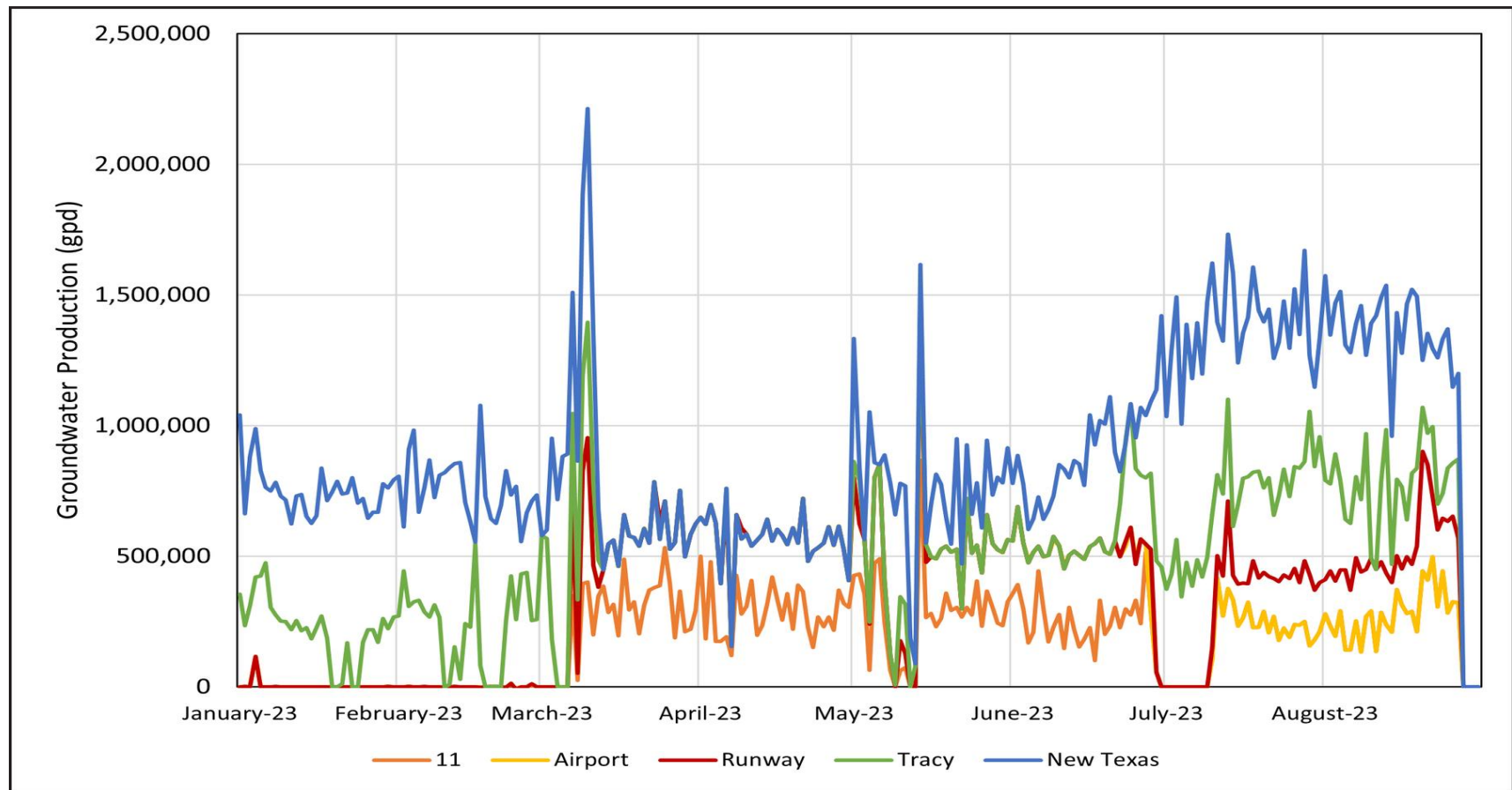


Historical Water Demands and Wastewater Flow

Reviewing historical demands and flows helps provides insight into system operations and to select planning criteria for use in projecting future water demands and wastewater flows. The City provided historical data for groundwater well production, water billing meter consumption, and wastewater treatment plant effluent flow.

Groundwater well production data was provided from January 2023 through August 2023 as shown in Figure 53. The total average production over the period is 0.9 MGD with a maximum day of 2.2 MGD compared to the total rated capacity of approximately 3.6 MGD for the five groundwater wells.

Figure 53. Groundwater Production – 2023



Monthly Use

The City of Rockdale provided a summary of billed water consumption for May through July of 2023, as summarized in Figure 54. The total number of active water customers is 2,186 as of July 2023. The average consumption per connection is approximately 270 gallons per day (gpd).

Monthly effluent flow from the City's Wastewater Treatment Plant was provided from July 2022 through July 2023 as shown in Figure 55. The average wastewater flow over the period is approximately 0.4 MGD with a maximum daily flow of 1.4 MGD compared to the annual average rated capacity of 1.25 MGD.

The received water billing data also noted wastewater customers, though wastewater flow is not directly recorded by customer. Additionally, the count of wastewater customers differs slightly from water customers, primarily due to water customers with private septic systems that are not provided City sewer service. The observed wastewater treatment plant flow is compared to the billed wastewater customers in Figure 56. The total number of active wastewater customers is 2,067 as of July 2023. The resulting average flow per connection is approximately 200 gallons per day.

