

CITY OF FULSHEAR

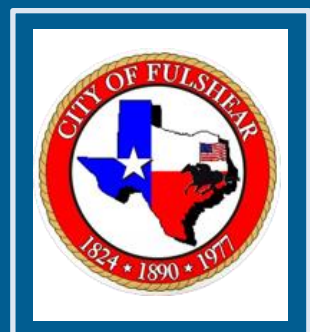
WATER AND WASTEWATER MASTER PLAN



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PREPARED FOR:
City of Fulshear

PREPARED BY:
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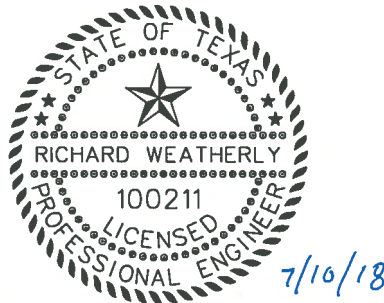


Innovative approaches
Practical results
Outstanding service

Water and Wastewater Master Plan

Prepared for:

City of Fulshear



Richard Weatherly

FREESE AND NICHOLS, INC.
TEXAS REGISTERED
ENGINEERING FIRM
F-2144

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

The City of Fulshear is a community located in southeast Texas, within Fort Bend County. The City's municipal system and surrounding municipal utility districts (MUD) currently provide water and wastewater service to approximately 10,202 residents. Over the next twenty years, the population in the City's water and wastewater service area is expected to grow to approximately 88,793 residents. Accommodating this growth in an efficient and cost-effective manner, while also focusing on the maintenance of existing water and wastewater system assets, is the purpose of this *Water and Wastewater Master Plan*. This report has been prepared to provide the City of Fulshear with a planning tool that will serve as a guide for short-term and long-term improvements to the water and wastewater infrastructure.

Freese and Nichols, Inc. (FNI), was retained by the City of Fulshear in 2016 to prepare a *Water and Wastewater Master Plan*. In 2017, the City amended FNI's contract evaluate integrating the City and Cross Creek Ranch water and wastewater systems. The goals of the *Water and Wastewater Master Plan* were to evaluate the integrity of the existing water and wastewater systems and to recommend a phased capital improvement plan (CIP) through the year 2036. The recommended improvements will serve as a basis for the design, construction, and financing of facilities required to meet Fulshear's water and wastewater capacity needs.

2.0 POPULATION

Population and future land use are important elements in the analysis of water distribution and wastewater collection systems. Water demands and wastewater loads are dependent on the residential population and commercial development served by the systems and determine the sizing and location of system infrastructure. A thorough analysis of projected populations provides the basis for future water demands and wastewater loads.

FNI reviewed the existing development agreements provided by City staff. The projected water and wastewater service area populations for each planning period are shown in **Table ES-1**. The water and wastewater service areas include the current city limits and part of the Extra Territorial Jurisdiction (ETJ). The 2017 water and wastewater service area populations were based on active trash accounts. The *2017 Demographic Update for Lamar Consolidated Independent School District (ISD)* and *2016 Demographic*



Update for Katy ISD were used to estimate the five and ten-year populations for each identified future development. In many cases, the buildout of a specific development occurred within the 10-year period. Where available, the buildout equivalent single family connections for each development were taken from the development agreements provided by the City.

Table ES-1: Projected Population

Year	Service Area Population ⁽¹⁾	
	Water	Wastewater
2017	10,202	10,202
2021	25,631	29,090
2026	46,940	55,512
2036	74,494	88,794

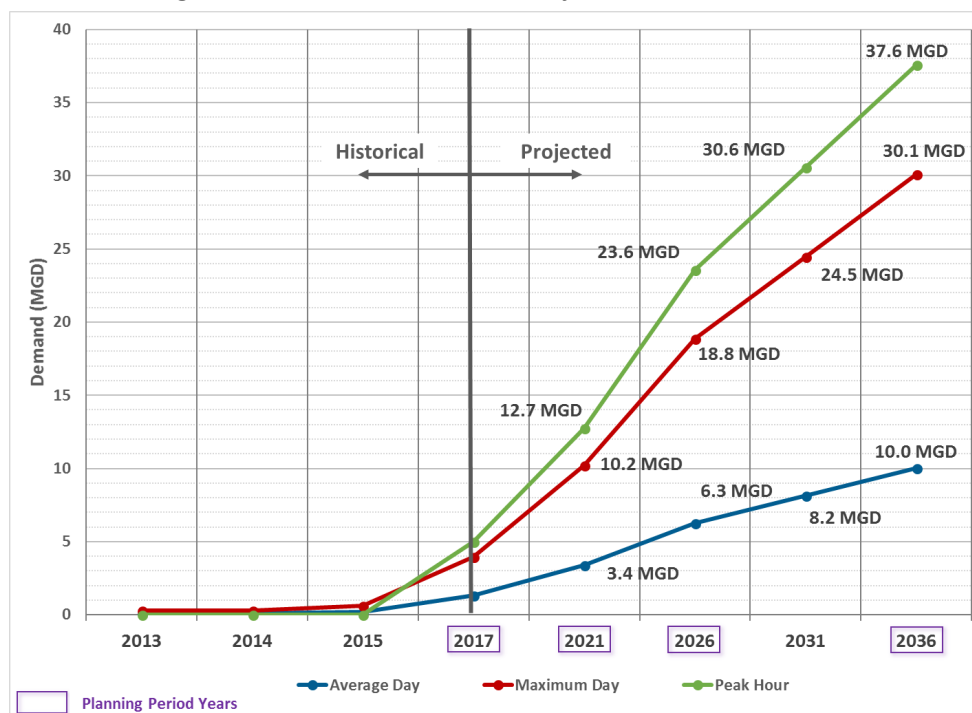
(1) Jordan Ranch development is included in the wastewater service area, and not in the water service area.

3.0 WATER DEMANDS

Reviewing historical water demands provides insight to select design criteria used to project future water demands. Annual average day demand, maximum day to average day peaking factors, and per-capita consumption were reviewed and provided the basis for the design criteria used to project water demands.

Figure ES-1 illustrates the historical and projected water demands for the City of Fulshear.

Figure ES-1: Historical and Projected Water Demands





4.0 EXISTING WATER SYSTEM

The City of Fulshear and the MUDs that serve Cross Creek Ranch withdraw groundwater from six groundwater supply wells at three water plants. The water distribution system consists of a network of 52 miles of water line, which range in diameter from 2-inch to 20-inches. Ground elevations throughout the water service area generally range from 96 feet to 144 feet and the City's system is served by a single pressure plane. The distribution system is supplied by six groundwater wells, five ground storage tanks, two hypopneumatic tanks, three pump stations, one standpipe, and one elevated storage tank at three water plants.

5.0 WATER DISTRIBUTION SYSTEM ANALYSES

A water model was developed and calibrated using H₂OMap Water[®] software by *Innovyze* to conduct hydraulic analyses and identify deficiencies in the City's existing water distribution system. Various combinations of improvements and system modifications were investigated to determine the most appropriate approach to meet projected water demands. These improvements are identified in a capital improvements plan to improve the existing system and meet projected water demands through 2036. Parameters used in developing the capital improvements plan included increasing system reliability, meeting required fire flows, and maintaining proper residual pressures.

The model was used to evaluate the existing distribution system and to assess current pumping and storage capacity, residual pressures, and fire flow capacity. This analysis was performed to identify existing system deficiencies and provide a baseline for the current level of service. Water system improvements were developed to accommodate the anticipated residential and non-residential growth over the next 20 years. Challenges facing the water system include providing additional supply, storage and transmission capacity, meeting service pumping requirements and providing adequate fire flow capacity. The results of the analysis are summarized below:

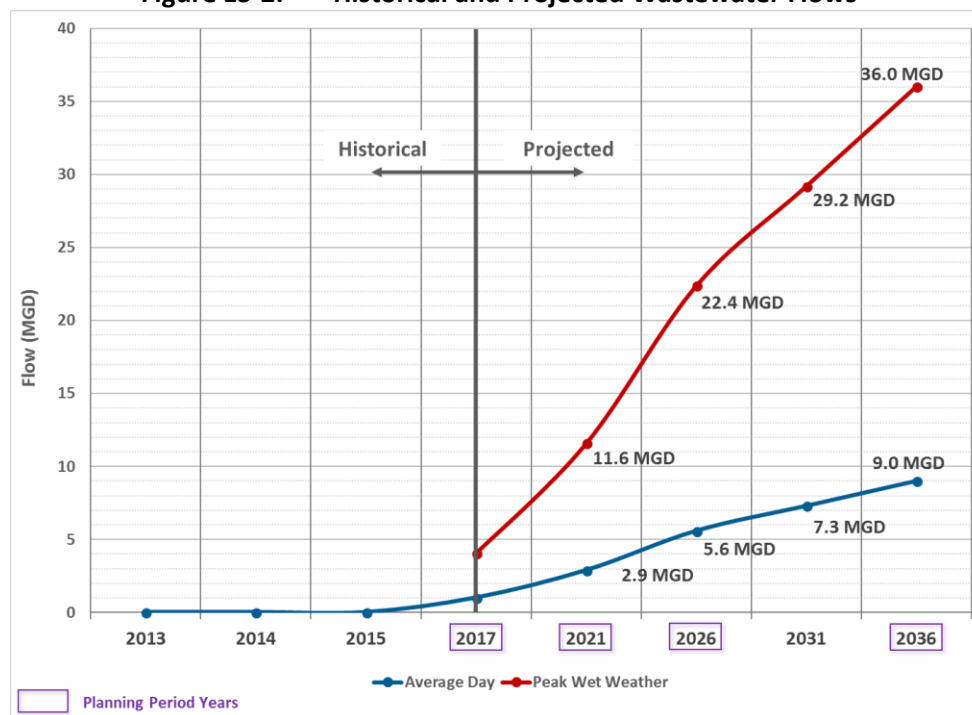
- Three new water plants will be required by 2036. Each water plant includes a 4.0 million gallon per day (MGD) groundwater well, 3.0 million gallons (MG) of ground storage and a 5.75 MGD pump station. The new water plants should be designed to accept surface water from the North Fort Bend Water Authority in 2023/2024.
- Three new elevated storage tanks will be required by 2036, totaling 3.5 MG of elevated storage.
- The majority of the water system will experience available fire flow of at least 1,000 gallons per minute (gpm). Areas with low available fire flow should be evaluated on a case by case basis.



6.0 WASTEWATER FLOWS

In order to estimate future wastewater flows, historical flow data was analyzed to determine the historical trends in system-wide average day wastewater flow and per-capita flow. Both the City and the Cross Creek Ranch MUDs provided monthly treatment plant flow data from 2013 to 2016. Average day wastewater flows for the 2021, 2026 and 2036 planning periods were developed by analyzing historical wastewater flow rates and future growth areas. FNI recommends using a per-capita loading of 100 gallons per capita per day (gpcd) except where development agreements require a higher gpcd. **Figure ES-2** illustrates the historical and projected wastewater flows for the City of Fulshear.

Figure ES-2: Historical and Projected Wastewater Flows



7.0 EXISTING WASTEWATER SYSTEM

The City of Fulshear’s wastewater collection system consists of nine miles of gravity wastewater mains and two miles of force mains, which range in diameter from 3-inch to 12-inch. This does not include the current extensive wastewater infrastructure in the Cross Creek Ranch development (MUD 169). Ground elevations throughout the wastewater service area require five lift stations to convey wastewater flows to the wastewater treatment plant, with two new lift stations currently under design. The existing City of Fulshear wastewater treatment plant (WWTP) site is located near City Hall adjacent to Farm to Market



Road (FM) 1093 and has an existing capacity of 0.5 MGD. The existing 1.5 MGD Cross Creek Ranch WWTP is located north of FM 1093 and southwest of the development.

8.0 WASTEWATER SYSTEM ANALYSES

The City's wastewater model was developed using H₂OMap Sewer[®] software by *Innovyze* to determine the flows and velocities that would occur in a collection system under a specified set of conditions. Hydraulic analyses were conducted to identify deficiencies in the existing wastewater collection system and to establish a capital improvements plan to improve the existing system and accommodate projected wastewater flows through 2036.

To serve the future growth, the City of Fulshear needs to extend service to areas of growth where little or no infrastructure currently exists. The hydraulic model indicates that the modeled wastewater system will experience no significant surcharging during peak flow conditions if all recommended improvements are completed. The results of the analysis are summarized below:

- The Cross Creek Ranch WWTP will require an expansion.
- City of Fulshear Regional WWTP is recommended to be relocated to a new regional WWTP site. This relocation and the construction of a new WWTP will require land acquisition.
- A new diversion lift station near the existing City of Fulshear WWTP site is required to send wastewater flow to the Cross Creek Ranch and new Regional WWTP.
- One new lift station will be required to convey flow from the west side of the City to the new diversion lift station.

9.0 INTEGRATED WATER AND WASTEWATER CAPITAL IMPROVEMENTS PLAN

An integrated water and wastewater capital improvements plan was developed for the City of Fulshear to maintain water and wastewater service that promotes residential and commercial development. The recommended improvements provide the capacity and reliability to meet projected water demands and wastewater flows through year 2036.

Table ES-2 summarizes the costs of the water system capital improvements plan and **Table ES-3** summarizes the costs of the wastewater system capital improvements plan for the City of Fulshear.



Table ES-2: Water Capital Improvements Plan Summary

Phase	Project Number	Project Name	Cost (2018 Dollars)
2017 - 2021 CIP Projects	1	16-inch Huggins Transmission Line	\$1,615,500
	2	12/16-inch FM 359 Transmission Line - Phase I	\$3,118,600
	3	16-inch FM Katy-Fulshear Rd Transmission Line	\$4,939,500
	4	16-inch Katy-Fulshear/McKinnon Rd Transmission Line	\$5,758,100
	5	1.0 MG South Elevated Storage Tank	\$3,120,000
	6	12-inch James Ln Transmission Line	\$1,013,700
	7	12-inch FM 359 Transmission Line - Phase II	\$1,623,600
	2017 – 2021 CIP Total		
2022 – 2026 CIP Projects	8	16-inch Bois D'Arc Lane Transmission Line	\$3,278,600
	9	16-inch Texas Heritage Parkway South Transmission Line - Phase I	\$4,420,800
	10	12/16-inch West Fulshear Transmission Line	\$3,398,000
	11	Water Plant No. 2	\$16,021,200
	12	12-inch Future Polo Ranch Transmission Line	\$2,404,000
	13	16-inch North Fulshear Transmission Line – Phase I	\$3,173,200
	14	16-inch Fulshear Farms Transmission Line Loop	\$2,323,300
	15	16-inch Transmission Line Loop	\$6,217,100
	16	1.0 MG North Elevated Storage Tank	\$3,120,000
	17	16-inch/12-inch Texas Heritage Parkway South Transmission Line - Phase II	\$3,076,800
	2022 - 2026 CIP Total		
2027 – 2036 CIP Projects	18	Water Plant No. 3	\$16,021,200
	19	16-inch South Fulshear Transmission Line – Phase I	\$1,629,600
	20	Water Plant No. 4	\$16,021,200
	21	1.5 MG West Elevated Storage Tank	\$4,680,000
	22	12-inch Bois D'Arc Lane Transmission Line	\$3,283,100
	23	16-inch South Fulshear Transmission Line	\$7,382,400
2027 - 2036 CIP Total			\$49,017,500
Total 25 Year Water CIP Cost			\$117,639,500



Table ES-3: Wastewater Capital Improvements Plan Summary

Phase	Project Number	Project Name	Cost (2018 Dollars)
2017 - 2021 CIP Projects	1	3.0 MGD Cross Creek Ranch WWTP Expansion to 4.0 MGD	\$ 37,440,000
	2	9.3 MGD WWTP Diversion Lift Station and 20-inch Force Main	\$ 11,594,000
	3	24/27/30/36-inch FM 359 Interceptor - Phase I	\$ 6,864,900
	4	30-inch Texas Heritage Parkway Interceptor	\$ 10,019,500
	5	2.6 MGD West Fulshear Lift Station	\$ 1,554,800
	6	15/18-inch West Fulshear Interceptor Phase I	\$ 1,646,000
	2017 - 2021 CIP Total		
2022 - 2026 CIP Projects	7	3.5 MGD Regional Wastewater Treatment Facility	\$ 44,460,000
	8	30/36/48/54-inch Bois D'Arc Interceptor - Phase I	\$ 11,787,300
	9	Expansion of the Diversion Lift Station from 9.3 MGD to 14.6 MGD	\$ 4,233,900
	10	Existing City of Fulshear WWTP Decommission	\$ 448,500
	11	12-inch Fulshear Polo Ranch and McCann Interceptor Phase II	\$ 297,600
	12	18-inch FM 359 Interceptor - Phase II	\$ 1,212,300
	2022 - 2026 CIP Total		
2027 - 2036 CIP Projects	13	21-inch Harrison Interests Interceptor - Phase I	\$ 761,900
	14	18-inch Harrison Interests Interceptor - Phase II	\$ 1,317,500
	15	Regional WWTP Expansion from 3.5 MGD to 6.5 MGD	\$ 37,440,000
	16	21/24-inch Foster Farms Interceptor	\$ 3,417,300
	2027 - 2036 CIP Total		
Total 25 Year Wastewater CIP Cost			\$ 174,495,500



1.0 INTRODUCTION

The City of Fulshear is a community located in southeast Texas, within Fort Bend County. The City and nearby development Cross Creek Ranch (MUD 169) currently provide water and wastewater service to approximately 10,202 residents. Over the next twenty years, the population in the water and wastewater service area is expected to grow to approximately 88,793 residents. Accommodating this growth in an efficient and cost effective manner, while also focusing on the maintenance of existing water and wastewater system assets, is the purpose of this *2018 Water and Wastewater Master Plan*. This report has been prepared to provide the City of Fulshear with a planning tool that will serve as a guide for short-term and long-term improvements to the water and wastewater infrastructure.

1.1 SCOPE OF WORK

Freese and Nichols, Inc. (FNI) was retained by the City of Fulshear in 2016 to prepare a *Water and Wastewater Master Plan*. In 2017, the City amended FNI's contract to evaluate integrating the City and Cross Creek Ranch water and wastewater systems. The goals of the *Water and Wastewater Master Plan* were to evaluate the integrity of the existing water and wastewater systems and to recommend a phased capital improvement plan (CIP) through the year 2036. The recommended improvements will serve as a basis for the design, construction, and financing of facilities required to meet Fulshear's water and wastewater capacity needs. The major elements of the scope of this project included:

- Population and Land Use Projections
- Water Model Development and Calibration
- Wastewater Model Development and Verification
- Water Demand and Wastewater Flow Projections
- Water Distribution and Wastewater Collection System Hydraulic Analyses
- Integrated Water and Wastewater Capital Improvements Plan
- Water and Wastewater Master Plan Report



1.2 LIST OF ABBREVIATIONS

Table 1-1 provides a list of abbreviations used throughout this report and its appendices.