Figure 54. Billed Water Consumption – May to July 2023

Month	Active Water Connections	Monthly Consumption (hundred gallons)	Consumption per Connection (gallons per day)
May	2,170	134,990	207.4
June	2,183	182,249	269.3
July	2,186	230,918	340.8
Average	2,180	182,719	270.4

Figure 55. Wastewater Treatment Plant Flow – July 2022 to July 2023

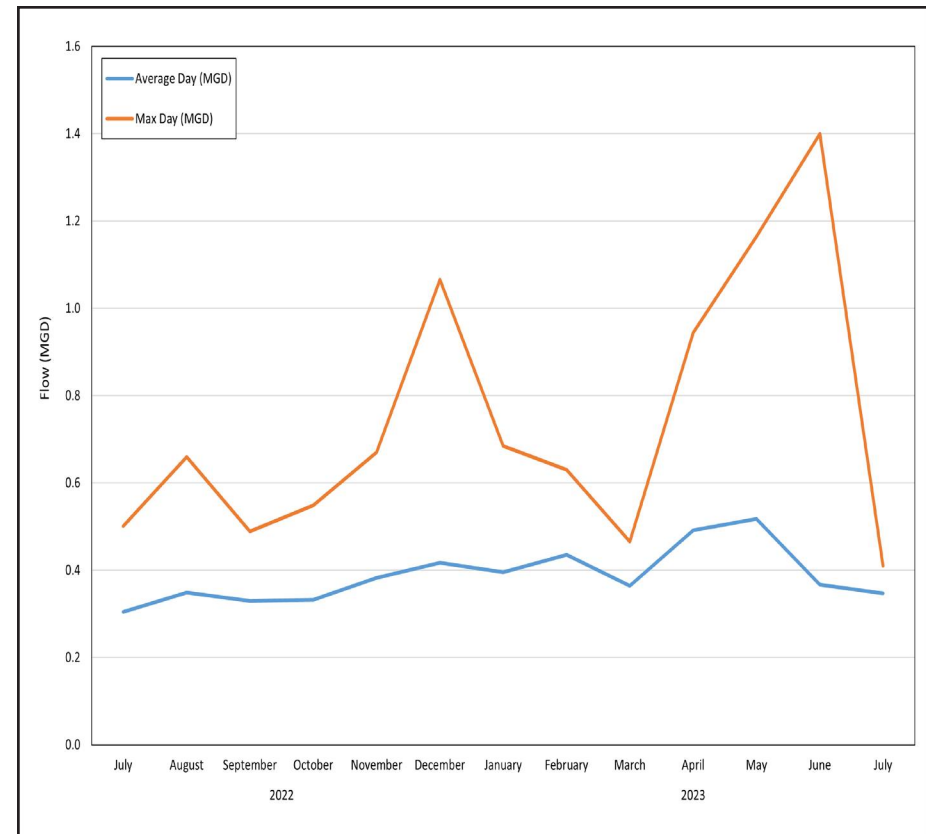


Figure 56. Flow per Wastewater Account

Month	Active Wastewater Connections	Average Day Flow (MGD)	Flow per Connection (gpd)
May	2,064	0.52	251.0
June	2,066	0.37	177.6
July	2,067	0.35	167.9
Average	2,066	0.41	198.8

Water Demand and Wastewater Flow Projections

As discussed previously, the City of Rockdale has experienced a slightly negative growth rate over the last decade but has significant growth potential over the next several decades. To account for the wide range of potential future growth, the growth scenarios identified in the Land Use and Development chapter were utilized to evaluate potential future water and wastewater conditions. Projected growth rates are presented as compound annual growth rates (CAGR) for each growth scenario. However, to project future water demand and wastewater flow, the identified growth rates are applied to the total 2023 water and wastewater customers and projected through all planning periods as shown in Figure 57. To account for the difference between water and wastewater customers, it is assumed that all existing non-wastewater customers do not connect to the wastewater system in the future, but all future customers are provided both water and wastewater service. The count of existing water and wastewater customers are 2,186 and 2,067, respectively. The low (1.5%) growth scenario would increase the total connections by approximately 50% through 2050 while the high (6.2%) growth scenario would result in an approximately 600% increase by the 2050 planning horizon.

Figure 57. Projected Future Water and Wastewater Connections

Planning Period	Growth Scenario (CAGR)			
	1.5%	2.5%	4.0%	6.2%
Water Connections				
2023	2,186	2,186	2,186	2,186
2025	2,252	2,297	2,364	2,465
2030	2,426	2,598	2,877	3,331
2035	2,614	2,940	3,500	4,499
2040	2,816	3,326	4,258	6,078
2045	3,033	3,763	5,181	8,211
2050	3,268	4,258	6,303	11,092
Wastewater Connections				
2023	2,067	2,067	2,067	2,067
2025	2,133	2,178	2,245	2,346
2030	2,307	2,479	2,758	3,212
2035	2,495	2,821	3,381	4,380
2040	2,697	3,207	4,139	5,959
2045	2,914	3,644	5,062	8,092
2050	3,149	4,139	6,184	10,973

Water Auditing

Soils with high plasticity indexes in Central Texas make Rockdale's system more susceptible to pipe breaks and leaks, which can decrease efficiency throughout the entire system, generating unnecessary costs for both the utility provider and end user.

The Texas Water Development Board released a report titled *Water Loss Audit Manual for Texas Utilities*¹ in 2008, which states the following:

- For utilities to operate efficiently, they should use recommended practices to monitor and control water and revenue losses. These include active leakage control, as well as metering production flows and customer consumption.
- Real losses cause a portion of the treated, pressurized water to be lost from the distribution system before customer use. In effect, the utility treats a greater volume than its customer base requires, hence incurring excess production costs.
- All water utilities incur leakage losses; only the amount varies. Leaks and visible main breaks occur for a variety of reasons, including poor installation workmanship or materials, corrosion, external forces, environmental extremes, and other causes. Leakage is always occurring, and only grows worse if left unchecked. Therefore, all water utilities

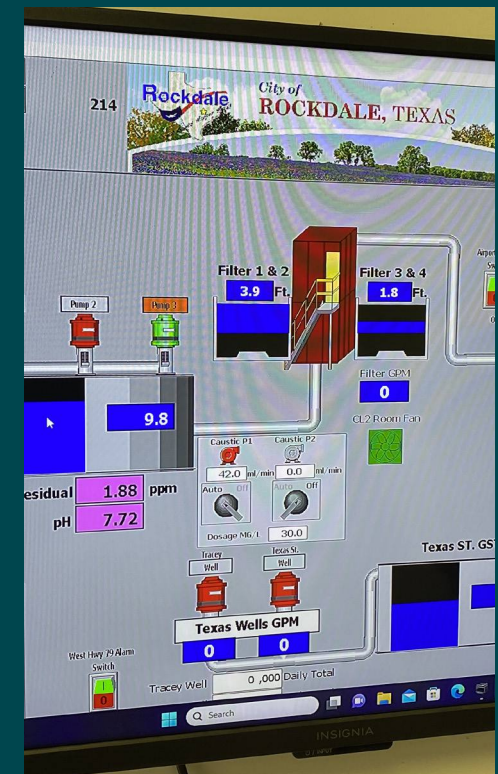
¹ Water Loss Audit Manual for Texas Utilities, by Mark Mathis, George Kunkel, P.E., and Andrew Chastain Howley for the Texas Water Development Board, Report 367, March 2008. https://www.twdb.texas.gov/publications/brochures/conservation/doc/WaterLossManual_2008.pdf

should provide system maintenance and upkeep functions that include appropriate components of leakage management via active leakage control, timely quality repair, water main rehabilitation, and pressure management.

- With decreasing water availability and rising costs for water treatment or purchase, auditing water supplies is essential for water utilities to ensure efficiency in their operations and preserve water resources.

Water auditing and loss control are emerging as significant conservation measures because as utilities minimize water loss, they increase their efficiency and reduce the need to search for additional water sources. For utilities to effectively identify losses in their systems, they must first employ water auditing as a routine business practice, using a method that has clearly defined terms and meaningful performance indicators. In recognizing the need for such a reliable method, the Water Loss Control Committee of the American Water Works Association adopted (AWWA, 2003) the method published by the International Water Association's Water Loss Task Force (Alegre and others, 2000). This methodology not only assists utilities in identifying where their losses are occurring, but also expresses by volume how much is lost and associates a cost to those losses. It also standardizes the water audit reporting process for water utilities.

- *Water Loss Audit Manual for Texas Utilities, 2008*



Design Criteria and Considerations

A water utility must be able to supply water at rates that fluctuate over a wide range. Yearly, monthly, and hourly variations in water use occur, with higher use typically during dry years and in hot months. Also, water use typically follows a diurnal pattern, being low at night and peaking early in the morning and in the early evening. Usage rates most important to the hydraulic design and operation of a water treatment plant and distribution system are average day, maximum day, and peak hour demand conditions.

- **Average day demand** is the total annual water use divided by the number of days in the year. The average day rate is used primarily as a basis for estimating maximum day and peak hour demands. The average day rate is also used to estimate future revenues and operating costs.
- **Maximum day demand** is the maximum quantity of water used on any one day of the year. The maximum day demand is used to size water supply facilities, treatment facilities, and pump stations.
- **Peak hour demand** is the peak rate at which water is required during any one hour of the year. Since minimum distribution system pressures are usually experienced during peak hour, the sizes and locations of distribution facilities are generally determined on the basis of this condition. Peak hour water requirements are partially met through the use of strategically located system storage. The use of system storage minimizes the required capacity of transmission mains and permits a more uniform and economical operation of the water supply, treatment, and pumping facilities.

The average water consumption and wastewater flow per connection from the water billing data were used to project future average water demand and wastewater flow. Typically, maximum and peak conditions are also determined from observed system conditions such as flow monitoring data or pump station records. However, this detailed information was not readily available for this study. In the absence of detailed historical data, the Texas Commission on Environmental Quality (TCEQ) recommends a maximum day to average day demand peaking factor of 2.40 and a maximum day to peak hour demand peaking factor of 1.25 for the water system, and a peak 2-hour to average day flow peaking factor of 4.00 for the wastewater system. The design criteria are specified in Figure 58. These design criteria were used to project maximum day and peak hour water demand and peak 2-hour wastewater flow as shown in Figures 59 and 60, respectively. Existing average water demand is approximately 0.59 MGD, with projected maximum day and peak hour demands of 1.42 MGD and 1.77 MGD, respectively. The existing average wastewater flow is 0.41 MGD with a projected peak 2-hour flow of 1.65 MGD.