Table 1-1: List of Abbreviations

Abbreviation	Actual
AD	Average Day
AADF	Annual Average Day Flow
CIP	Capital Improvements Plan
EST	Elevated Storage Tank
ETJ	Extra Territorial Jurisdiction
FM	Farm to Market Road
FNI	Freese and Nichols, Inc.
ft/sec	Feet per Second
GCWA	Gulf Coast Water Authority
GIS	Geographic Information System
gpcd	Gallons per Capita per Day
gpm	Gallons per Minute
GST	Ground Storage Tank
HGL	Hydraulic Grade Line
MD	Maximum Day
MG	Million Gallons
MGD	Million Gallons per Day
MUD	Municipal Utility District
NFBWA	North Fort Bend Water Authority
PH	Peak Hour
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
q/Q	Flow in the line divided by the maximum capacity of the line
SCADA	Supervisory Control and Data Acquisition
TCEQ	Texas Commission on Environmental Quality
TPDES	Texas Pollutant Discharge Elimination System
TIN	Triangular Irregular Network
WP	Water Plant
WWTP	Wastewater Treatment Plant



2.0 POPULATION

Population and future land use are important elements in the analysis of water distribution and wastewater collection systems. Water demands and wastewater loads are dependent on the residential population and commercial development served by the systems and determine the sizing and location of system infrastructure. A thorough analysis of projected populations provides the basis for future water demands and wastewater loads.

2.1 HISTORICAL POPULATION

Table 2-1 presents the estimated historical populations for the City of Fulshear. The 2013 population was estimated using historical water billing data for the City and Cross Creek Ranch. The City of Fulshear provided population estimates based on active trash accounts for 2014 and 2015 in the *Development Indicator Spreadsheet*.

Table 2-1: Historical Population

Year	Water/ Wastewater Served Population ⁽¹⁾	Growth Rate
2013	7,174	-
2014	7,899	10%
2015	9,078	15%
2016	9,640	6%
2017	10,202	6%

(1) Population includes City limits and part of ETJ.

2.2 WATER SERVICE AREA

The water service area is shown on **Figure 2-1**. This master plan assumes that, over the next twenty years, the City will provide water service to residents of the City of Fulshear Extra Territorial Jurisdiction (ETJ) who are not in the Jordan Ranch, Churchill Farms, Firethorne, or Tamarron developments. The water service area consists of approximately 45 square miles.

2.3 WASTEWATER SERVICE AREA

The wastewater service areas are shown on **Figure 2-2**. This master plan assumes that, over the next twenty years, the City will provide wastewater service to residents of the City of Fulshear ETJ who are not in the Churchill Farms, Firethorne, or Tamarron developments. The wastewater service area consists of approximately 47 square miles.

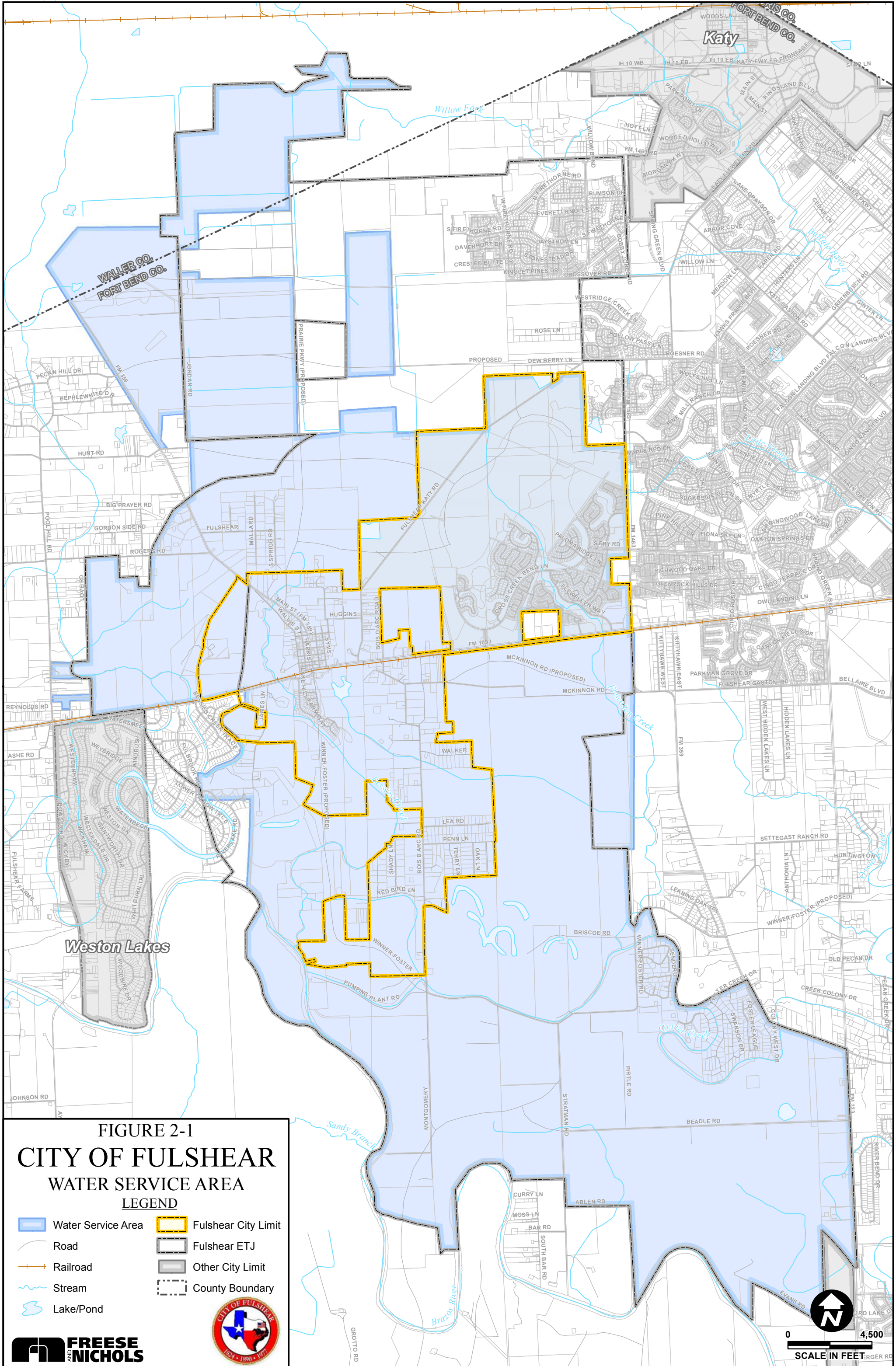











FIGURE 2-1
CITY OF FULSHEAR
WATER SERVICE AREA
LEGEND

-  Water Service Area
-  Fulshear City Limit
-  Road
-  Fulshear ETJ
-  Railroad
-  Other City Limit
-  Stream
-  County Boundary
-  Lake/Pond



0 4,500
 SCALE IN FEET

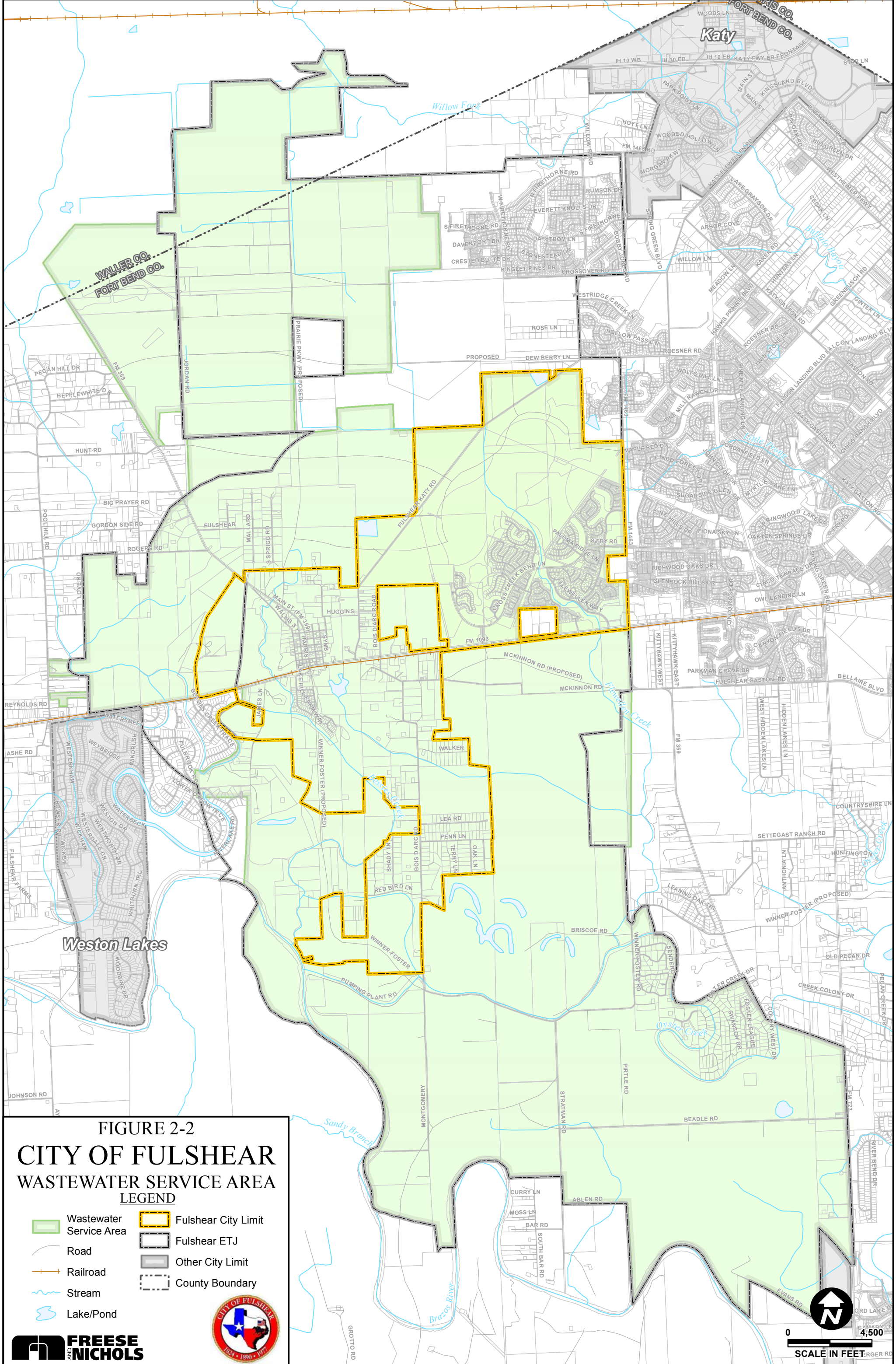












FIGURE 2-2
CITY OF FULSHEAR
WASTEWATER SERVICE AREA
LEGEND

-  Wastewater Service Area
-  Fulshear City Limit
-  Road
-  Fulshear ETJ
-  Railroad
-  Other City Limit
-  Stream
-  County Boundary
-  Lake/Pond



0  4,500
 SCALE IN FEET



2.5 PROJECTED POPULATION

The magnitude and distribution of the growth in population will dictate where future water and wastewater infrastructure is required. It is important to note that projecting future population is challenging, especially for relatively small geographic areas such as individual cities because it can be difficult to predict how fast or slow development will occur when there are a variety of circumstances that can impact it.

City staff identified areas where residential and non-residential developments are expected to occur. **Figure 2-3** identifies the location of each of these anticipated developments. FNI reviewed the development agreements provided by City staff, as not all anticipated developments will receive water and wastewater service from the City. The projected water and wastewater service area populations for each planning period are shown in **Table 2-2**. The 2016 water and wastewater service area populations were based on active trash accounts for 2016 in the *Development Indicator Spreadsheet*.

Table 2-2: Projected Population

Year	Service Area Population ⁽¹⁾	
	Water	Wastewater
2017	10,202	10,202
2021	25,631	29,090
2026	46,940	55,512
2036	74,494	88,794

(1) Jordan Ranch development is included in the wastewater service area, and not in the water service area.

Where available, the buildout equivalent single family connections for each development were taken from the development agreements provided by the City. The *2017 Demographic Update for Lamar Consolidated Independent School District (ISD)* and *2016 Demographic Update for Katy ISD* were used to estimate the five and ten year populations for each development. Water demand projections were developed for each planning year and wastewater flows were distributed throughout the City using the anticipated developments. Detailed information on population, water and wastewater flow projections for each development are included in **Appendix A**.

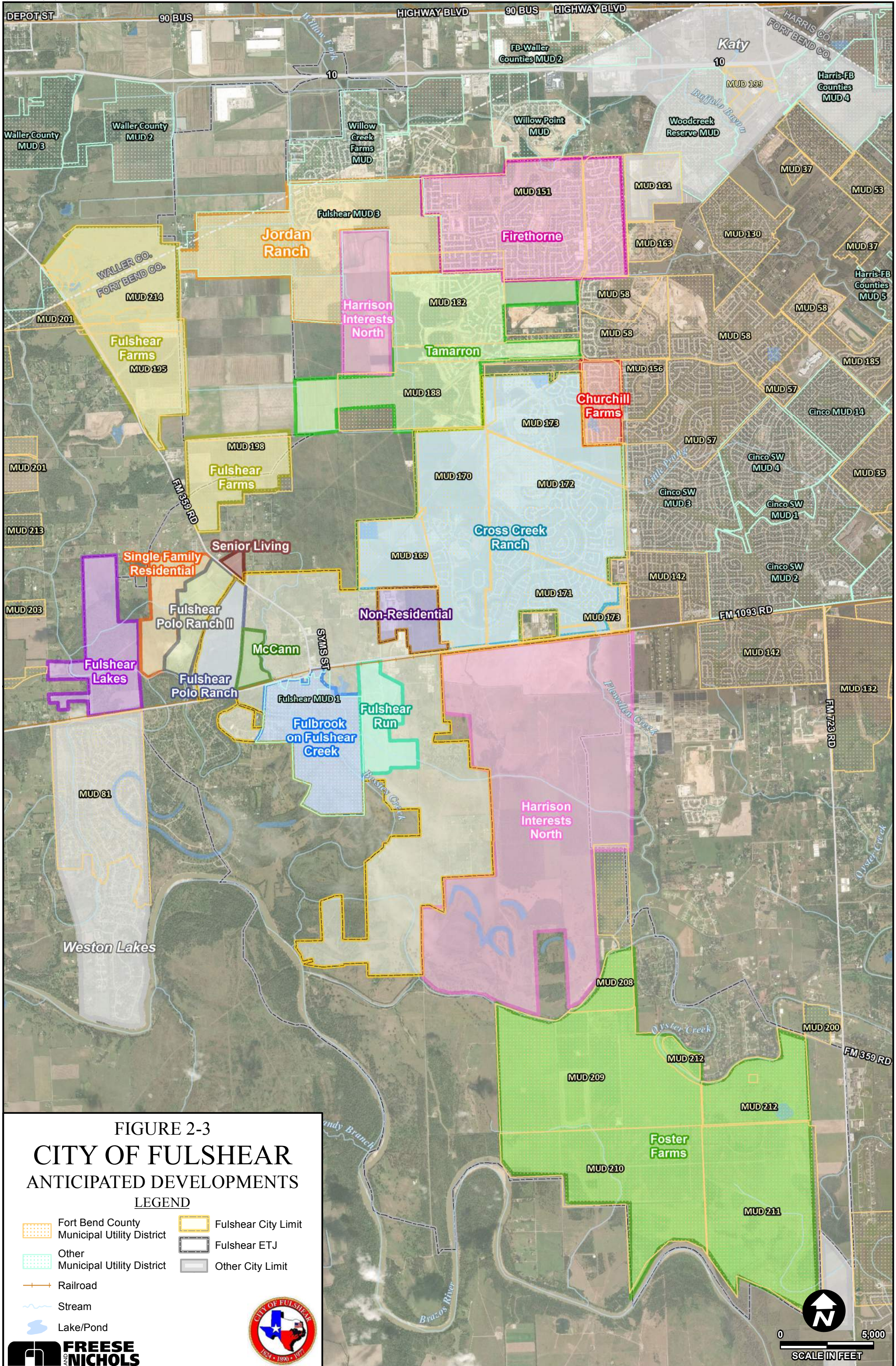


FIGURE 2-3

CITY OF FULSHEAR ANTICIPATED DEVELOPMENTS

LEGEND

- Fort Bend County Municipal Utility District
- Other Municipal Utility District
- Railroad
- Stream
- Lake/Pond
- Fulshear City Limit
- Fulshear ETJ
- Other City Limit





3.0 WATER DEMANDS

A water utility must be able to supply water at rates that fluctuate over time. Yearly, monthly, daily, and hourly variations in water use occur, with higher use typically occurring during dry years and in hot months. Water use typically follows a diurnal pattern, being low at night and peaking in the early morning and late afternoon. Demand conditions most important to the hydraulic design and operation of a distribution system are average day (AD), maximum day (MD), and peak hour (PH) demands. Average day use is the total annual water use divided by the number of days in the year. The average day demand rate is used as a basis for estimating maximum day and peak hour demands. Maximum day demand is the maximum quantity of water used on any one day of the year. Water supply facilities are typically designed based on the maximum day demand. Peak hour use is the peak rate at which water is required during any one hour of the year. Since minimum distribution pressures are usually experienced during peak hour, the sizing and location of distribution facilities are generally determined based on this condition.

3.1 HISTORICAL WATER DEMANDS

Reviewing historical water demands provided insight into the City’s daily average production requirement. Both the City and Cross Creek Ranch provided historical water usage data consisting of monthly consumption from 2013 through 2016. This data provided the basis for calculating the daily average used to determine historical water demands. **Table 3-1** and **Table 3-2** illustrate the historical water production for the City of Fulshear and Cross Creek Ranch, respectively.

Table 3-1: City of Fulshear - Historical Water Usage (2013 – 2016)

Year	Water Service Area Population	Annual Average Day Demand (MGD)	Annual Average Day Demand (gpcd)	Maximum Day Demand (MGD)	Maximum Day to Average Day Peaking Factor
2013	1,174	0.13	115	0.33	2.4
2014	1,338	0.15	109	0.35	2.4
2015	1,465	0.19	131	0.55	2.9
2016	1,550	0.26	171	1.00	3.8
Average	-	0.18	132	0.56	2.9
Maximum	-	0.26	171	1.00	3.8



Table 3-2: Cross Creek Ranch - Historical Water Usage (2013 – 2016)

Year	Water Service Area Population	Annual Average Day Demand (MGD)	Annual Average Day Demand (gpcd)	Maximum Day Demand (MGD)	Maximum Day to Average Day Peaking Factor
2013	6,000	0.66	111	1.77	2.7
2014	6,561	0.80	121	1.82	2.3
2015	7,613	0.91	119	2.99	3.3
2016	8,090	1.05	130	3.25	3.1
Average	-	0.85	120	2.46	2.8
Maximum	-	1.05	130	3.25	3.3

Reviewing historical water demands allows design criteria to be selected in order to project future water demands. Historical annual average day demand in million gallons per day (MGD), maximum day to average day peaking factors, and per-capita consumption in gallons per capita day (gpcd) were reviewed and provided a basis for determining the design criteria used to project water demands. Average day per capita water usage ranged from 109 gpcd to 171 gpcd, with an average of 126 gpcd. Historical water usage data indicated the maximum day to average day peaking factor ranged from 2.4 to 3.8, with an average of 2.9.

3.2 PROJECTED WATER DEMANDS

The evaluation of historical data provided the basis for determining the design criteria used to project water demands. Based on the review of this data and the need to plan for low rainfall (dry) years with minimal water restrictions, FNI recommends using an average day demand of 130 gallons per capita day (gpcd) except where development agreements require a specific gpcd. In selecting a peaking factor to project maximum day demands, FNI reviewed historical peaking factors and the years in which those peaking factors occurred, as just using the highest values for per-capitas and peaking factors may not be representative. Based on the historical range of peaking factors, FNI recommends using a maximum day to average day peaking factor of 3.0. Hourly Supervisory Control and Data Acquisition (SCADA) data was not available so a peak hour to maximum day peaking factor of 1.25 was selected based on prior experience with cities similar in size to Fulshear. These water demand design criteria are summarized in **Table 3-3**.



Table 3-3: Water Demand Design Criteria

Gallons per Capita per Day	Maximum Day to Average Day Peaking Factor	Peak Hour to Maximum Day Peaking Factor
130	3.0	1.25

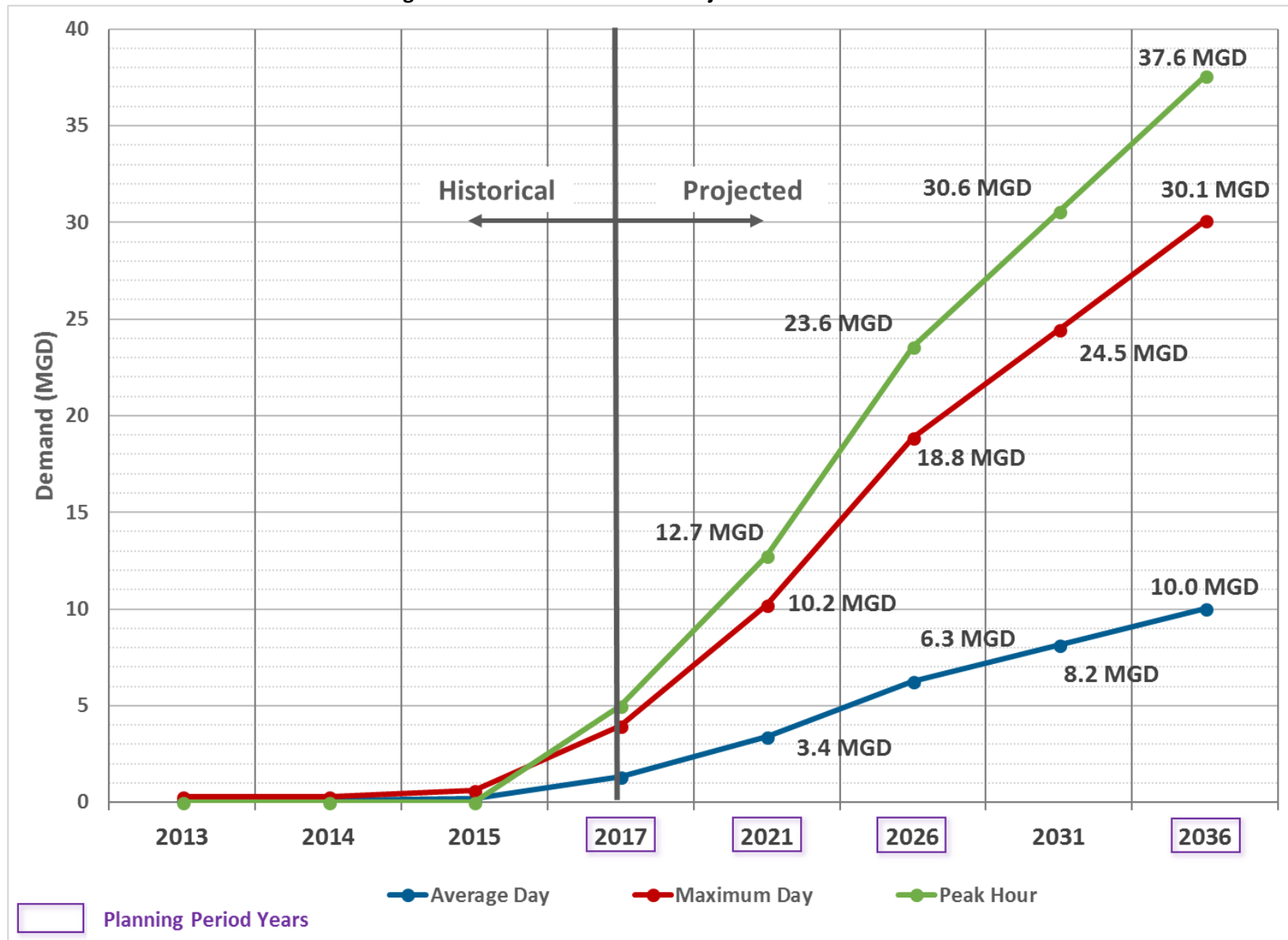
Using a combination of the water demand design criteria received from developers and that presented in **Table 3-3**, water demands were projected for 2017, 2021, 2026 and 2036. **Figure 3-1** illustrates the historical and projected water demands for the City of Fulshear. The projected population and water demands are summarized for each planning period in **Table 3-4**.

Table 3-4: Projected Water Demands

Year	Projected Water Service Area Population	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Peak Hour Demand (MGD)
2017	10,202	1.33	4.0	5.0
2021	25,631	3.40	10.2	12.7
2026	46,940	6.28	18.8	23.6
2036	74,494	10.03	30.1	37.6



Figure 3-1: Historical and Projected Water Demand





4.0 EXISTING WATER SYSTEM

The City of Fulshear and Cross Creek Ranch water distribution systems consist of a network of approximately 52 miles of water line, one elevated storage tank (EST) and three water plants with six groundwater supply wells, five ground storage tanks (GST), two hydropneumatic tanks, and three pump stations. These systems are currently operated separately. As part of the Master Plan, the systems were analyzed considering that they will be interconnected in future. **Figure 4-1** shows the existing water distribution system for the City of Fulshear.

4.1 PRESSURE PLANES AND WATER STORAGE FACILITIES







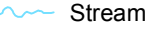

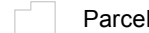

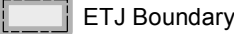
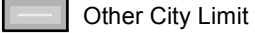
The water distribution system operates on a single pressure plane. Ground elevations within the existing system range from 96 feet to 144 feet. Pressure is maintained throughout the system by the 0.25 MG Water Plant No. 1 EST and hydropneumatic tanks in Cross Creek Ranch. These tanks establish the hydraulic grade line (HGL) for the City’s pressure plane. The overflow elevation of the elevated tank is 278 feet, which translates to a minimum static head of 58 pounds per square inch (psi) and maximum static head of 79 psi. In addition to the EST and hydropneumatic tanks, the system also has ground storage tanks and a standpipe operated as ground storage. The existing system water storage facilities are summarized in **Table 4-1**.

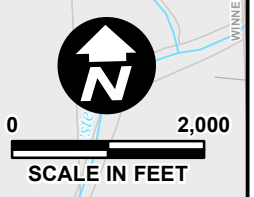
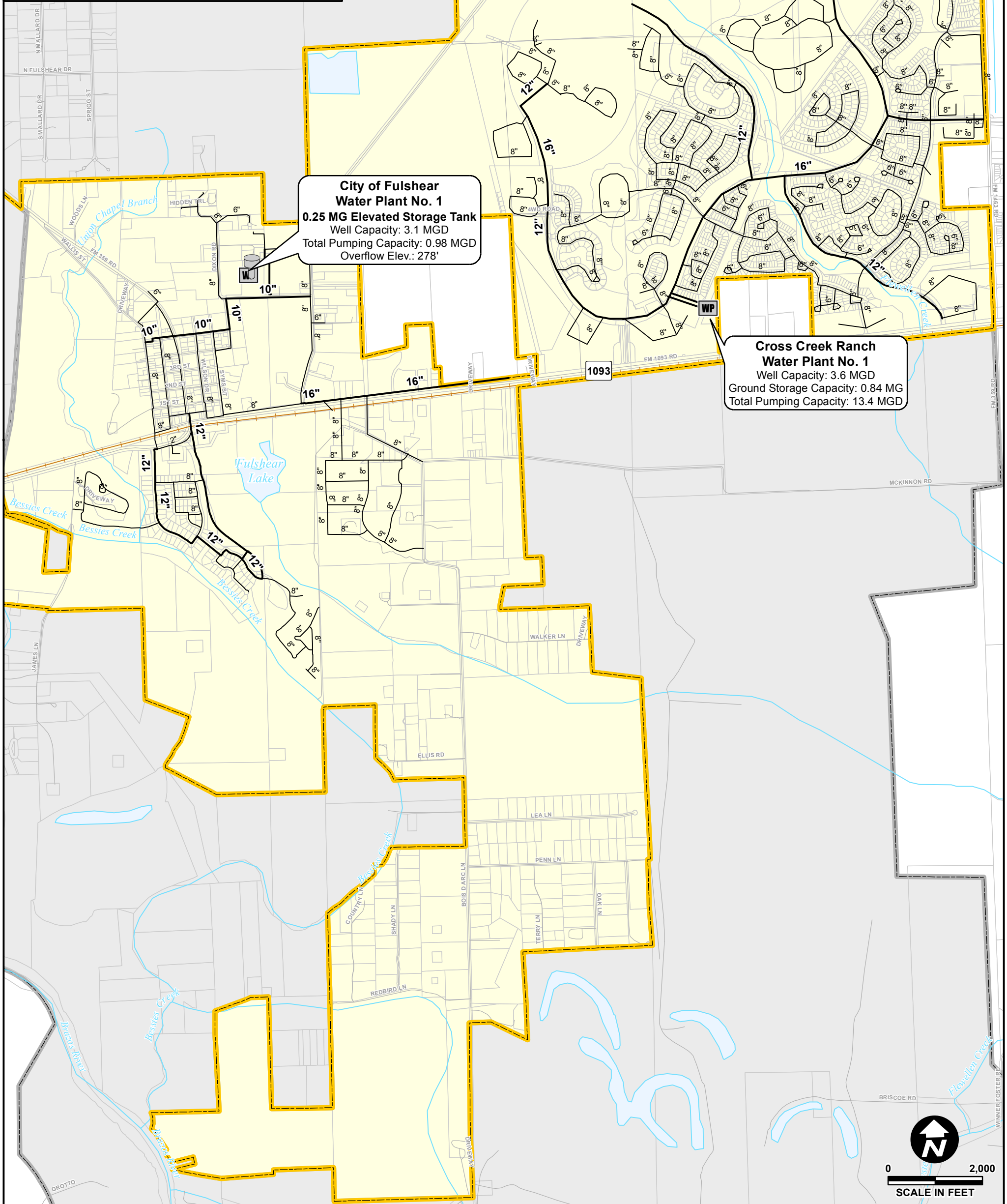
Table 4-1: Existing Storage Facilities

Location	Tank Name	Type	Capacity (MG)
City of Fulshear Water Plant No. 1	EST	Elevated	0.25
	Standpipe	Ground	0.085
	GST No. 1	Ground	0.15
Cross Creek Ranch WP #1	CCR WP #1 GST No. 1	Ground	0.42
	CCR WP #1 GST No. 2	Ground	0.42
	Hydropneumatic	Ground	0.015
Cross Creek Ranch WP #2	CCR WP #2 GST No. 1	Ground	0.42
	CCR WP #2 GST No. 2	Ground	0.44
	Hydropneumatic	Ground	0.015
Total Elevated Storage			0.25
Total Storage			2.19

FIGURE 4-1 CITY OF FULSHEAR EXISTING WATER SYSTEM

LEGEND

-  Elevated Storage Tank
-  Water Plant
-  8" and Smaller Water Line
-  10" and Larger Water Line
-  Road
-  Railroad
-  Stream
-  Lake/Pond
-  Parcel
-  City Limit
-  ETJ Boundary
-  Other City Limit





4.2 GROUNDWATER SUPPLY AND PUMPING CAPACITY

The City relies on six groundwater well to supply drinking water to its residents. **Table 4-2** provides a summary of existing groundwater well capacities.

Table 4-2: Existing Groundwater Well Capacity

Location	Well	Well Capacity (gpm)
City of Fulshear Water Plant No. 1	No. 1	105
	No. 2	230
	No. 3	1,800
Cross Creek Ranch WP #1	No. 1	1,500
	No. 2	1,000
Cross Creek Ranch WP #2	No. 1	1,650
Total (gpm)		6,285
Total (MGD)		9.05

The City utilizes three pump stations to distribute groundwater to residents. **Table 4-2** provides a summary of existing service pumping capacities at each water plant.

Table 4-3: Existing Service Pumping Capacity

Location	Pump Number	Rated Capacity	
		(gpm)	(MGD)
City of Fulshear WP #1	1	180	0.26
	2	500	0.72
Cross Creek Ranch WP #1	1	500	0.72
	2	2,200	3.17
	3	2,200	3.17
	4	2,200	3.17
	5	2,200	3.17
Cross Creek Ranch WP #2	1	500	0.72
	2	2,200	3.17
	3	2,200	3.17
System Total		14,880	21.43
System Firm ⁽¹⁾		12,680	18.26

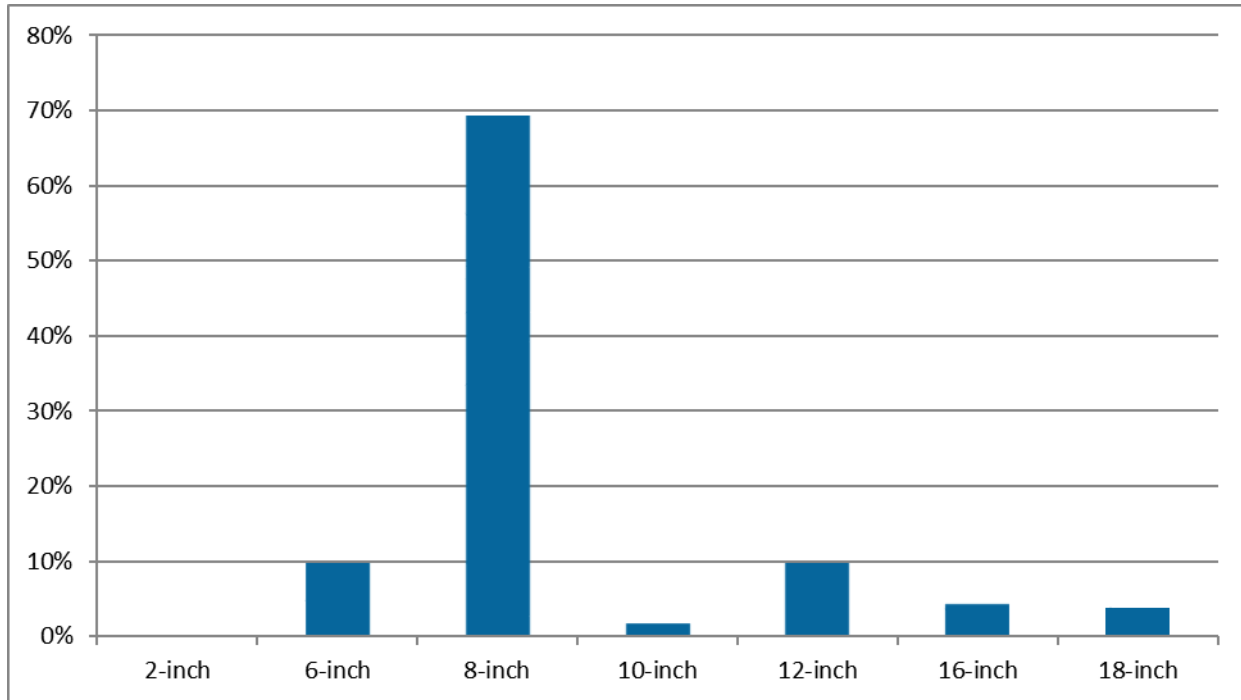
(1) Pumping capacity with the largest pump out of service.



4.3 WATER LINES

The City of Fulshear’s distribution system consists of approximately 52 miles of water lines. Water line diameters range in size from 2-inch to 20-inches. **Figure 4-2** illustrates the percentage of pipe length by diameter based on as-builts provided by the City. Almost 70% percent are 8-inch water lines.

Figure 4-2: Pipe Diameter by Length





5.0 WATER SYSTEM ANALYSES AND HYDRAULIC MODELING

A water model was developed and calibrated in order to conduct hydraulic analyses and identify deficiencies in the City of Fulshear’s existing water distribution system and to establish a capital improvements plan to improve the existing system and meet projected water demands through 2036. Various combinations of improvements and system modifications were investigated to determine the most appropriate approach for meeting projected demands. Parameters used in developing the capital improvements plan included increasing system reliability, meeting required fire flows, and maintaining proper residual pressures.

5.1 WATER MODEL DEVELOPMENT

The hydraulic model is one of the most critical elements in the analysis of water distribution systems. A calibrated water model serves as a key decision making tool to help determine the sizing and location of system infrastructure in both the present and future planning periods. The following subsections document the development and calibration of the water system hydraulic model to be used as part of this Master Plan. The procedures used for model construction are presented, as well as the results of the calibration process.

5.1.1 Field Testing

To assist with model calibration and to supplement available operational data, field pressure testing was conducted August 4 – September 29, 2016. A total of four temporary pressure recorders were installed throughout the distribution system. Locations of the pressure recorders are illustrated on **Figure B-1** in **Appendix B**. Minimum, maximum, and average pressure was recorded every 5 minutes at each location using Telog® brand pressure recorders. **Appendix B** includes the pressure recorder data from the field testing period.

5.1.2 Physical Network and Demand Allocation

The City’s water model was developed using H₂OMap Water® software by *Innovyze* and includes all pipes 6-inches and larger in the distribution system. City staff provided as-built plans that were converted to Geographic Information System (GIS) shapefiles and imported into the model. The existing system model includes approximately 126 pipes, ranging in size from 6- to 16-inches. Initial Hazen-Williams roughness coefficients for pipes were assigned as 120 based on the assumption that all pipe materials were Polyvinyl Chloride (PVC). Model nodes in the distribution system were assigned an elevation based on publicly available ground contour data.