Figure 58. Design Criteria

Criteria	Value
Water System	
Average Day Demand per Connection	270
Maximum Day to Average Day Peaking Factor	2.40
Peak Hour to Maximum Day Peaking Factor	1.25
Wastewater System	
Average Day Flow per Connection	200
Peak 2-hour to Average Day Peaking Factor	4.00

Figure 59. Water Demand Projections

Planning Period	Growth Scenario (CAGR)			
	1.5%	2.5%	4.0%	6.2%
Average Water Demand (MGD)				
2023	0.59	0.59	0.59	0.59
2025	0.61	0.62	0.64	0.67
2030	0.66	0.70	0.78	0.90
2035	0.71	0.79	0.94	1.21
2040	0.76	0.90	1.15	1.64
2045	0.82	1.02	1.40	2.22
2050	0.88	1.15	1.70	2.99
Maximum Day Water Demand (MGD)				
2023	1.42	1.42	1.42	1.42
2025	1.46	1.49	1.53	1.60
2030	1.57	1.68	1.86	2.16
2035	1.69	1.91	2.27	2.92
2040	1.82	2.16	2.76	3.94
2045	1.97	2.44	3.36	5.32
2050	2.12	2.76	4.08	7.19
Peak Hour Water Demand (MGD)				
2023	1.77	1.77	1.77	1.77
2025	1.82	1.86	1.92	2.00
2030	1.97	2.10	2.33	2.70
2035	2.12	2.38	2.83	3.64
2040	2.28	2.69	3.45	4.92
2045	2.46	3.05	4.20	6.65
2050	2.65	3.45	5.11	8.98

Figure 60. Wastewater Flow Projections

Planning Period	Growth Scenario (CAGR)			
	1.5%	2.5%	4.0%	6.2%
Average Wastewater Flow (MGD)				
2023	0.41	0.41	0.41	0.41
2025	0.43	0.44	0.45	0.47
2030	0.46	0.50	0.55	0.64
2035	0.50	0.56	0.68	0.88
2040	0.54	0.64	0.83	1.19
2045	0.58	0.73	1.01	1.62
2050	0.63	0.83	1.24	2.19
Peak 2-hour Flow (MGD)				
2023	1.65	1.65	1.65	1.65
2025	1.71	1.74	1.80	1.88
2030	1.85	1.98	2.21	2.57
2035	2.00	2.26	2.70	3.50
2040	2.16	2.57	3.31	4.77
2045	2.33	2.92	4.05	6.47
2050	2.52	3.31	4.95	8.78



Regulatory Compliance

For water distribution systems, TCEQ sets minimum requirements for production capacity, storage capacity, and pumping capacity according to Chapter §290 of the Texas Administrative Code. Distribution systems are primarily evaluated by pressure plane, except for water production and total storage, which are evaluated on a system-wide basis.

The minimum TCEQ production requirement is 0.6 gpm/connection. For distribution pumping, if a pressure plane has at least 200 gallons per connection of elevated storage, the resulting TCEQ pumping requirement is 0.6 gpm/connection. If the pressure plane has less than 200 gallons per connection of elevated storage, the TCEQ distribution pumping requirement increases to 2.0 gpm/connection or at least 1,000 gpm total capacity with the ability to meet peak hour demands in the pressure plane if the largest pump was to be out of service (i.e., firm capacity).

Generally, 2.0 gpm/connection is a more stringent requirement than peak hour demand for required pumping capacity. However, due to the lack of historical peak hour demand conditions, the 2.0 gpm/connection is utilized for this analysis to be conservative. The minimum TCEQ elevated storage capacity requirement is 100 gallons per connection and the total storage capacity requirement is 200 gallons per connection. Minimum production, pumping, and storage requirements for water distribution systems per TCEQ are summarized in Figure 61.

The results of the TCEQ minimum requirements analysis for the existing planning period are shown in Figures 62, 63, and 64 for production, storage, and pumping, respectively. The City of Rockdale meets all TCEQ requirements for the existing water distribution system. However, the Low-Pressure Plane has slightly less than 200 gallons of elevated storage per connection, so the required minimum pumping capacity is 2.0 gpm per connection. The existing connection count for each pressure plane was provided by City staff.

For the purposes of this study, it was assumed that all future growth would occur across the pressure planes following the existing distribution, approximately 60% to the Low-Pressure Plane and 40% in the High-Pressure Plane.

The results of the TCEQ minimum requirements analysis for all future scenarios are included in Appendix C. The City of Rockdale has adequate production capacity under the low (1.5%) growth scenario through the 2050 planning period. Under the high (6.2%) growth scenario, additional production capacity is needed by the 2035 planning period.

The High-Pressure Plane has adequate elevated and total storage through the 2050 planning period across all growth scenarios. The Low-Pressure Plane does not currently have 200 gallons of elevated storage per connection but is still meeting the TCEQ minimum requirement of 100 gallons of elevated storage per connection. This state is projected to continue under the low growth scenario through the 2050 planning period. However, the Low-Pressure Plane is projected to need additional elevated and total storage for all other growth scenarios, starting by the 2035 planning period under the high growth scenario.

Lastly, the High-Pressure Plane has adequate pumping capacity through the 2050 planning period across all growth scenarios. The Low-Pressure Plane is projected to need additional pumping capacity by the 2030 planning period under the high growth scenario and the 2045 planning period by the low growth scenario. It is also worth noting that the elevated storage and pumping requirements are dependent of one another and expansion of either may satisfy the minimum requirements of the other.