The pumping and storage facilities were manually added to the model based on as-built drawings and information provided by the City. FNI spatially distributed water demands to the model using water meter billing data. The water demand for residents of Fulbrook on Fulshear Creek was distributed based on parcels with active trash accounts. The active trash accounts were spatially located and the estimated consumption was assigned to the nearest model node.

5.2 WATER MODEL CALIBRATION

To verify that the hydraulic model accurately represented the actual distribution system, a steady state model calibration was performed. The calibration process involved adjusting system operation, C-values, demand allocation, and peaking factors to match a known condition. The average pressure from the 24-hour period occurring on August 16, 2016, from 12:00 am to 11:59 pm was selected for calibration. Minor demand distribution adjustments were made to the model during the steady state calibration in order to match the known conditions of August 16, 2016. A summary of the calibration results is shown in **Table 5-1**. The percent difference between modeled and measured pressures were within five percent at each pressure recorder location. The results demonstrate a good correlation between recorded and modeled values and provide confidence in the accuracy of the model.

Table 5-1: Calibration Results

Pressure Recorder	Address	Modeled Pressure (psi)	Measured Average Pressure (psi)	% Difference in Modeled vs. Measured Pressure
1	Cross Creek Ranch at FM 1093	61	58	5%
2	FM 1093	63	60	5%
3	City Water Plant	60	58	3%
4	Valley Terrace at Trickle Creek	72	72	0%

5.3 EXISTING WATER SYSTEM ANALYSIS

The existing distribution system was evaluated to assess current supply, pumping, and storage capacity, residual pressures, and fire flow capacity. This analysis was performed to determine if there are any existing system deficiencies and also to provide a baseline for the current level of service. The parameters that were evaluated are discussed in the following sections.

5.3.1 Existing Water Supply Capacity

As a public water utility, the City of Fulshear must comply with the rules and regulations for public water systems set forth by the Texas Commission on Environmental Quality (TCEQ) in Chapter 290. The City is required to meet TCEQ water supply requirements of having two or more wells with a total capacity of



0.6 gpm per connection. The estimated existing number of equivalent connections was used to calculate the minimum required water supply capacity. **Table 5-2** presents the TCEQ water supply requirements for the existing water system.

Table 5-2: 2017 TCEQ Water Supply Capacity Requirements

Water Service Area Population	Estimated Number of Connections	Existing Water Supply Capacity (MGD)	TCEQ Requirement 0.6 gpm/con (MGD)
10,202	3,401	9.05	2.9

Based on the regulations, the City is currently in compliance with the minimum water supply capacity requirement.

5.3.2 Existing Storage Capacity

The City is required to meet the TCEQ total storage capacity requirement of 200 gallons per connection and elevated storage capacity requirement of 100 gallons per connection. The estimated existing number of connections was used to calculate the TCEQ minimum required storage. **Table 5-3** presents the TCEQ storage requirements for the existing water system.

Table 5-3: 2017 TCEQ Storage Capacity Requirements

Water Service Area Population	Estimated Number of Connections	Total Storage (MG)		Elevated Storage (MG)	
		Existing	Required (200 gal/con)	Existing	Required (100 gal/con)
10,202	3,401	2.19	0.68	0.25	0.34

Based on the regulations, the City is in compliance with the minimum amount of total storage capacity requirements. Cross Creek Ranch utilizes hydropneumatic tank and large pumping capacity in lieu of elevated storage. Since the City of Fulshear is currently hydraulically separated from Cross Creek Ranch, the City is in compliance with the minimum amount of elevated storage capacity requirements based on 545 connections or 0.06 MG required elevation storage capacity. However, Table 5-3 shows that the combined system will be deficient in elevated storage capacity. This Master Plan includes recommendations for the construction of ESTs for the combined system.



5.3.3 Existing Pumping Capacity

In addition to storage and water supply requirements, the City is also required to meet the service pumping capacity requirements presented in **Table 5-4**. **Table 5-5** presents the TCEQ service pumping requirements for the existing water system.

Table 5-4: TCEQ Service Pumping Requirements

Condition	Service Pumping Capacity Requirement ⁽¹⁾
1. If providing at least 200 gallons per connection of elevated storage	Two service pumps with a minimum combined capacity of 0.6 gpm per connection at each pressure plane
2. If providing less than 200 gallons per connection of elevated storage	The lesser of (a) or (b):
	(a) Total pumping capacity of 2.0 gpm per connection
	(b) Total capacity of at least 1,000 gpm and the ability to meet peak hourly demands with the largest pump out of service

(1) According to 290.45(b)(1)(D)(iii).

Table 5-5: 2017 TCEQ Pumping Capacity Requirements

Water Service Area Population	Number of Connections	Peak Hour Demand (MGD)	Existing Firm Pumping Capacity (MGD)	TCEQ Requirement 2.0 gpm/con (MGD)
10,202	3,401	5.0	18.26	9.79

Since the elevated storage capacity in the water system is less than 200 gallons per connection, Condition 2 from **Table 5-4** applies to the water system for pumping capacity. Based on the regulations, the City is currently in compliance with the minimum pumping capacity requirements.

5.3.4 Hydraulic Analysis

Steady-state hydraulic analyses were performed on the distribution system under maximum day demand conditions. The peak hour demand was simulated by applying the peak hour to maximum day peaking factor of 1.25. Peak hour demand represents the single hour of the year with the highest system demand. Peak hour simulations are used to assess the ability of the distribution system to maintain residual pressures because the highest demand period typically induces the lowest pressure due to increased headloss throughout the system. The TCEQ minimum required pressure within a distribution system is 35 psi under normal operating conditions. A review of modeled existing pressures throughout the system did not indicate any areas of low pressure.



In addition to documenting minimum pressures under maximum day demands, FNI analyzed and evaluated the existing system water lines based on the following headloss criteria:

- Water lines 16-inches in diameter and smaller: maximum headloss of 7 feet per 1,000 ft of water line length
- Water lines larger than 16-inches: maximum headloss of 3 feet per 1,000 ft of water line length

A review of existing headloss and velocities did not indicate any lines that experienced excessive head loss and/or velocities in the water lines.

5.3.5 Fire Flow Analysis

To evaluate the fire suppression capabilities of the system, a fire flow analysis was conducted under maximum day demand conditions. TCEQ requires a minimum residual pressure of 20 psi be maintained while delivering the fire flow demand. For this analysis, a steady-state model run was utilized to calculate the available fire flow at each fire hydrant node in the system with a pressure of 20 psi. The majority of the City has an available fire flow greater than 1,000 gpm, which is a typical residential fire flow demand. Available fire flows below 1,000 gpm are due to small diameter and/or dead end lines and areas of higher elevation. Upsizing of smaller lines, looping and increasing pressure are three methods to improve low fire flow. Available fire flow for commercial, multi-family, and industrial land uses should be evaluated on a case by case basis and compared to the model results to determine if adequate fire flow is available.

5.4 FUTURE WATER SYSTEM ANALYSIS

Water system improvements were developed to accommodate the anticipated residential and non-residential growth over the next 20 years. Parameters used in developing the capital improvements plan included increasing water supply, storage and transmission capacity, meeting service pumping requirements, meeting required fire flows, and maintaining proper residual pressures.

5.4.1 North Fort Bend Water Authority Water Supply

In 2008, the North Fort Bend Water Authority (NFBWA) published its Groundwater Reduction Plan. This plan established increasing surface water conversion requirements as seen in **Table 5-6**. For the communities that it chooses to convert to surface water, the NFBWA will provide 90% of the average annual day water demand. The NFBWA also requires a minimum additional groundwater well supply capacity of 0.25 gpm/connection. Because the groundwater and surface water supplies will be mixing, chloramine disinfection is required at all connected groundwater plants. Therefore, the City of Fulshear,



Cross Creek Ranch and Municipal Utility Districts (MUD) No. 1 through 3 water systems must all convert to chloramine disinfection before receiving NFBWA surface water by 2023 or 2024. The NFBWA provided the water supply rate information included in **Table 5-7**.

Table 5-6: NFBWA Surface Water Supply Requirements

Planning Period	Surface Water Supply Requirement
2010 - 2024	30%
2025 - 2034	60%
2036 and Beyond	80%

Table 5-7: NFBWA Water Supply Rates

Water Supply	NFBWA Rate
Surface Water	\$3.70/1,000 gal
Groundwater	\$3.35/1,000 gal
Reuse Credit	\$0.75/1,000 gal

5.4.2 Future Required Water Supply Capacity

Table 5-8 shows the TCEQ water supply requirement for future planning periods versus the recommended water supply based on projected maximum day water demands.

Table 5-8: Projected Water Supply Capacity Requirements

Planning Period	Water Service Area Population	Estimated Number of Connections	Existing Water Supply Capacity (MGD)	Water Supply (MGD)	
				TCEQ Requirement (0.60 gpm per con)	Recommended Capacity ⁽¹⁾
2021	25,631	8,544	9.05	7.4	11.43
2026	48,759	15,647	9.05	13.5	21.08
2036	74,494	24,831	9.05	21.5	32.45

(1) It is recommended that water supply capacity be equal to the projected maximum day demand, which is higher than the TCEQ minimum requirement.

It is recommended that the City plan to accept surface water supply from NFBWA at all water plants in the form of 90% of the average day demand starting in 2023 or 2024. Cross Creek Ranch Water Plant No. 3 is currently under design with 2.4 MGD of groundwater supply, 0.43 MG ground storage and 4,900 gpm service pumping capacity. It is also recommended that the City plan to construct of Fulshear Water Plant



No. 2 with a 4 MGD groundwater well by 2026 and construct the City of Fulshear Water Plants No. 3 and 4 each with a 4 MGD groundwater well by 2036.

5.4.3 Future Required Storage Capacity

Table 5-9 shows the TCEQ storage requirements for future planning periods versus the recommended storage based on projected maximum day water demands.

Table 5-9: Projected Storage Capacity Requirements

Planning Period	Water Service Area Population	Number of Connections	Total Storage (MG)		Elevated Storage (MG)	
			Required (200 gal/con)	Recommended	Required (100 gal/con)	Recommended
2021	25,631	8,544	1.71	2.62	0.85	1.25
2026	46,940	15,647	3.13	5.62	1.56	2.25
2036	74,494	24,831	4.97	11.62	2.48	3.75

It is recommended that the City plan to construct 3 MG of ground storage tank capacity at each new water plant location, a 1.0 MG elevated storage tank by 2021, a 1.0 MG elevated storage tank by 2026, and a 1.5 MG elevated storage tank by 2036.

5.4.4 Future Required Service Pumping Capacity

Table 5-10 shows the TCEQ service pumping requirements for future planning periods versus the recommended service pumping based on projected maximum day water demands. As the elevated storage requirements are less than 200 gallons per connection, criteria 2(b) from **Table 5-4** is applicable which requires total pumping capacity of at least 1,000 gpm and the ability to meet peak hourly demands with the largest pump out of service.

Table 5-10: Projected Service Pumping Capacity Requirements

Year	Water Service Area Population	Number of Connections	Existing Firm Pumping Capacity (MGD)	Required (1,000 gpm Total and Peak Hour with Firm)	Recommended Capacity (MGD)
2021	25,631	8,544	18.26	12.74	25.32
2026	46,940	15,647	18.26	23.56	31.07
2036	74,494	24,831	18.26	37.61	42.57

It is recommended that the City plan to construct a 5.75 MGD City of Fulshear Water Plant No. 2 by 2026 and 5.75 MGD City of Fulshear Water Plant Nos. 3 and 4 by 2036.



5.4.5 Water System Improvements

FNI worked with City staff to develop and identify water system improvements to accommodate future growth while optimizing the existing system operations and infrastructure. Major improvements to the distribution system include large diameter transmission lines along planned major thoroughfares and new water plants and elevated storage tanks distributed throughout the City. The improvements will result in increased system reliability and available fire flow capacity. Specific capital improvement projects to accomplish the above are discussed in detail in **Section 9.0**.

Hydraulic analyses of the maximum day and fire flow scenarios were performed to confirm that CIP projects addressed existing and future water system deficiencies. Under 2036 maximum day demand conditions with recommended improvements, the minimum water system pressure is anticipated to be 50 psi and the available fire flow capacity is anticipated to be 2,000 gpm in the majority of the water system. In areas with isolated lines, small diameter pipes, and dead-end water lines, the available fire flow is anticipated to be less than 2,000 gpm.

A summary of the proposed water system design criteria is shown in **Table 5-11**.



Table 5-11: Proposed Design Criteria

	Evaluation Parameter	FNI Recommendation	TCEQ Requirement	Reference Standard
Water Supply Capacity	Water Supply	Maximum Day Demand (0.9 gpm/con)	0.6 gpm/con	TCEQ 290.45(b)(1)(D)(i)
Pumping and Storage Capacity	Total ground and elevated storage	200 gal/con	200 gal/con	TCEQ 290.45(b)(1)(D)(ii)
	Elevated storage	100 gal/con	100 gal/con	TCEQ 290.45(b)(1)(D)(iv)
	Service Pumping Requirement – Condition 1	N/A	If Elevated Storage > 200 gal/con: 0.6 gpm/con	TCEQ 290.45(b)(1)(D)
	Service Pumping Requirement – Condition 2	If Elevated Storage < 200 gal/con: at least 1,000 gpm and ability to meet PH demands with firm pumping capacity		TCEQ 290.45(b)(1)(D)
Pressure	Maximum Pressure	80 psi	-	Developed for this Study
	Minimum Pressure (PH)	40 psi	35 psi	TCEQ 290.44(d)
	Minimum Pressure (MD + FF)	20 psi	20 psi	TCEQ 290.44(d)
Fire Flow Requirements	Minimum fire flow	1,000 gpm	-	Developed for this Study
Velocity and Headloss	<i>Water Transmission Lines (diameter larger than 16-inches)</i>			
	Maximum Pipeline velocity (MD)	5 ft/s	5 ft/s	AWWA M32 Manual
	Maximum Pipeline velocity (MD + FF)	10 ft/s	10 ft/s	AWWA M32 Manual
	Maximum friction loss	3 ft/1,000 ft	5 ft/1,000 ft	AWWA M32 Manual
	<i>Water Distribution Lines (diameter 16-inches and smaller)</i>			
	Maximum Pipeline velocity (MD)	5 ft/s	5 ft/s	AWWA M32 Manual
	Maximum Pipeline velocity (MD + FF)	10 ft/s	10 ft/s	AWWA M32 Manual
	Maximum friction loss	7 ft/1,000 ft	5 ft/1,000 ft	AWWA M32 Manual



6.0 WASTEWATER FLOWS

Wastewater flows in a municipal collection system vary by time of day, wastewater discharge source, and weather conditions. Annual average daily flow is defined as the total wastewater flow over a one-year period divided by the number of days in that year. Wastewater treatment plants are typically sized in terms of annual average daily flow. The collection system must be able to convey the peak wastewater flows.

6.1 HISTORICAL WASTEWATER FLOWS

In order to estimate future wastewater flows, historical flow data was analyzed to determine the historical trends in system-wide average day wastewater flow and per-capita flow. **Table 6-1** and **Table 6-2** summarize the historical flows at the City of Fulshear and Cross Creek Ranch wastewater treatment plants, respectively. The information utilized to prepare this summary was obtained from the EPA Enforcement and Compliance History Online website (ECHO). The citywide per-capita flow rate ranged from 21 gpcd to 47 gpcd and has increased approximately by 22% between 2013 and 2016.

Table 6-1: City of Fulshear - Historical Wastewater Flows (2013 – 2016)

Year	Wastewater Service Area Population	Annual Average WWTP Flow (MGD)	Per Capita Flow (gpcd)	Annual Rainfall (inches)
2013	1,174	0.04	34	43.0
2014	1,338	0.04	28	60.7
2015	1,465	0.03	21	93.7
2016 ⁽¹⁾	1,750	0.06	35	55.3
Average	-	0.04	30	63.2
Maximum	-	0.06	35	93.7

Table 6-2: Cross Creek Ranch - Historical Wastewater Flows (2013 – 2016)

Year	Wastewater Service Area Population	Annual Average WWTP Flow (MGD)	Per Capita Flow (gpcd)	Annual Rainfall (inches)
2013	6,000	0.20	34	61.7
2014	6,561	0.22	34	83.5
2015	7,613	0.30	40	97.4
2016	7,808	0.37	47	55.3
Average	-	0.27	39	74.5
Maximum	-	0.37	47	97.4



6.2 PROJECTED WASTEWATER FLOWS

Average day wastewater flows for the 2021, 2026 and 2036 planning periods were developed by analyzing historical wastewater flow rates and future growth areas. Flow projections for future development were added to the existing 2016 wastewater flows to determine the projected future average daily flow.

TCEQ §217.32(a)(3) recommended design guideline for average daily wastewater flow for municipal wastewater treatment facilities is 75 – 100 gpcd. Existing City of Fulshear development agreements utilize a gallon per connection per day ranging from 300 to 315, which equates to approximately 100 gpcd. FNI recommends using a per-capita loading of 100 gpcd except where development agreements require a specific gpcd. Future average daily wastewater loads were calculated by applying the selected per-capita loading of 100 gpcd to the growth in population for the 2021, 2026 and 2036 planning periods. Future peak wet weather flows were developed using a peak wet weather to average dry weather peaking factor of 4.0. **Figure 6-1** illustrates the historical and projected wastewater flows for the City of Fulshear. **Table 6-3** summarizes the projected flows for the 2016, 2021, 2026 and 2036 planning periods for the City of Fulshear. **Table 6-4** provides a breakdown of the projected wastewater treatment plant flows for the City of Fulshear WWTP and Cross Creek ranch WWTP service area. The projections in **Table 6-4** consider that the Cross Creek Ranch WWTP will serve flows generated in the Cross Creek Ranch, Jordan Ranch and Harrison Interests North development.

Table 6-3: Projected Wastewater Loads

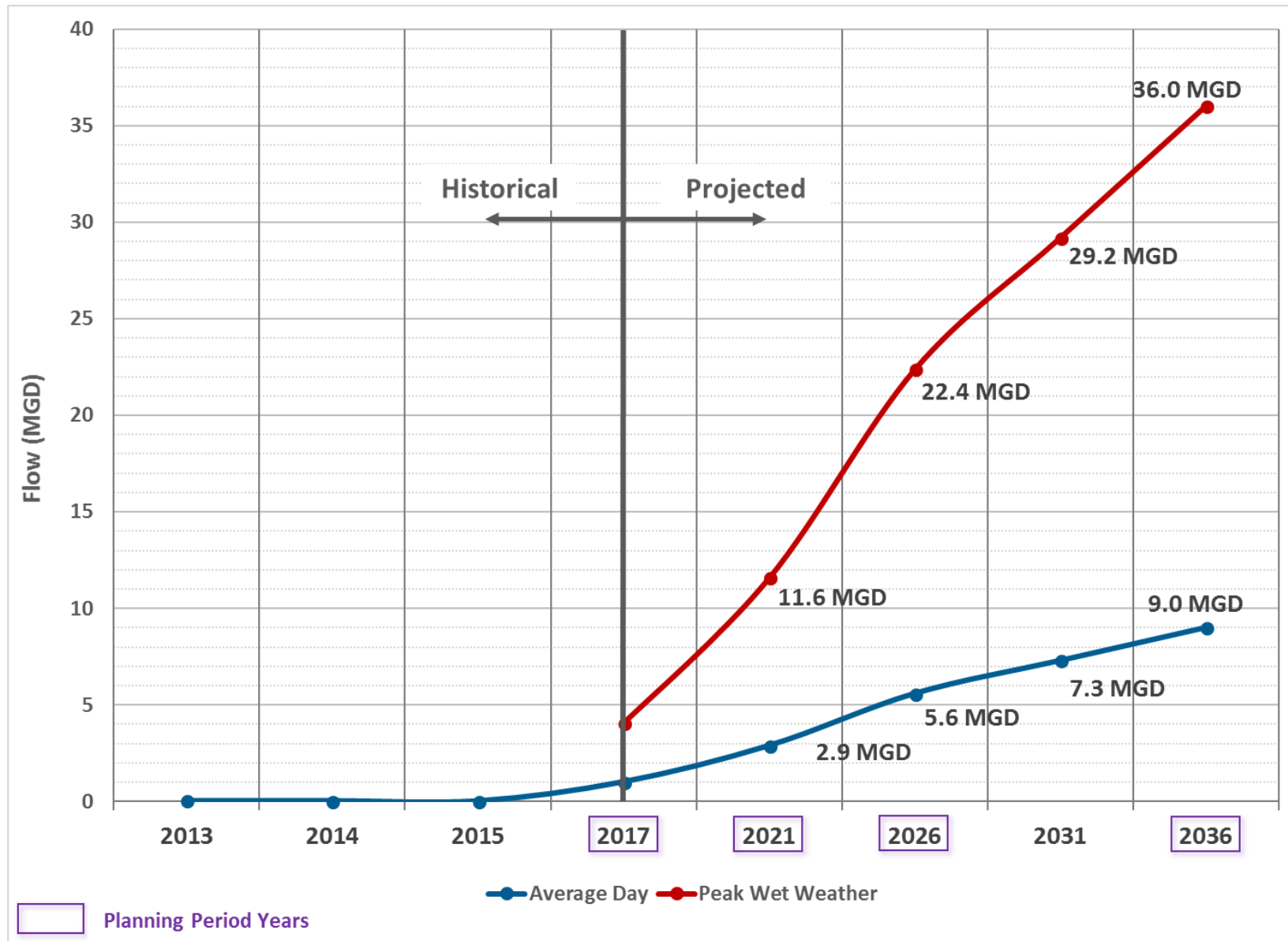
Year	Projected Wastewater Service Area Population	Average Dry Weather Flow (MGD)	Peak Wet Weather Flow (MGD)
2017	10,202	1.02	4.08
2021	29,090	2.90	11.59
2026	55,512	5.60	22.39
2036	88,794	9.01	36.04

Table 6-4: Projected Wastewater Loads by Wastewater Service Area

Year	Projected Average Dry Weather Flow (MGD)		Total City Wide Average Dry Weather Flow (MGD)
	City of Fulshear WWTP	Cross Creek Ranch WWTP	
2021	0.60	2.30	2.90
2026	2.52	3.08	5.60
2031	3.90	3.41	7.30
2036	5.28	3.73	9.01



Figure 6-1: Historical and Projected Wastewater Flows





7.0 EXISTING WASTEWATER SYSTEM

The City of Fulshear’s wastewater collection system consists of five lift stations and associated force mains, a wastewater treatment plant and a network of gravity mains and force mains ranging from 3-inches to 12-inches. The existing wastewater system is shown on **Figure 7-1**. The Cross Creek Ranch development has a separate network of gravity mains and force mains in addition to lift stations and a wastewater treatment plant.

7.1 WASTEWATER TREATMENT PLANT

The City of Fulshear owns and operates one wastewater treatment plant (WWTP). The plant operates under Texas Pollutant Discharge Elimination System (TPDES) permit number WQ0013314001 at a current permitted capacity of 0.50 MGD AADF and 1,042 gpm peak 2-hour flow. The permit also provides for an expansion to 0.70 MGD AADF and 1,458 gpm peak 2-hour flow. The existing WWTP site is located adjacent to FM 1093 and will need to be relocated to allow for the extension of the Westpark Tollway. The existing plant effluent outfalls into Union Chapel Branch, which flows to Bessie’s Creek and into the Brazos River.

Cross Creek Ranch operates one WWTP under TPDES permit number WQ001475001 at a current permitted capacity of 0.5 MGD AADF and 1,389 peak 2-hour flow. The permit also provides for an expansion of the WWTP to 1.50 MGD AADF and 4,167 gpm peak 2-hour flow and a second expansion to 2.50 MGD AADF and 6,944 gpm peak 2-hour flow. The current Cross Creek Ranch WWTP property is sufficient for a WWTP plant expansion to 4 MGD.

7.2 LIFT STATIONS

City staff provided as-built drawings for four of the five wastewater lift stations. The existing City of Fulshear wastewater system lift stations are summarized in **Table 7-1**. There is room for a third pump in the FM 1093 Lift Station No. 1. Information on Cross Creek Ranch lift stations was not provided for this master plan.

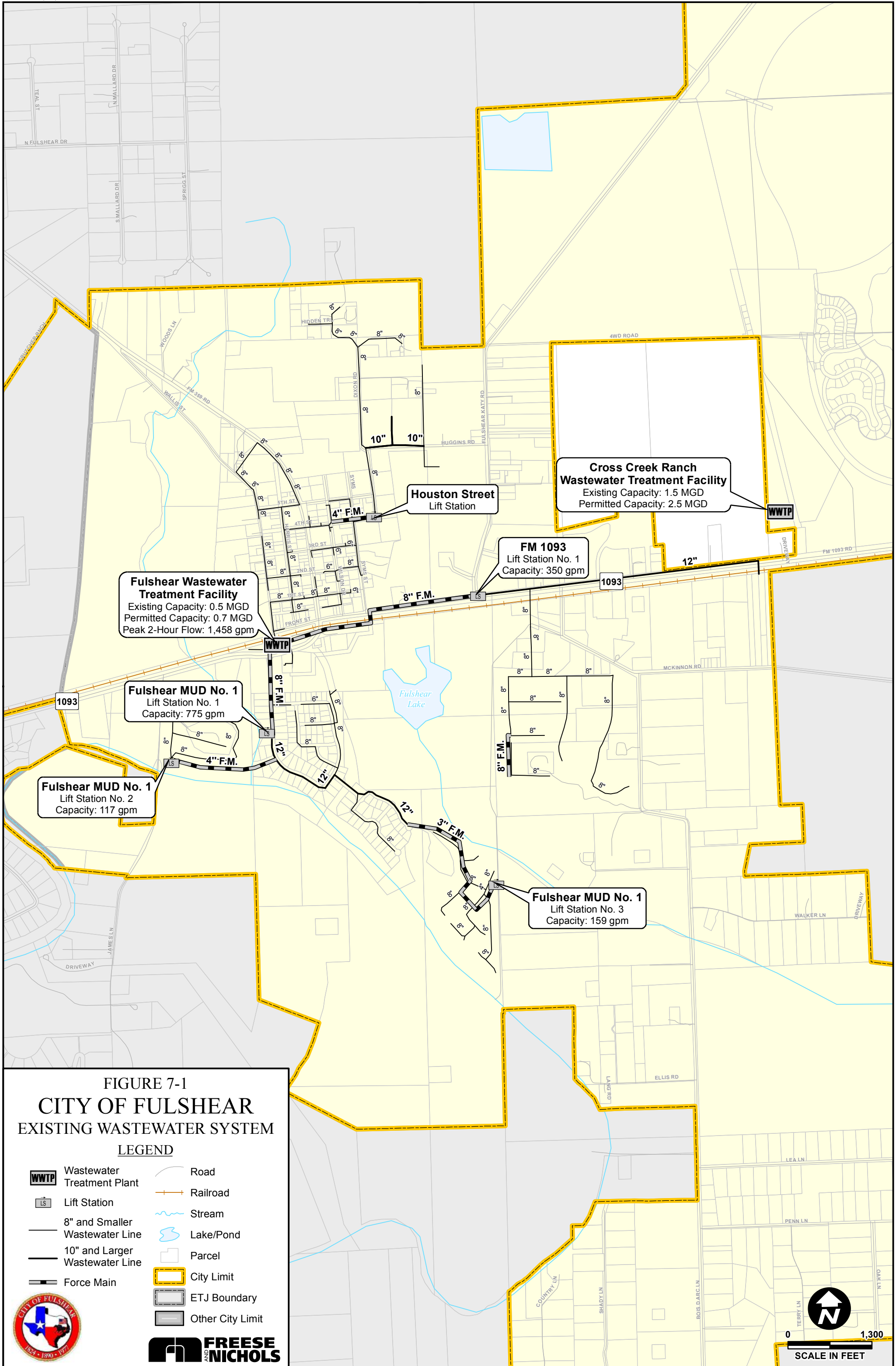


FIGURE 7-1
CITY OF FULSHEAR
EXISTING WASTEWATER SYSTEM

LEGEND

Wastewater Treatment Plant	Road
Lift Station	Railroad
8" and Smaller Wastewater Line	Stream
10" and Larger Wastewater Line	Lake/Pond
Force Main	Parcel
City Limit	ETJ Boundary
Other City Limit	

FREES AND NICHOLS

0 1,300
 SCALE IN FEET



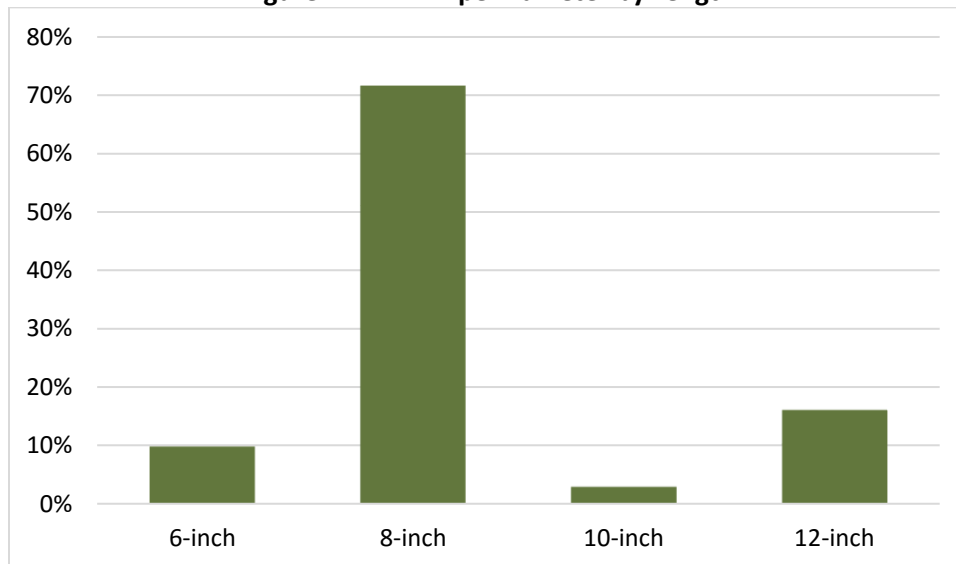
Table 7-1: Existing Lift Stations

Pump Station Name	No. of Pumps	Firm Capacity (gpm)	Rated Head (ft)	Wet Well Diameter (ft)	Active Depth (ft)	Active Volume (ft ³)
FM 1093 Lift Station No. 1	2	350	51	8	-	-
Houston Street Lift Station	2	-	-	-	-	-
Fulshear MUD No. 1 Lift Station No. 1	3	775	72	10	3	235
Fulshear MUD No. 1 Lift Station No. 2	2	117	76	6	2	56
Fulshear MUD No. 1 Lift Station No. 3	2	159	77	7	2.2	85

7.3 COLLECTION SYSTEM

The City of Fulshear’s existing wastewater system consists of 9 miles of gravity wastewater mains, and 2 miles of force mains. Wastewater line diameters range in size from 3-inch to 12-inch. **Figure 7-2** illustrates the percentage of pipe length by diameter based on as-builts provided by the City. The majority of the system is comprised of 8-inch wastewater lines. Information on Cross Creek Ranch wastewater lines was not provided for this master plan.

Figure 7-2: Pipe Diameter by Length





8.0 WASTEWATER SYSTEM ANALYSES

A wastewater model was developed in order to conduct hydraulic analyses and identify deficiencies in the City of Fulshear's existing wastewater collection system and to establish a capital improvements plan to improve the existing system and accommodate projected wastewater flows through 2036. Various combinations of improvements and system modifications were investigated to determine the most appropriate approach for conveying projected flows. Parameters used in developing the capital improvements plan included increasing system reliability, simplifying system operations, conveying the projected peak wet weather flows, and reducing the possibility of surcharging and sanitary sewer overflows. The wastewater collection system analysis only included the infrastructure in the City of Fulshear system. The analysis of the Cross Creek Ranch collection system is being conducted by the MUD district engineer.

8.1 WASTEWATER MODEL DEVELOPMENT

The City's wastewater model was developed using H₂OMap Sewer[®] software by *Innovyze*. The software makes use of engineering equations and mathematical algorithms to determine the flows and velocities that would occur in a collection system under a specified set of conditions.

City staff provided as-built plans that were converted to Geographic Information System (GIS) shapefiles and imported into the model. The wet well and pumping facilities were manually added to the model based on as-built drawings and information provided by the City. FNI used as-built drawings, where available, to assign manhole rim elevations and inverts. Where as-built plans were not available, FNI assumed interpolated invert elevations between known invert elevations and interpolated rim elevations from a triangular irregular network (TIN) of two-foot contours. When no upstream invert elevations were known, TCEQ minimum slopes were assigned to the wastewater lines, beginning at the last known invert elevation. FNI spatially distributed water demands to the model using daily water plant production data and scaled the demands to represent approximate wastewater return flows.

The model includes 6-inch and larger gravity wastewater lines and all force mains. The existing system model consists of approximately 212 nodes and 211 pipes. The future loads and the recommended wastewater infrastructure were added to the model for planning scenarios. The modeled wastewater lines, including force mains, range in size from 4-inch to 12-inch. The modeled lift stations represent 100% of the total lift station capacity.



8.2 EXISTING WASTEWATER SYSTEM ANALYSES

The existing collection system was evaluated to assess the ability of the system to adequately convey wastewater to the treatment plant without excessively surcharging or overflowing. This analysis was performed to determine if there are any existing system deficiencies and also to provide a baseline for the current level of service.

The critical flow condition for analyzing a wastewater collection system is peak wet weather. Flow, depth, and velocity are important factors when analyzing the peak wet weather flow simulations. Design criteria vary, but for this wastewater system study, it was determined that the hydraulic grade line (HGL) should not exceed a depth of three feet from the manhole rim. The flow in the line divided by the maximum capacity of the line, or q/Q , was also analyzed when reviewing model results. A q/Q greater than one indicates that the wastewater flow exceeds the capacity of the wastewater line. The modeled system does not indicate any areas where surcharging is expected under peak wet weather event conditions. The hydraulic model indicates that the modeled wastewater system conveys the peak flows with no overflows under existing system conditions.

8.3 WASTEWATER TREATMENT PLANT SITING

The City's current wastewater treatment plant must be relocated to accommodate the growth of the City and the extension of FM 1093. It is recommended that the City's future regional WWTP be located in the southern area of the future wastewater service area. The following factors are to be considered for wastewater treatment plant siting:

- Contours
- Surrounding Existing Land Use
- Approximate Land Value
- Environmental Buffers
- Soil Conditions
- Approximate Site Clearing Required
- Proximity to Existing City Limit
- Presence of Floodplain and Potential Wetlands
- 30 Contiguous Acres
- Proximity to GCWA Raw Water Intake – Potential for Higher Discharge Limits
- Proximity to Bessie's Creek or Brazos River
- Vehicle Accessibility
- Proximity to Power



8.4 FUTURE WASTEWATER SYSTEM ANALYSES

Wastewater system improvements were developed to accommodate the anticipated residential and non-residential growth over the next 20 years. To serve the future growth, the City of Fulshear needs to extend service to areas of growth where little or no infrastructure currently exists. In addition, the City’s current wastewater treatment plant must be relocated to accommodate the expansion of FM 1093. Infrastructure must be constructed to convey flows to the new regional wastewater treatment plant location.

Design Criteria for Gravity Lines

When determining the size of proposed wastewater lines, TCEQ provides specific design criteria. TCEQ §217.53 (l)(1) dictates that collection systems must be designed to maintain a minimum velocity of 2 feet/second. Maintaining these velocities discourages the settling of solids. In accordance with this, TCEQ has established minimum slope guidelines in §217.53 (l)(2)(A). The size and spacing of manholes are also governed by TCEQ guidelines. These requirements are shown in **Table 8-1**. Additionally, TCEQ §217.53 (j)(3) states “An owner must ensure that the collection system has capacity to prevent a surcharge.”

Table 8-1: Recommended Minimum Slopes, Manhole Sizing and Spacing

Pipe Size (inches)	Minimum Slope (feet/100 ft)	Manhole Size (inches)	Manhole Spacing (feet)
6	0.50	48	500
8	0.33	48	500
10	0.25	48	500
12	0.20	48	500
15	0.15	60	500
18	0.11	60	800
21	0.09	60	800
24	0.08	60	800
27	0.06	72	800
30	0.055	72	800
36	0.045	72	1,000
48	0.045	72	1,000
54	0.045	72	2,000

Design Criteria for Lift Stations and Force Mains

TCEQ design criteria §217.61 (c) states “The firm pumping capacity of a lift station must handle the peak flow.” Firm pumping capacity is defined as the maximum pumping capacity with the largest pumping unit



out of service. TCEQ §217.67 (a) also states that force mains shall be sized to convey the lift station pumping capacity at a minimum velocity of 3 feet/second for duplex lift stations and 2 feet/second with one pump operating at a lift station with three or more pumps. Recommended lift station firm pumping capacities and force main sizes are based on these TCEQ criteria.

TCEQ slope requirements, manhole spacing, and manhole sizing were utilized for new lines in undeveloped areas. If proposed lines are constructed at a different slope than the modeled lines, the proposed line size should be evaluated based on the updated capacity. FNI sized any new lift stations or lift station expansions to convey 110% of the projected peak hourly wastewater flow.

Wastewater Collection System Hydraulic Analysis

Hydraulic analyses were performed on the wastewater collection system under future peak wet weather flow conditions to identify the timing and size of recommended improvements. The hydraulic model indicates that the modeled wastewater system will experience no surcharging during peak flow conditions if all recommended improvements are completed. The results of the analysis are summarized below:

- The design firm pumping capacity of the Fulbrook on Fulshear Creek Lift Station No. 1 exceeds the treatment capacity of the current wastewater treatment plant.
- The relocation and construction of the new regional WWTP requires land acquisition.
- System modifications will be required to convey flow to the new WWTP location.
- One new lift station will be required.
- The system will be able to convey the projected peak wet weather flows without surcharging or overflows.