Figure 61. Minimum TCEQ Requirements

System Component	TCEQ Minimum Requirement	Evaluation Area
Production	0.6 gpm/connection	Systemwide
Distribution Pumping	0.6 gpm/connection (≥ 200 gal/connection elevated storage) 2.0 gpm/connection (< 200 gal/connection elevated storage)	Pressure Plane
Elevated Storage	100 gallons/connection	Pressure Plane
Ground Storage	100 gallons/connection	Pressure Plane
Total Storage	200 gallons/connection	Systemwide

Figure 62. Existing TCEQ Minimum Production Requirements

Planning Period	Connections	Required Production (gpm)	Total Available Production (gpm)	Meets TCEQ Requirements(Y/N)
2023	2,186	1,311.6	2,490	Y

Figure 63. Existing TCEQ Minimum Storage Requirements

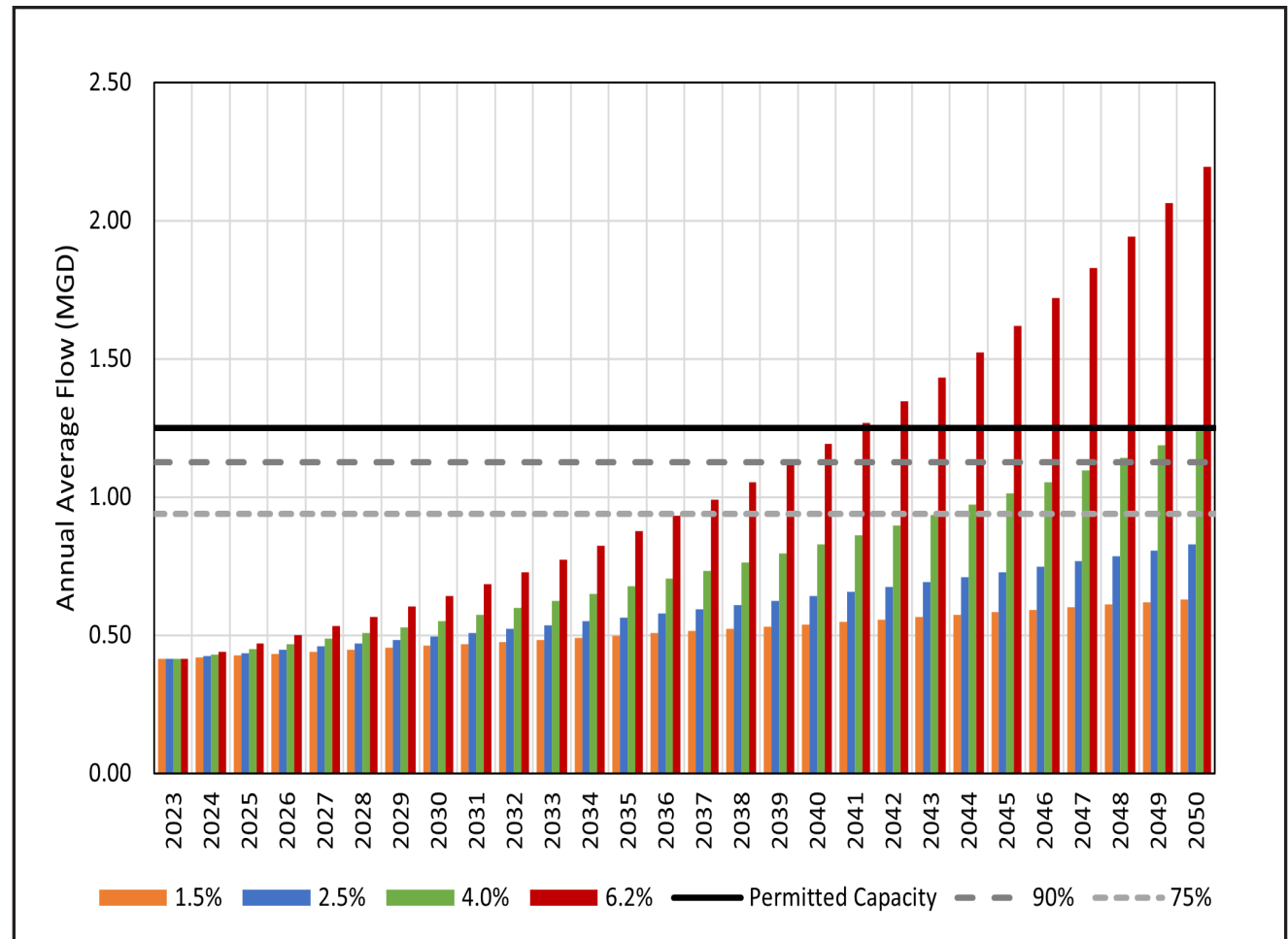
Planning Period	Pressure Plane	Connections	Required Elevated Storage (MG)	Required Total Storage (MG)	Available Elevated Storage (MG)	Available Total Storage (MG)	Meets TCEQ Requirement (Y/N)
2023	Low	1,291	0.13	0.26	0.25	0.54	Y
	High	895	0.09	0.18	0.50	1.00	Y

Figure 64. Existing TCEQ Minimum Pumping Requirements

Planning Period	Pressure Plane	Connections	Minimum Requirement (gpm/connection)	Required Pumping Capacity	Available Pumping Capacity (gpm)	Meets TCEQ Requirement (Y/N)
2023	Low	1,291	2.0	2,582	3,500	Y
	High	895	0.6	537	3,000	Y

TCEQ requirements for wastewater capacity are not as detailed as the water distribution system requirements. TCEQ regulates permitted wastewater treatment plant capacity with the "75/90 rule". The 75/90 rule states that when a plant exceeds 75% of its permitted annual average flow for three consecutive months, the facility must begin planning for its next expansion. In addition, the rule states that when a facility exceeds 90% of its permitted annual average flow, the facility must be in construction of its next expansion. The projected annual average wastewater flows are compared to the rated capacity of the wastewater treatment plant in Figure 65. Expansion of the WWTP is projected to be under design by the 2036 planning period and complete by the 2040 planning period under the high growth scenario. The low growth scenario is not projected to exceed 75% of the existing permitted capacity through the 2050 planning period.