8.4.1 Wastewater Treatment Plant Capacity Analysis

The wastewater flow projections developed in **Section 6.2** show that additional WWTP capacity is needed within the next 25 years to treat the identified average daily wastewater flows within the study area. The future City of Fulshear Regional WWTP is not expected to be in service until the 2021 - 2026 time period. The projected flows into the existing City of Fulshear WWTP are expected to exceed the permitted capacity by 2021. Therefore, it is recommended that the City divert 0.75 MGD from the City of Fulshear WWTP to the Cross Creek Ranch WWTP until the City of Fulshear Regional WWTP is in service. Based on



the projected average day flows presented in **Figure 8-1** and **Figure 8-2**, the following recommendations were made:

- Expansion of the Cross Creek Ranch WWTP capacity to 4.0 MGD.
- Relocation and construction of the new 3.5 MGD Fulshear Regional WWTP by 2026, and expansion to 6.5 MGD treatment capacity by 2036.

TCEQ Evaluation Criteria (75/ 90 Rule)

Lines showing the recommended **permitted average daily flow (ADF)**, **90% of the permitted ADF capacity**, and **75% of the permitted ADF capacity** are shown on **Figure 8-1** and **Figure 8-2**. These lines are based on TCEQ §305.126, commonly referred to as the 75/90 rule, which requires a WWTP permit holder to begin planning for expansion of the treatment facility when the average day or average annual flow reaches 75% of the permitted capacity for three consecutive months. When the average day or average annual flow reaches 90% of the permitted capacity, the permit holder shall obtain necessary authorization from the commission to commence construction of the necessary additional treatment facilities.



Figure 8-1: City of Fulshear Regional WWTP Average Daily Flow and Capacity

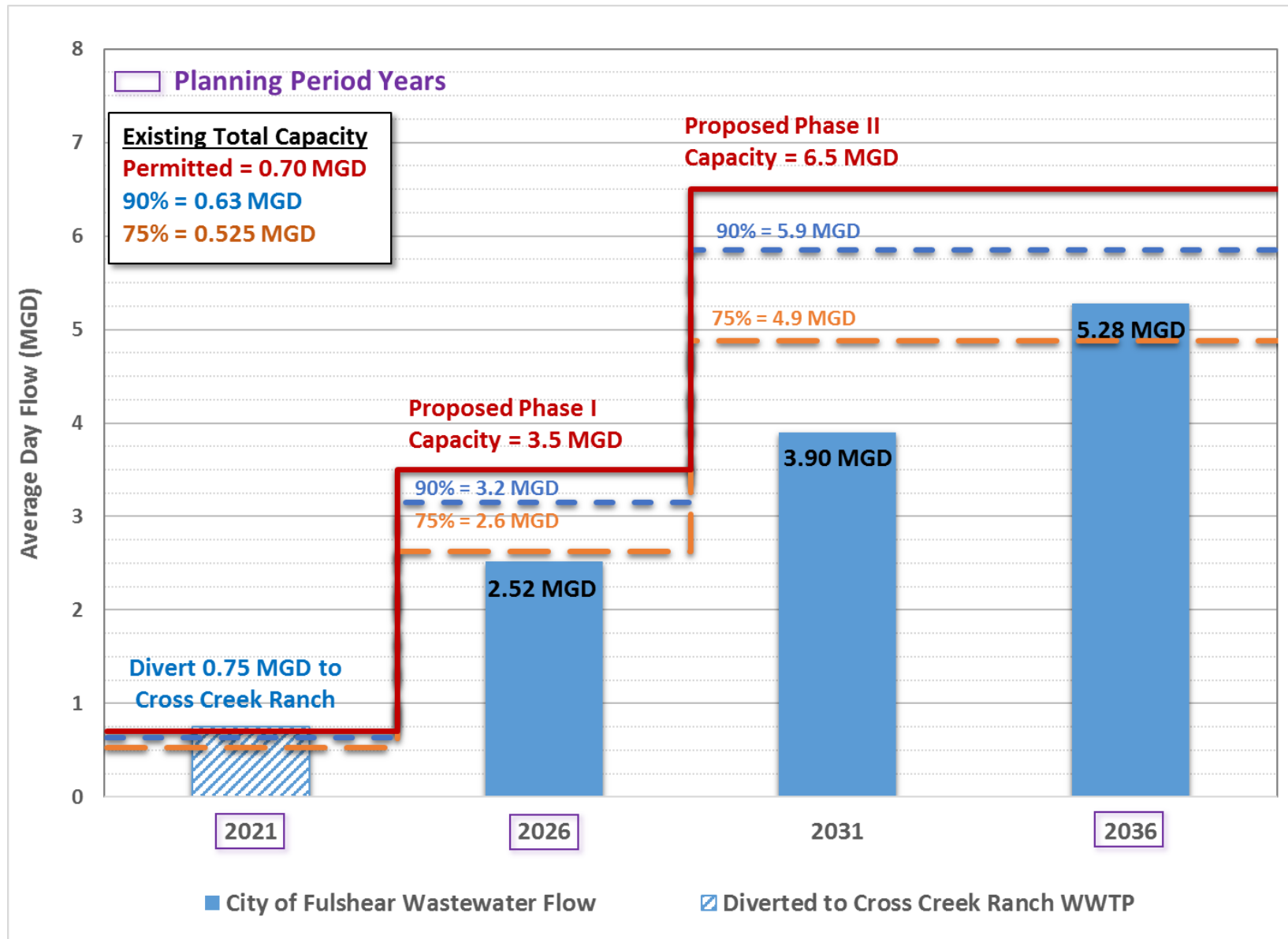
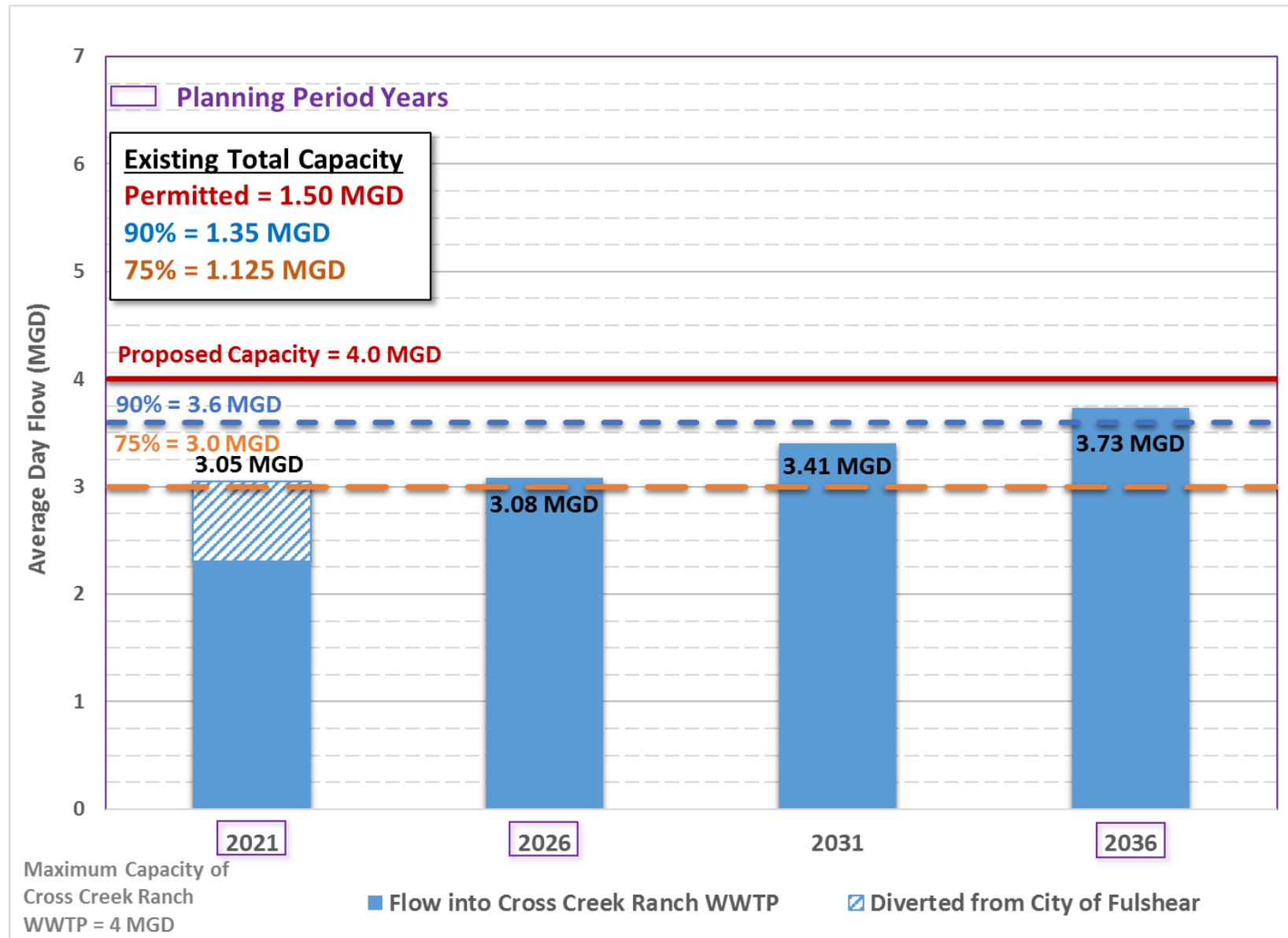




Figure 8-2: Cross Creek Ranch WWTP Projected Average Daily Flow and Capacity





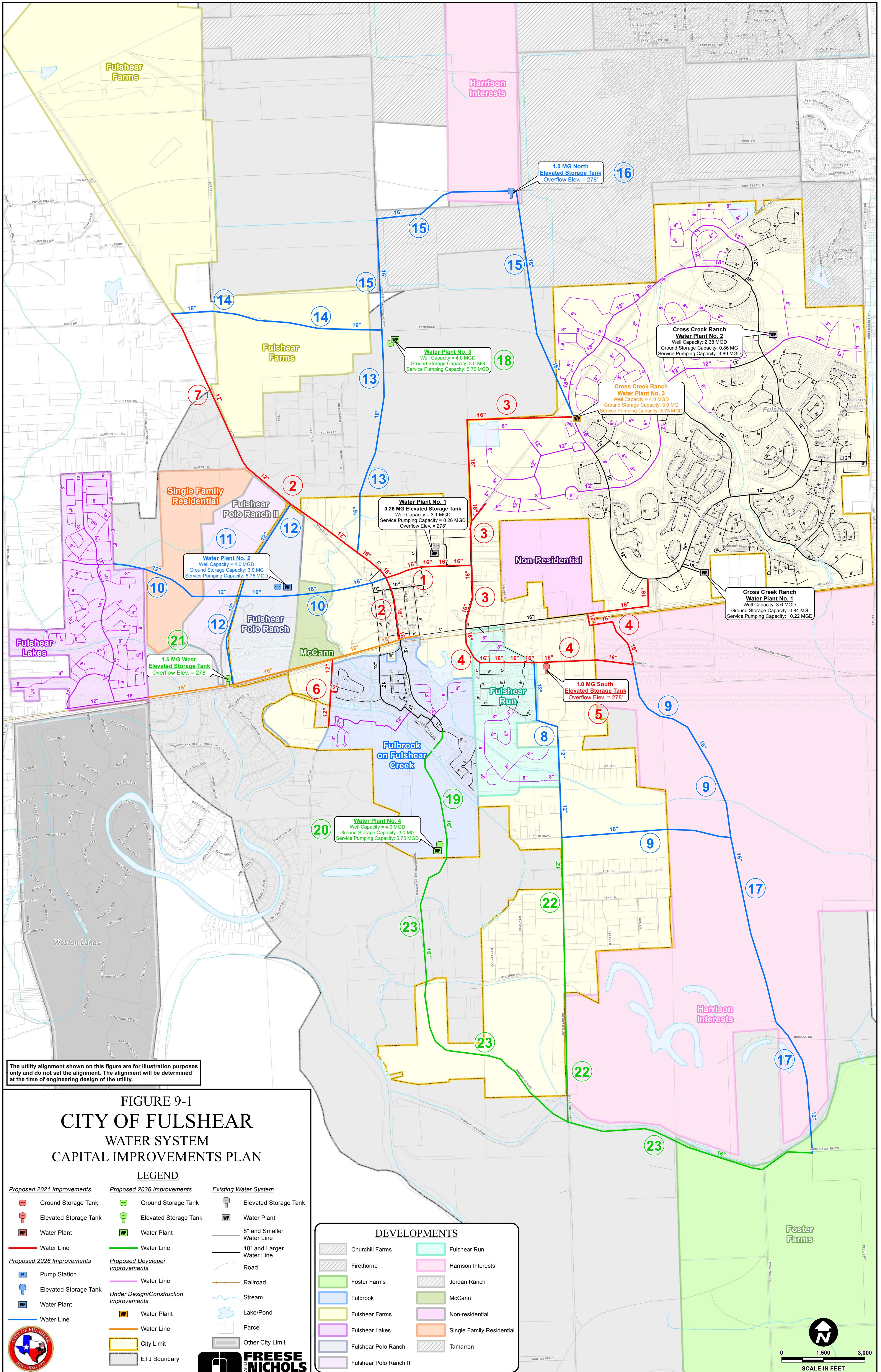
9.0 INTEGRATED CAPITAL IMPROVEMENTS PLAN

An integrated water and wastewater capital improvements plan was developed for the City of Fulshear to maintain water and wastewater service that promotes residential and commercial development. The recommended improvements provide the capacity and reliability to meet projected water demands wastewater flows through year 2036. The following sections describe how the CIP projects contribute to water and wastewater system improvements. The CIP projects for water and wastewater system are **Figure 9-1** and **Figure 9-2**, respectively.

Locations shown for new lines and other recommended improvements were generalized for hydraulic analyses. Specific alignments and sites will be determined as part of the design process. Water lines to be constructed by developers are indicated with orange and were included and correctly sized for the hydraulic analysis. It is recommended that these projects be constructed generally in the order listed. However, development or renewal patterns may make it necessary to construct some projects sooner than anticipated.

Capital costs were calculated for the recommended improvements. The costs are in 2018 dollars and include an allowance for engineering, surveying, and contingencies. Unless specifically stated, costs do not include easements or land acquisition.

Table 9-1 and **Table 9-2** summarize the costs of the water and wastewater system capital improvements plan for the City of Fulshear. Detailed descriptions of the water and wastewater projects and associated costs are provided in **Appendices C** and **D**, respectively.



The utility alignment shown on this figure are for illustration purposes only and do not set the alignment. The alignment will be determined at the time of engineering design of the utility.

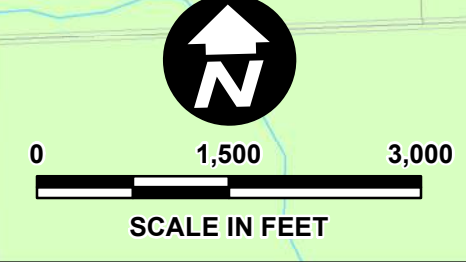
FIGURE 9-1
CITY OF FULSHEAR
WATER SYSTEM
CAPITAL IMPROVEMENTS PLAN

LEGEND

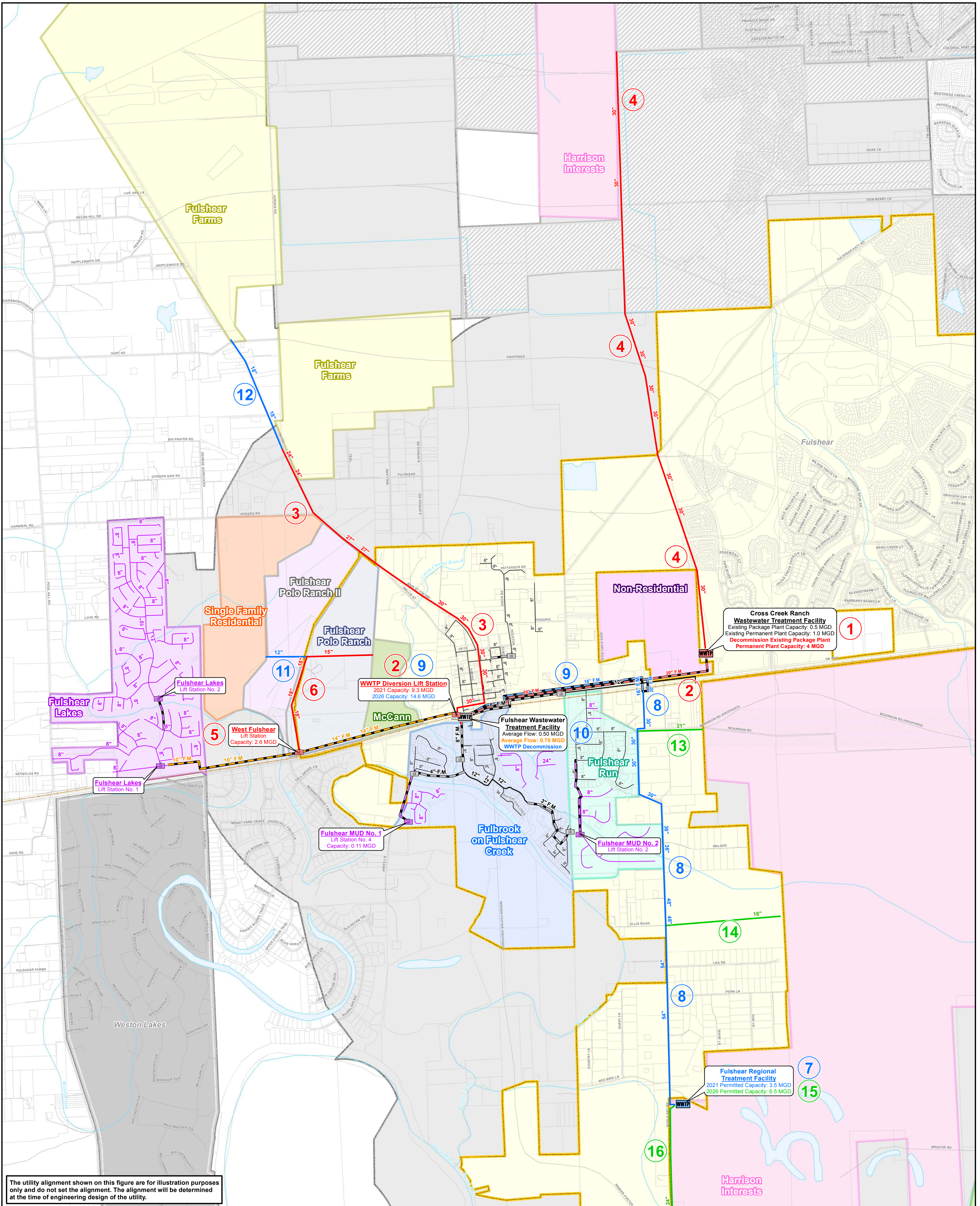
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|-----------------------------------|--|------------------------------|
| Proposed 2021 Improvements | Proposed 2036 Improvements | Existing Water System |
| Ground Storage Tank | Ground Storage Tank | Elevated Storage Tank |
| Elevated Storage Tank | Elevated Storage Tank | Water Plant |
| Water Plant | Water Plant | 8" and Smaller Water Line |
| Water Line | Water Line | 10" and Larger Water Line |
| Pump Station | Water Line | Road |
| Elevated Storage Tank | Under Design/Construction Improvements | Railroad |
| Water Plant | Water Plant | Stream |
| Water Line | Water Line | Lake/Pond |
| City Limit | ETJ Boundary | Parcel |
| Other City Limit | | Other City Limit |

DEVELOPMENTS

- | | |
|------------------------|---------------------------|
| Churchill Farms | Fulshear Run |
| Firethorne | Harrison Interests |
| Foster Farms | Jordan Ranch |
| Fulbrook | McCann |
| Fulshear Farms | Non-residential |
| Fulshear Lakes | Single Family Residential |
| Fulshear Polo Ranch | Tamarron |
| Fulshear Polo Ranch II | |



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The utility alignment shown on this figure are for illustration purposes only and do not set the alignment. The alignment will be determined at the time of engineering design of the utility.

FIGURE 9-2 CITY OF FULSHEAR WASTEWATER SYSTEM CAPITAL IMPROVEMENTS PLAN LEGEND

Proposed 2021 Improvements	Proposed Developer Improvements	Proposed 2026 Improvements	Proposed 2036 Improvements	Other
Lift Station	Lift Station	Lift Station	Lift Station	Road
Wastewater Treatment Plant	Wastewater Line	Wastewater Treatment Plant	Wastewater Line	Railroad
Wastewater Line	Force Main	Wastewater Line	Force Main	Stream
Force Main	Existing Wastewater System	Wastewater Line	Force Main	Lake/Pond
Proposed 2026 Improvements	Lift Station	Wastewater Line	Force Main	Parcel
Proposed 2026 Improvements	Wastewater Treatment Plant	Wastewater Line	Force Main	City Limit
Proposed 2026 Improvements	Wastewater Line	Wastewater Line	Force Main	ETJ Boundary
Proposed 2026 Improvements	Force Main	Wastewater Line	Force Main	Other City Limit
Proposed 2026 Improvements	Under Design/Construction Force Main	Wastewater Line	Force Main	

DEVELOPMENTS	





Table 9-1: Water System Capital Improvement Plan Cost Summary

Phase	Project Number	Project Name	Cost (2018 Dollars)
2017 - 2021 CIP Projects	1	16-inch Huggins Transmission Line	\$1,615,500
	2	12/16-inch FM 359 Transmission Line - Phase I	\$3,118,600
	3	16-inch FM Katy-Fulshear Rd Transmission Line	\$4,939,500
	4	16-inch Katy-Fulshear/McKinnon Rd Transmission Line	\$5,758,100
	5	1.0 MG South Elevated Storage Tank	\$3,120,000
	6	12-inch James Ln Transmission Line	\$1,013,700
	7	12-inch FM 359 Transmission Line - Phase II	\$1,623,600
	2017 – 2021 CIP Total		
2022 – 2026 CIP Projects	8	16-inch Bois D'Arc Lane Transmission Line	\$3,278,600
	9	16-inch Texas Heritage Parkway South Transmission Line - Phase I	\$4,420,800
	10	12/16-inch West Fulshear Transmission Line	\$3,398,000
	11	Water Plant No. 2	\$16,021,200
	12	12-inch Future Polo Ranch Transmission Line	\$2,404,000
	13	16-inch North Fulshear Transmission Line – Phase I	\$3,173,200
	14	16-inch Fulshear Farms Transmission Line Loop	\$2,323,300
	15	16-inch Transmission Line Loop	\$6,217,100
	16	1.0 MG North Elevated Storage Tank	\$3,120,000
	17	16-inch/12-inch Texas Heritage Parkway South Transmission Line - Phase II	\$3,076,800
	2022 - 2026 CIP Total		
2027 – 2036 CIP Projects	18	Water Plant No. 3	\$16,021,200
	19	16-inch South Fulshear Transmission Line – Phase I	\$1,629,600
	20	Water Plant No. 4	\$16,021,200
	21	1.5 MG West Elevated Storage Tank	\$4,680,000
	22	12-inch Bois D'Arc Lane Transmission Line	\$3,283,100
	23	16-inch South Fulshear Transmission Line	\$7,382,400
2027 - 2036 CIP Total			\$49,017,500
Total 25 Year Water CIP Cost			\$117,639,500



Table 9-2: Wastewater System Capital Improvements Plan Cost Summary

Phase	Project Number	Project Name	Cost (2018 Dollars)
2017 - 2021 CIP Projects	1	3.0 MGD Cross Creek Ranch WWTP Expansion to 4.0 MGD	\$ 37,440,000
	2	9.3 MGD WWTP Diversion Lift Station and 20-inch Force Main	\$ 11,594,000
	3	24/27/30/36-inch FM 359 Interceptor - Phase I	\$ 6,864,900
	4	30-inch Texas Heritage Parkway Interceptor	\$ 10,019,500
	5	2.6 MGD West Fulshear Lift Station	\$ 1,554,800
	6	15/18-inch West Fulshear Interceptor Phase I	\$ 1,646,000
	2017 - 2021 CIP Total		
2022 - 2026 CIP Projects	7	3.5 MGD Regional Wastewater Treatment Facility	\$ 44,460,000
	8	30/36/48/54-inch Bois D'Arc Interceptor - Phase I	\$ 11,787,300
	9	Expansion of the Diversion Lift Station from 9.3 MGD to 14.6 MGD	\$ 4,233,900
	10	Existing City of Fulshear WWTP Decommission	\$ 448,500
	11	12-inch Fulshear Polo Ranch and McCann Interceptor Phase II	\$ 297,600
	12	18-inch FM 359 Interceptor - Phase II	\$ 1,212,300
	2022 - 2026 CIP Total		
2027 - 2036 CIP Projects	13	21-inch Harrison Interests Interceptor - Phase I	\$ 761,900
	14	18-inch Harrison Interests Interceptor - Phase II	\$ 1,317,500
	15	Regional WWTP Expansion from 3.5 MGD to 6.5 MGD	\$ 37,440,000
	16	21/24-inch Foster Farms Interceptor	\$ 3,417,300
	2027 - 2036 CIP Total		
Total 25 Year Wastewater CIP Cost			\$ 174,495,500



9.1 20-YEAR WATER DISTRIBUTION SYSTEM CIP

A water system capital improvements plan was developed for the City of Fulshear to improve the water distribution system's reliability, redundancy and ability to provide adequate fire flow. The recommended improvements provide the capacity and reliability to meet projected water demands through year 2036. The alignments of the proposed water lines generally follow existing streets or proposed roadways consistent with the City's Thoroughfare Master Plan. The locations of proposed water plants or storage facilities are approximate and exact locations will be determined during engineering design. A detailed description of each project is provided below.

Water Distribution System Projects: 2017 - 2021

Project 1: 16-inch Huggins Transmission Line

The existing 10-inch water line along Huggins Rd is undersized for future demands and should be replaced to provide additional capacity to and from the existing Water Plant No. 1. This project consists of the construction of a new 16-inch transmission line along extended Huggins Rd from Katy-Fulshear Road to FM 359.

Project 2: 12/16-inch FM 359 Transmission Line - Phase I

This project consists of the construction of new 12-inch and 16-inch transmission lines along FM 359 from FM 1093 to the southern section of the Fulshear Farms developments (FBC MUD 195). This project will deliver flow to the FM 1093 and FM 359 corridor and will complete a loop to deliver flow to enhance fire flow capacity.

Project 3: 16-inch FM Katy-Fulshear Rd Transmission Line

The existing 8-inch water line along Katy-Fulshear Rd is undersized for future demands and should be replaced. This project consists of the construction of a new 16-inch transmission line along Katy-Fulshear Rd from FM 1093 to Cross Creek Ranch Water Plant No. 3. This project will increase fire flow capacity and provide water system connectivity between the Cross Creek Ranch Water Plant No. 3 and City of Fulshear Water Plant No. 1.

Project 4: 16-inch Katy-Fulshear/McKinnon Rd Transmission Line

The existing 8-inch water line along Katy-Fulshear/McKinnon Rd is undersized for future demands and should be replaced and extended. This project consists of the construction of a new 16-inch transmission line along Katy-Fulshear/ McKinnon Rd from FM 1093 to future Texas Heritage Parkway. This project also



includes the construction of a new 16-inch transmission line along future Texas Heritage Parkway from FM 1093 to McKinnon Rd and also the extension of the existing 16-inch transmission line along FM 1093 to the Cross Creek Ranch system at approximately Cross Creek Ranch Blvd. This project will deliver flow to the Fulshear Run and Harrison Interests South developments and provide an additional connection between the Cross Creek Ranch System and the City of Fulshear System. This will complete a loop in order to increase fire protection and increase supply redundancy.

Project 5: 1.0 MG South Elevated Storage Tank

In order to serve short term growth and provide required elevated storage capacity, the City will need to construct a new 1.0 MG Elevated Storage Tank. An approximate location along McKinnon Road between Bois D'arc Lane and future Texas Heritage Parkway was utilized for this study due to its optimal hydraulics and proximity to existing and future developments. An exact location will be determined during engineering design.

Project 6: 12-inch James Ln Transmission Line

This project consists of the construction of a new 12-inch transmission line along James Lane from FM 1093 to Meadow Wood Drive. This project will deliver flow to Fulbrook on Fulshear Creek in order to complete a loop and increase fire protection.

Project 7: 12-inch FM 359 Transmission Line - Phase II

This project consists of the construction of a new 12-inch transmission line along FM 359 from the south section of Fulshear Farms (FBC MUD 195) to the north section of Fulshear Farms. This project will complete a loop to deliver flow to the northern section Fulshear Farms (FBC MUD 195).

Water Distribution System Projects: 2022 – 2026

Project 8: 16-inch Bois D'Arc Lane Transmission Line

This project consists of the construction of a new 16-inch transmission line south along Bois D'Arc Lane from McKinnon Road to Ellis Road. This project will serve future developments to the southeast part of the City.

Project 9: 16-inch Texas Heritage Parkway South Transmission Line - Phase I

This project consists of the construction of a new 16-inch transmission line along future Texas Heritage Parkway from McKinnon Road to Ellis Road extension (future collector) and west along Ellis Road



extension (future collector) from future Texas Heritage Parkway to Bois D'Arc Lane. This project will complete a loop to provide fire flow capacity and water service to the southeast Fulshear developments.

Project 10: 12/16-inch West Fulshear Transmission Line

This project consists of the construction of new 12 and 16-inch transmission lines along a future collector road west of Huggins Road from FM 359 to Fulshear Lakes development. This project will provide additional capacity to west Fulshear developments and connect the proposed Water Plant No. 2 with the rest of the system.

Project 11: Water Plant No. 2

A one-acre parcel has been designated in Polo Ranch for construction of a water plant (Water Plant No. 2). In order meet TCEQ requirements the groundwater well should be designed to produce approximately 4.0 MGD. The project also includes construction of a 3.0 MG ground storage tank and 5.75 MGD pump station. This project will provide increased water supply to meet city-wide maximum day water demands.

Project 12: 12-inch Future Polo Ranch Transmission Line

This project consists of the construction of a new 12-inch transmission line along a future collector road bisecting the Fulshear Polo Ranch development. This project will complete a loop to deliver flow to the western Fulshear developments.

Project 13: 16-inch North Fulshear Transmission Line – Phase I

This project consists of the construction of a new 16-inch transmission line along a future Prairie Parkway from FM 359 to the eastern edge of the southern Fulshear Farms development. This project will deliver flow to Fulshear Farms, Harrison Interests North, and a proposed North Elevated Storage Tank.

Project 14: 16-inch Fulshear Farms Transmission Line Loop

This project consists of the construction of a new 16-inch transmission line from 359 through the southern Fulshear Farms developments to the eastern edge of Fulshear Farms. This project will provide looping and reliable water service to Fulshear Farms development.

Project 15: 16-inch Transmission Line Loop

This project consists of the construction of a new 16-inch north Fulshear transmission line loop. This project will complete a north system loop and deliver flow to and from the proposed 1.0 MG North Elevated Storage Tank.



Project 16: 1.0 MG North Elevated Storage Tank

In order to serve growth and provide required elevated storage capacity, the City will need to construct an additional 1.0 MG elevated storage tank in the northern part of the system. An approximate location near future Texas Heritage Parkway was utilized for this study due to its optimal hydraulics and proximity to existing and future developments. An exact location will be determined during engineering design.

Project 17: 16-inch/12-inch Texas Heritage Parkway South Transmission Line - Phase II

This project consists of the construction of a new 16-inch transmission line along future Texas Heritage Parkway from Ellis Road extension to Winner-Foster Rd. This project will deliver flow to the Foster Farms development.

Water Distribution System Projects: 2027 – 2036

Project 18: Water Plant No. 3

In order meet TCEQ requirements the groundwater well should be designed to produce approximately 4.0 MGD. The project also includes construction of a 3.0 MG ground storage tank and 5.75 MGD pump station. This project will provide increased water supply to meet city-wide maximum day water demands.

Project 19: 16-inch South Fulshear Transmission Line – Phase I

This project consists of the construction of a new 16-inch transmission line connecting the existing water system to the proposed Water Plant No. 4.

Project 20: Water Plant No. 4

A one-acre parcel has been designated in Fulbrook on Fulshear Creek development for construction of a water plant (Water Plant No. 4). In order meet TCEQ requirements the groundwater well should be designed to produce approximately 4.0 MGD. The project also includes construction of a 3.0 MG ground storage tank and 5.75 MGD pump station. This project will provide increased water supply to meet city-wide maximum day water demands.

Project 21: 1.5 MG West Elevated Storage Tank

In order to serve growth and provide required elevated storage capacity, the City will need to construct an additional 1.5 MG elevated storage tank to the west of the city. An approximate location in the west part of the City along FM 1093 was utilized for this study due to its optimal hydraulics and proximity to existing and future developments. An exact location will be determined during engineering design.



Project 22: 12-inch Bois D'Arc Lane Transmission Line

This project consists of the construction of a new 12-inch transmission line along Bois D'Arc Lane from Ellis Road to Winner-Foster Road. This project will serve the southern Fulshear developments.

Project 23: 16-inch South Fulshear Transmission Line

This project consists of the construction of a new 16-inch transmission line along Winner-Foster Road to future Texas Heritage Parkway. This project will complete a loop to deliver flow and serve the southern Fulshear developments and provide additional capacity to Foster Farms.



9.2 20-YEAR WASTEWATER SYSTEM CIP

A wastewater system capital improvements plan was developed for the City of Fulshear to improve the wastewater collection system's ability to convey flow to the wastewater treatment plant. The recommended improvements provide the capacity and reliability to meet projected wastewater flows through year 2036. A detailed description of each project is provided below.

Wastewater System Projects: 2017 – 2021

Project 1: 3.0 MGD Cross Creek Ranch WWTP Expansion to 4.0 MGD

This project consists of the expansion of the existing 1.5 MGD Cross Creek Ranch WWTP to 4.0 MGD and decommissioning the existing 0.5 MGD package plant. This project will provide additional treatment capacity for short term growth within the City of Fulshear system and provide sufficient capacity for the buildout of the Cross Creek Ranch development.

Project 2: 9.3 MGD WWTP Diversion Lift Station and 20-inch Force Main

This project consists of the construction of a new diversion lift station with 9.3 MGD of pumping capacity and 14.6 MGD of wet well capacity (wet well capacity sized for future expansion). This project also includes a 20-inch Force Main along FM 1093 from the diversion lift station to the existing Cross Creek Ranch WWTP. The existing City of Fulshear WWTP is located on a site that does not have sufficient room for future expansion to serve anticipated growth within the city. This project will divert flows from the existing WWTP to the Cross Creek Ranch WWTP and allow the City to decommission the existing WWTP in future.

Project 3: 24/27/30/36-inch FM 359 Interceptor - Phase I

This project consists of the construction of a new 24/27/30/36-inch Interceptor along FM 359 to from Fulshear Farms to the existing City of Fulshear WWTP. This project will serve wastewater flows from northwest Fulshear developments along Highway 359.

Project 4: 30-inch Texas Heritage Parkway Interceptor

This project consists of the construction of a new 30-inch interceptor along the future Texas Heritage Parkway to the Cross Creek Ranch WWTP. This project will serve wastewater flows from Jordan Ranch and other northern Fulshear developments.



Project 5: 2.6 MGD West Fulshear Lift Station

This project consists of the construction of a new 2.6 MGD West Fulshear Lift Station. The existing force main that the lift station will pump into was completed in early 2018. This project would serve developments in west Fulshear such as Polo Ranch and Fulshear Lakes.

Project 6: 15/18-inch West Fulshear Interceptor Phase I

This project consists of the construction of a new 15/18-inch interceptor that will serve developments in west Fulshear, primarily Polo Ranch.

Wastewater System Projects: 2022 – 2026

Project 7: 3.5 MGD Regional Wastewater Treatment Facility

This project is a proposed 3.5 MGD Regional WWTP that will replace the existing City of Fulshear WWTP and is intended to serve existing and future developments within the City of Fulshear and its ETJ. A contiguous 30-acre parcel of land would be needed to construct this project and facilitate future expansions.

Project 8: 30/36/48/54-inch Bois D'Arc Interceptor - Phase I

This project consists of the construction of a new 30/36/48/54-inch interceptor along Bois D'Arc Ln from FM 1093 to the proposed Fulshear Regional Treatment Facility (project 7). This project will convey flows from eastern Fulshear developments as well as the Diversion Lift Station to the new Fulshear Regional WWTP.

Project 9: Expansion of the Diversion Lift Station from 9.3 MGD to 14.6 MGD

This project consists of the expansion of the Diversion Lift Station (Project 2) from 9.3 MGD to 14.6 MGD and construction of a 16-inch force main parallel to the proposed 20-inch force main (Project 2) along FM 1093 from the existing WWTP. This project also includes a connection from the proposed 20-inch force main along FM 1093 to the Bois D'Arc Interceptor (Project 8). This project will divert flow from the existing City of Fulshear WWTP service area through the future interceptors (Project 8) to the new Fulshear Regional Treatment Facility (Project 7).



Project 10: Existing City of Fulshear WWTP Decommission

The existing City of Fulshear WWTP must be decommissioned due to the extension of the Westpark Tollway. Decommissioning of the existing City of Fulshear WWTP on FM 1093 will include an environmental assessment, environmental remediation/disposal and demolition.