Figure 65. WWTP Flow Projections



Wastewater Beneficial Reuse

Public water supplies are generally treated to drinking water standards, even though household potable use is only a portion of the overall water usage in communities. Many uses like irrigation and industrial processes do not require water treated to drinking standards, but they are still using this finite and precious resource because it is available. Reclaimed water has become an increasingly common and accepted method to both conserve potable water supplies as well as manage wastewater or treated effluent. In some cases, this can become its own utility funding stream. The ability to access it can also help realize opportunities such as enhanced landscaping associated with state-maintained roadways.

Beneficial reuse is governed by TCEQ's Chapter 210 Use of Reclaimed Water regulations. Authorization for the use of reclaimed water applied to an area of land for irrigation requires determination and documentation of typical irrigation demands for the proposed use based on the type of vegetation and land area to be irrigated. There are two types of reclaimed water; Type I is reclaimed water that the public may come into contact with and Type II is in more remote or restricted locations where human contact is unlikely. Type I use is allowed for unrestricted areas and may also be used for any Type II use. Designing WWTPs to meet Type I standards provides the City the greatest flexibility in effluent management.

One of the obstacles in developing a reclaimed water system is balancing the demand for water with the limited and variable supply produced by a wastewater treatment facility. The flows

demanded from the reclaimed water system are rarely constant and will vary significantly over a 24-hour period. Furthermore, the reclaimed water demands will fluctuate and vary greatly depending on the type of use and time of year. For example, typical irrigation demands are highest at night during the summer months, but this is also the time of day when less wastewater is being put into the system from the community.

Since the reclaimed water supply is from a WWTP, the supply is variable based on water use throughout the day. The water that flows through a treatment facility will fluctuate and generally follows the non-irrigation domestic demand and use of potable water. Wastewater flows will often have two peaks with a crest in the morning and lower flows through the day and then another peak in the evening before tailing off during the nighttime hours. This means methods of storage and pressurization are needed.



Recommendations

As discussed in the previous sections, the City of Rockdale has a wide range of potential future growth. The various growth scenarios make it difficult to manage utility systems and proactively make decisions based on future needs. This wide future variability highlights the importance of planning as a foundation for future decision making. The first part of the planning process includes developing a Comprehensive Plan, as achieved with this document. The Comprehensive Plan helps to define the potential future scenarios and document the desired direction of the City and community at large.

The next part of the planning journey includes developing Water and Wastewater Master Plans. The master plans will further refine the results of the Comprehensive Plan and determine the infrastructure needs to support the vision for future growth. In addition to a detailed hydraulic analysis, it is recommended that the master plans include a risk-based condition assessment to identify potential infrastructure in need of renewal. Master planning is a tool for budgeting and capital planning that will help define the desired level of service and monetary needs through the future planning horizon. Upon completion of the Comprehensive Plan, it is recommended that the City engage a professional engineering services firm to develop Water and Wastewater Master Plans.

The results of the master plans will identify the City's budget for water and wastewater capital expenditure. These capital costs can be funded via utility rates, impact fees, or various bond, loan, and grant programs. It is also recommended that the City conduct financial studies to identify potential revenue sources to help fund the capital budget for the water and wastewater systems.



Stormwater Infrastructure

Stormwater

In natural areas, stormwater is either slowly absorbed into the soil or gradually moves toward the lowest points and channels before reaching ponds, low-lying wetlands or waterways. In urban and suburban areas, a significant portion of the land is covered by buildings, pavement, and other surfaces that do not allow the water to seep into the ground, known as impervious surfaces. This causes a greater quantity and velocity of water to run off into adjacent areas and waterways.

Stormwater management is often front-of-mind in Central Texas given the frequency and size of large storm events, resulting in flash flooding. Water quality and wildlife habitat are also a concern along natural waterways. These stormwater features, sometimes considered liabilities, can serve as assets if designed and managed as such.

Drainage & Floodplains

Like most cities west of the Mississippi, Rockdale deploys a system of underground pipes and drainage channels to convey stormwater runoff from developed areas to natural creeks. On-site detention ponds collect rainfall and gradually release it into the storm system to ensure that the location does not shed water at a rate or volume that could overwhelm the system and prove detrimental to surrounding areas. Nevertheless, heavy rainfall events can result in flooding in parts of the City due, at least in part, to location

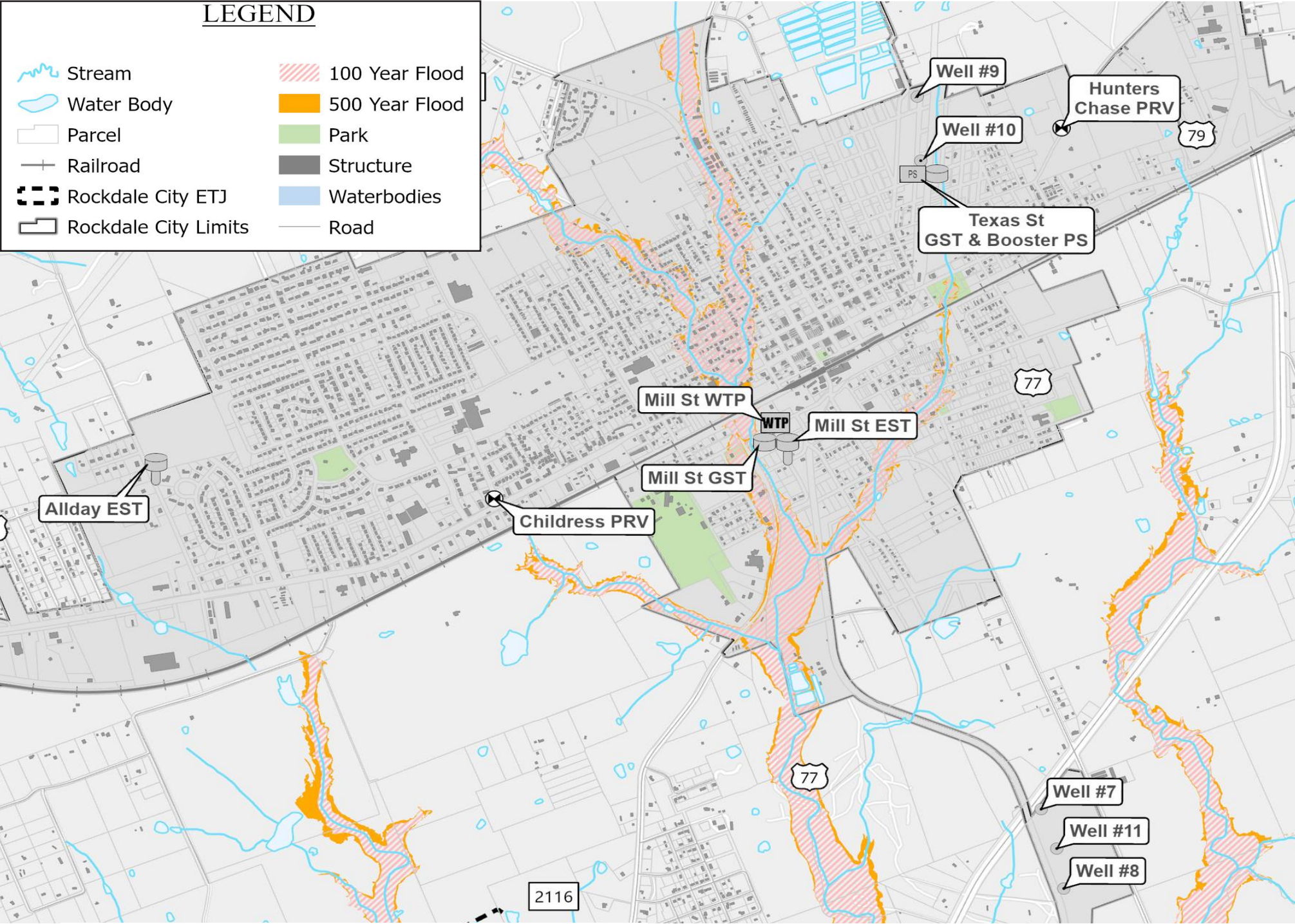
of development, the pattern of development, drainage system maintenance and the approach to dealing with stormwater. Rockdale may consider regional stormwater management rather than relying upon disconnected and uncoordinated facility implementation happening on a development-by-development basis. When done correctly, this can introduce placemaking opportunities and recreational amenities via dual-purpose stormwater management facilities. A stormwater impact fee can be an effective vehicle to support this.

Soil, topography, and land use cover shape the role and performance of stormwater in any city. As mentioned previously, Rockdale's soils feature a variety of clays with high plasticity, meaning they shrink and swell based on moisture content.

This is most commonly understood to the general public as a cause for home foundation issues, but this soil trait also means the soil does not allow infiltration at high rates compared to other soils.

In Central Texas, a number of creeks and waterways are unstudied or minimally studied for floodplain presence. In addition, several waterways originate beyond the City's jurisdiction, meaning the stormwater affecting Rockdale residents is beyond the control of Rockdale. As a result, it is a prudent practice to establish buffers from stream centerlines where the floodplain is not established on NFIP maps, and buffers from the 100-year floodplain where the floodplain is established on NFIP maps.





Map 20. Floodplain & Facilities Map

Water Quality & Innovative Stormwater Management

Water quality is impacted by point and nonpoint source pollution. Point source pollution can be traced to specific points of discharge from wastewater treatment plants or industrial sites. Nonpoint source pollution typically originates from rainfall that moves over the ground and picks up natural and human pollutants and then deposits them into lakes, rivers, wetlands and coastal waters. Common examples of nonpoint source pollution include septic systems, oil and other contaminants on parking lots and roadways, fertilizers, and animal waste. Point source pollution is regulated through the National Pollutant Discharge Elimination System (NPDES) permit program.

Nonpoint source pollution has emerged as a major contributor to water quality problems. Unmanaged stormwater runoff is harmful to the environment as it often carries pollutants such as oil, dirt, chemicals, and lawn fertilizers directly to streams and rivers. Nonpoint pollutants are especially concentrated in the initial wash or “first inch” of runoff during a storm. Additionally, heavy storms can generate excessive volumes and velocities of runoff that can damage streamside vegetation and aquatic habitat, especially at the point of outlet from storm drains.

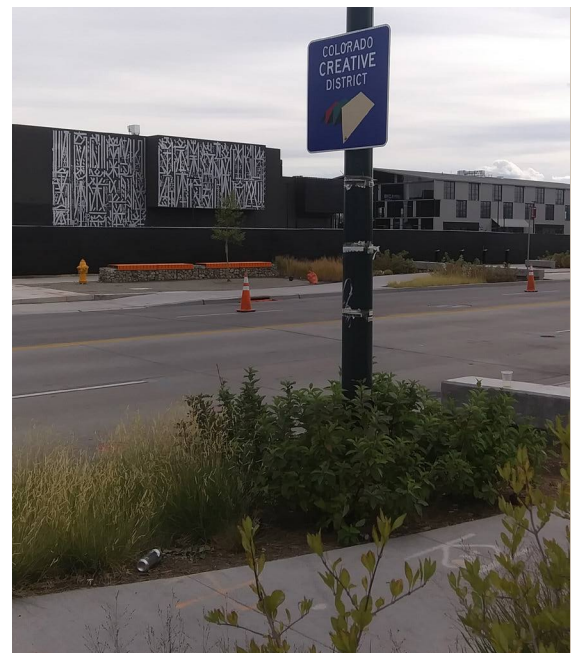
Beyond environmental implications, poor water quality can make these spaces, which are naturally suited to act as amenities in the forms of linear open spaces and trails, less safe for human contact and reduces the potential for people to develop positive interactions with nature.

To protect water quality, infrastructure and development should be designed and built to minimize runoff and treat that first inch of water through conservation of natural areas, green infrastructure, cluster development, use of pervious surfaces, and other best management practices (BMPs). These low-impact approaches are generally recognized as preferred instead of or in partnership with engineered, or “gray” solutions, and tend to result in the creation of amenities that also support quality of life and high-quality, valuable developments. Utilizing natural systems/processes and taking a comprehensive approach to managing water can help meet several of the community’s goals, including improved water quality, water conservation, interconnection between parks and neighborhoods, placemaking, and flooding reduction.

The use of natural systems and processes, including wetlands, native planting areas, and bioswales, to treat and retain stormwater is referred to as green infrastructure. These are important parts of holistically managing stormwater and water quality and can be accomplished at the regional, community, and site scale. It is also critical to understand that green infrastructure extends to other aspects of the built environment and can be utilized as amenities and dual-purpose facilities that bring multiple benefits to the City and community.

Maintenance of facilities is of the utmost importance; this is especially true for innovative stormwater practices where plants are serving

functional purposes. Vegetated stormwater facilities do not need more maintenance, in fact they should overall require less, but they do need to be properly maintained. There is a specific set of knowledge required to maintain green infrastructure. Certification classes are available for just this purpose.



Images of Green Infrastructure and Innovative Stormwater Management Elements.

Best Practices for Public & Community Facilities

Facilities take on a variety of forms — from public safety facilities like police stations to places of community gathering, like libraries, city halls and recreation centers. As growth occurs, it is the City's responsibility to determine what influences are at work and what data is necessary to make decisions that meet the needs of the community. Adequate land allocation for anticipated community facilities is necessary to meet evolving community expectations for community services, both essential services and those that enhance quality of life. As Rockdale continues to experience development, it becomes vital that the land allocation needs for public facilities are identified before the options available become limited and less optimal.

In addition, schools are an important partner for the City of Rockdale, even though the Rockdale Independent School District leads school operations and facilities and not the City itself. School districts typically conduct their own long-range planning, but there are significant opportunities to work together with the City to address mutual challenges and opportunities.

Facility master plans are the best means of addressing Rockdale's needs, taking into consideration what the City's long-term goals are for programming and services. Given ongoing growth, a more holistic approach is likely warranted to address all municipal functions across all departments. This can help to identify complementary uses and needs that result in improved efficiency overall, as well as prioritization. Perhaps more important, sites can

then be selected with the goal of accommodating a complete buildout with consideration of these complementary uses.

Generally, any new facility should be designed to at least the 20-year population projection for efficiency. Rather than relying on ratios of square footage to population exclusively, a Facility Master Plan should focus on the real space needed for effective desired programming and operations as this links more directly to the user experience and residents' desired service quality.

APPROACH TO FACILITIES PLANNING

DESIGN TREND: Flexible spaces & sites

A growing city like Rockdale should consistently "begin with the end in mind" by planning for future expansions and natural service breaks for facilities (when a service should either separate into a new facility or into an expansion, allowing other services within the facility to expand to accommodate the needs of all services). The flexibility of use within spaces inside buildings is important to accomplishing this, as well as meeting a variety of community needs—those already known and those unknown as technology and community needs change. Likewise, selecting

sites to accommodate ultimate buildout needs is critical to success, as discussed earlier.

This also extends to the design of the architecture itself, seeking to create wide structural spans and volumes that allow for future reconfiguration without altering critical building structures or systems.

DESIGN TREND: Technology & digital connectivity

Technology continues its rapid pace of growth and change. The public as well as employees expect facilities to keep pace with and prepare for this dynamic landscape. Inclusion of additional conduits, accessible tracks and drops, and other low-cost design methods to ensure connectivity will be necessary to support technology of the future.

DESIGN TREND: Shared spaces

Co-locating uses, especially those with alternating hours, allows for the shared use of common spaces and parking. This means less redundancy in facilities and increased space and fiscal efficiency.

Sharing sites and buildings extends outside of the city itself. Increasingly, city halls and other facilities co-house other state agencies, county offices and even school district offices. These sometimes take the form of condominium-

like arrangements within a building, cost participation in construction with a low/no-cost lease, or constructing a larger space than needed at the time and subleasing. Each approach carries different risks depending on the entities involved. This applies not just to office spaces, but other types of buildings and sites. For example, county maintenance may have an interest in shared facilities with City Public Works.

DESIGN TREND: Public buildings as catalysts

Some public facilities have been shown to function particularly well as part of an overall economic development and placemaking effort. City halls, libraries and recreation centers have customer visits similar to retail use as well as significant employment, and are often planned as one stop of many rather than as single-trip destinations. This means their thoughtful design and placement can serve as a catalyst to development in key desired locations, such as a Downtown. Knowing a large public employer or large customer base will be present often prompts interest in surrounding development.