Project 11: 12-inch West Fulshear Interceptor Phase II

This project consists of the construction of a 12-inch interceptor to serve Fulshear Polo Ranch Phase II and additional developments in west Fulshear.

Project 12: 18-inch FM 359 Interceptor - Phase II

This project consists of the construction of a new 18-inch Interceptor along FM 359 from Hunt Rd to FM 359 Interceptor (Project 3). This project will serve the northern Fulshear Farms development.

Wastewater System Projects: 2027 – 2036

Project 13: 21-inch Harrison Interests Interceptor - Phase I

This project consists of the construction of a new 21-inch Interceptor along McKinnon Rd from Harrison Interests South to Bois D'Arc Interceptor (Project 8). This project will convey flows from earlier phases of the Harrison Interests development.

Project 14: 18-inch Harrison Interests Interceptor - Phase II

This project consists of the construction of a new 18-inch Interceptor along Ellis Rd ext. from Harrison Interests South. This project will convey flows from the later phases of Harrison Interests South to the Bois D'Arc Interceptor (Project 8).

Project 15: Regional WWTP Expansion from 3.5 MGD to 6.5 MGD

This project is an expansion of the Regional WWTP (Project 7) from 3.5 MGD to 6.5 MGD. This 3.0 MGD expansion will be needed to provide sufficient treatment capacity for proposed future developments.

Project 16: 21/24-inch Foster Farms Interceptor

This project consists of the construction of a new 21-inch Interceptor along Winner-Foster Rd from Foster Farms to Bois D'Arc Lane and 24-inch Interceptor along Bois D'Arc Lane to the proposed 6.5 MGD Fulshear Regional Treatment Facility (project 15). This project will convey flows from Foster Farms to the proposed Regional WWTP.



APPENDIX A: Future Developments

City of Fulshear

Water and Wastewater Master Plan

Known Future Residential Developments - Projected Populations



Utilities Served By	Development Name	Land Use	Projected No. Homes	Projected Population	Projected Buildout	Density (LUE per acre)	Area (acres)	Number of LUEs	Percent Developed				Housing Units Occupied				Expected Population			
									2017	2021	2026	2036	2017	2021	2026	2036	2017	2021	2026	2036
City	City Existing ^{1,2}	Single Family	-	-	-	-	-	-	0%	0%	0%	0%	230	230	230	230	928	928	928	928
	Single Family Residential ^{1,2}	Single Family	880	2,816	Beyond 2026		292	880	0%	1%	19%	100%	0	10	170	880	0	29	493	2,816
	McCann ^{1,2}	Single Family	235	752	Beyond 2026		290	235	0%	26%	85%	100%	0	60	200	235	0	171	570	752
	Fulshear Polo Ranch ^{1,2}	Single Family	900	2,880	Beyond 2026		450	900	0%	25%	68%	100%	0	225	610	900	0	686	1,861	2,880
	Fulshear Polo Ranch Phase II ^{1,2}	Single Family	900	2,880	Beyond 2026			900	0%	0%	0%	100%	0	0	0	900	0	0	0	2,880
	Fulshear Lakes ^{1,2}	Single Family	1,500	4,500	Beyond 2026	3.00	500	1,500	0%	12%	49%	100%	0	180	735	1,500	0	522	2,132	4,500
		Multi-Family	500	800	Beyond 2026			500	0%	0%	40%	100%	0	0	200	500	0	0	320	800
	Fulshear Farms ³	Single Family	2,512	8,038	By 2026		1,600	2,512	0%	14%	100%	100%	0	341	2,512	2,512	0	1,090	8,039	8,039
	Non-Residential ^{1,2}	Single Family	206	658	Beyond 2026		137	206	0%	22%	105%	97%	0	45	215	200	0	97	462	640
	Senior Living ^{1,2}	Multi-Family	300	600	Beyond 2026		25	300	0%	8%	117%	100%	0	25	350	300	0	41	578	600
	Jordan Ranch ^{1,2}	Single Family	4,000	12,800	Beyond 2026	2.96	1,350	4,000	0%	26%	61%	100%	0	1,056	2,425	4,000	0	3,411	7,833	12,800
		Multi-Family	750	1,500	Beyond 2026			750	0%	3%	51%	100%	0	25	385	750	0	48	739	1,500
	Harrison Interests North ^{1,2}	Single Family	713	2,280	Beyond 2026		475	713	0%	10%	72%	100%	0	70	510	713	0	224	1,632	2,280
	Foster Farms ^{1,2}	Single Family	10,800	34,560	Beyond 2026		4,626	10,800	0%	0%	8%	20%	0	15	850	2,160	0	48	2,720	6,912
	Fulshear Run ^{1,2}	Single Family	250	800	Beyond 2026	0.87	287	250	0%	37%	75%	100%	0	92	188	250	0	276	564	800
		Multi-Family	480	960	Beyond 2026	10		480	0%	16%	31%	100%	0	75	150	480	0	120	240	960
Fulbrook at Fulshear Creek ^{1,2}	Single Family	1,000	3,200	Beyond 2026	1.49	670	1,000	22%	54%	91%	100%	221	537	909	1,000	707	1,671	2,805	3,200	
	Multi-Family	400	800	Beyond 2026			400	0%	0%	0%	100%	0	0	0	400	0	0	0	800	
Cross Creek Ranch ³	Single Family	5,800	18,560	By 2021			5,800	46%	100%	100%	100%	2,677	5,800	5,800	5,800	8,567	18,560	18,560	18,560	
	Multi-Family	1,500	3,000	Beyond 2026			1,500	0%	30%	100%	100%	0	455	1,500	1,500	0	975	2,157	2,240	
Harrison Interests South ^{1,2}	Single Family	5,795	18,542	Beyond 2026		3,863	5,795	0%	1%	16%	75%	0	60	900	2,897	0	192	2,880	13,907	
Projected Population Due to Future Residential Developments Served by the City:													3,128	9,301	18,839	28,107	10,202	29,090	55,512	88,794
Others	Firethorne ^{1,2}	Single Family	3,400	10,880	Beyond 2026	2.43	1,400	3,400		11%	12%	100%		368	421	3,400		1,178	1,347	10,880
	Churchill Farms ^{1,2}	Single Family	637	2,038	Beyond 2026	3.08	207	637		0%	0%	100%		0	0	637		0	0	2,038
	Tamarron ^{1,2}	Single Family	4,200	8,320	Beyond 2026	4	1,400	4,200	23%	41%	87%	100%		1,724	3,635	4,200		5,395	11,511	8,320
Multi-Family		300	10			300				100%			300							
Population Due to Future Residential Developments Served by Others:															0	6,573	12,859	21,238		
Population Due to Future Residential Developments Served by the City and Others:															10,202	35,663	68,371	110,032		

1. From Population and Survey Analysts (PASA) Demographic Report - Spring 2018

2. From Developer Agreement

3. Input from Developer



APPENDIX B:

Pressure Recorder Data

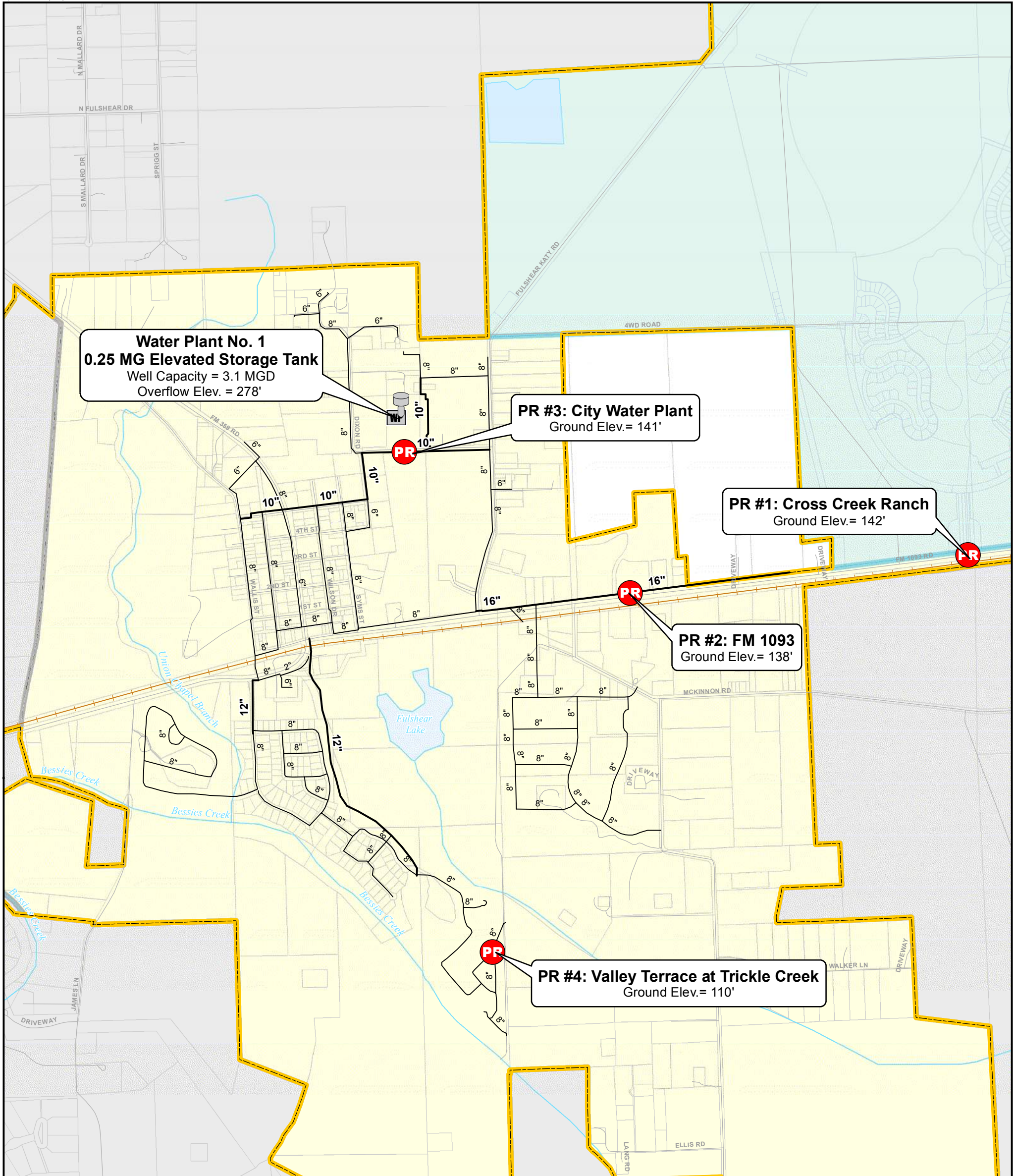


FIGURE B-1
CITY OF FULSHEAR
PRESSURE RECORDER LOCATIONS
LEGEND

Pressure Recorders	Stream
Water Plant	Lake/Pond
Elevated Storage Tank	Parcel
8" and Smaller Water Line	City Limit
10" and Larger Water Line	ETJ
Road	Other City Limit
Railroad	

FREES AND NICHOLS

CITY OF FULSHEAR
 1924 • 1890 • 1977

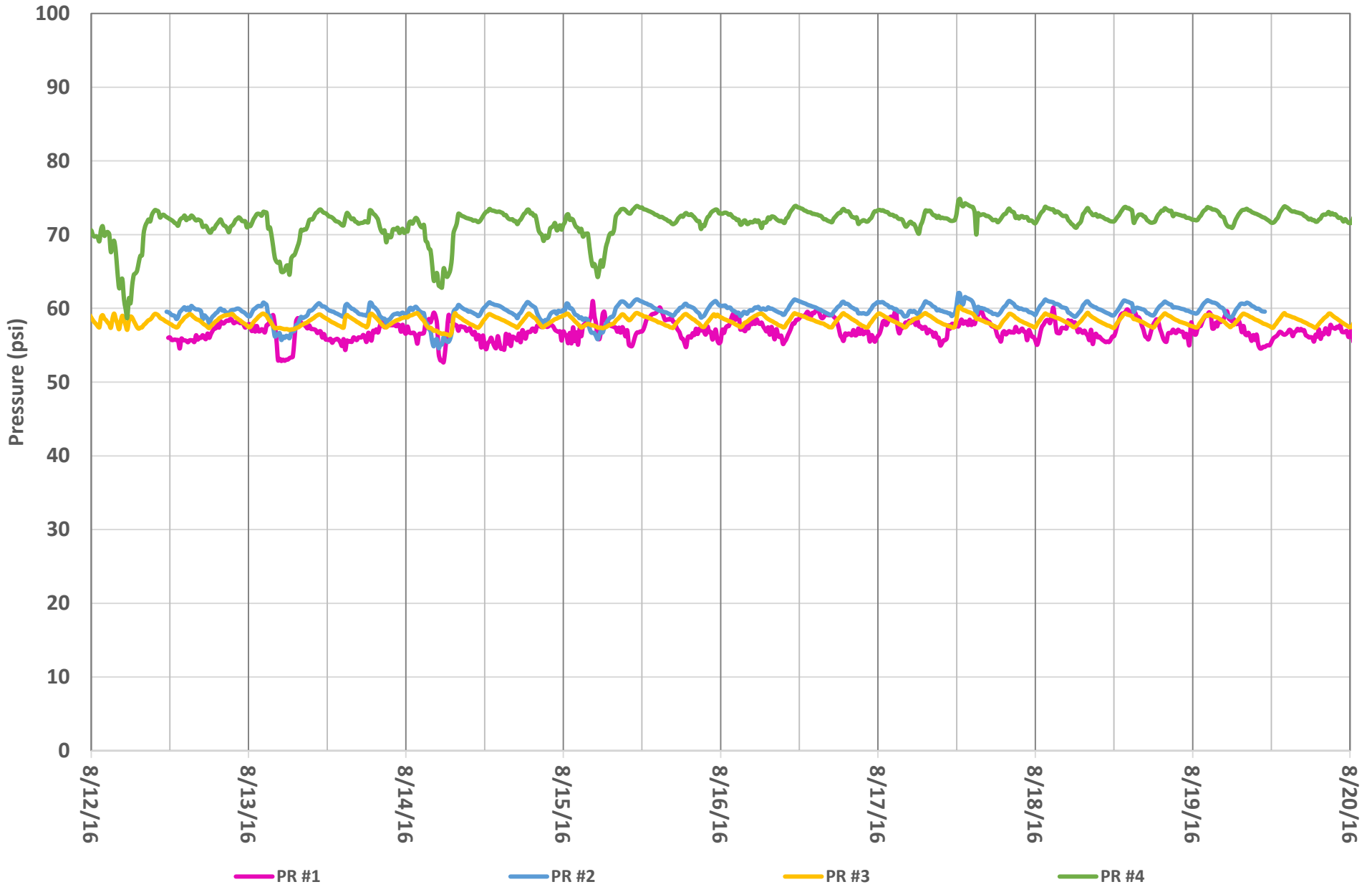
N

0 1,000
 SCALE IN FEET

City of Fulshear

Pressure Testing Results

August 12 - 19, 2016



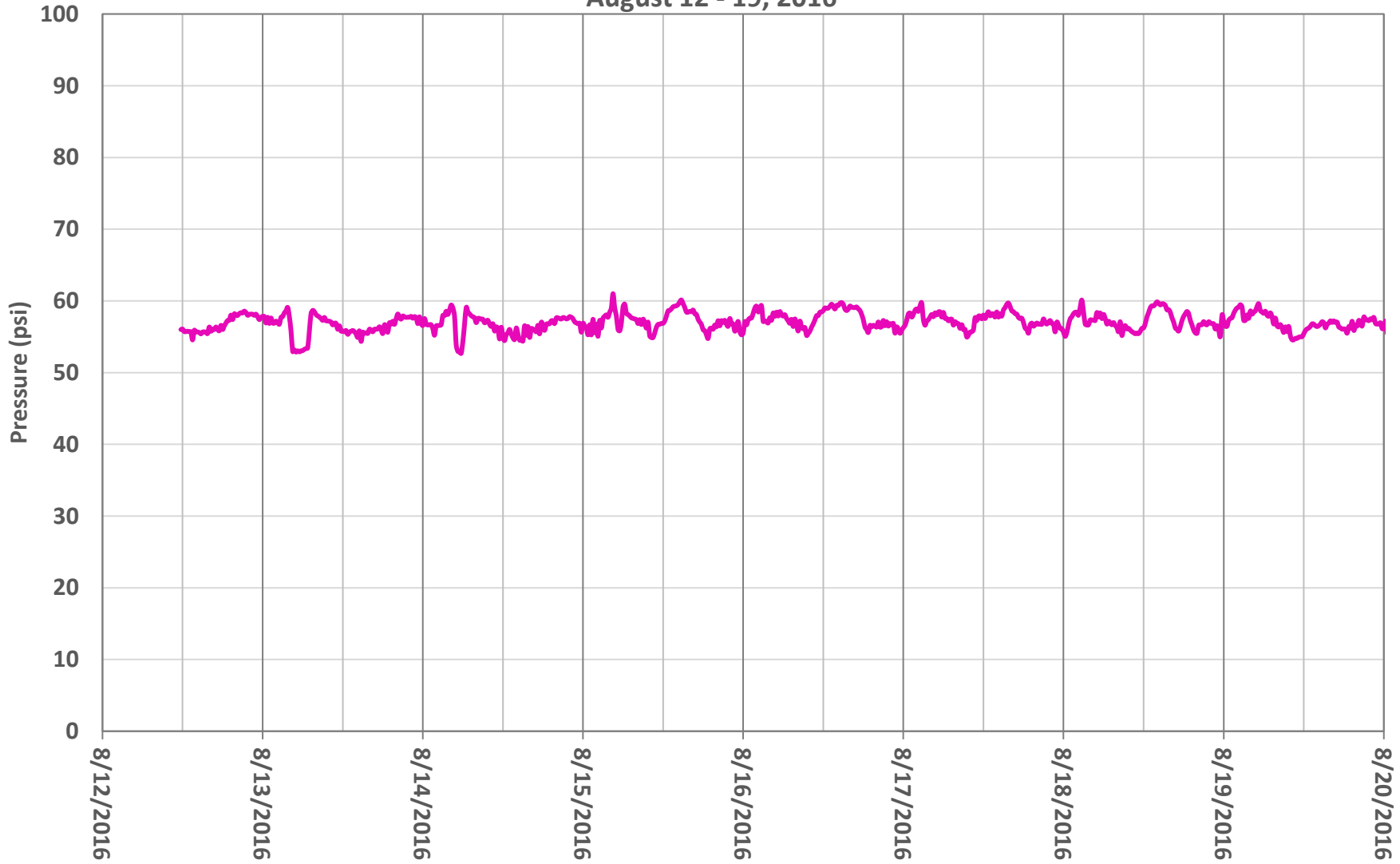


City of Fulshear

Pressure Recorder #1: PR201667

Cross Creek Ranch at FM 1093 - **Ground Elevation 142'**

August 12 - 19, 2016



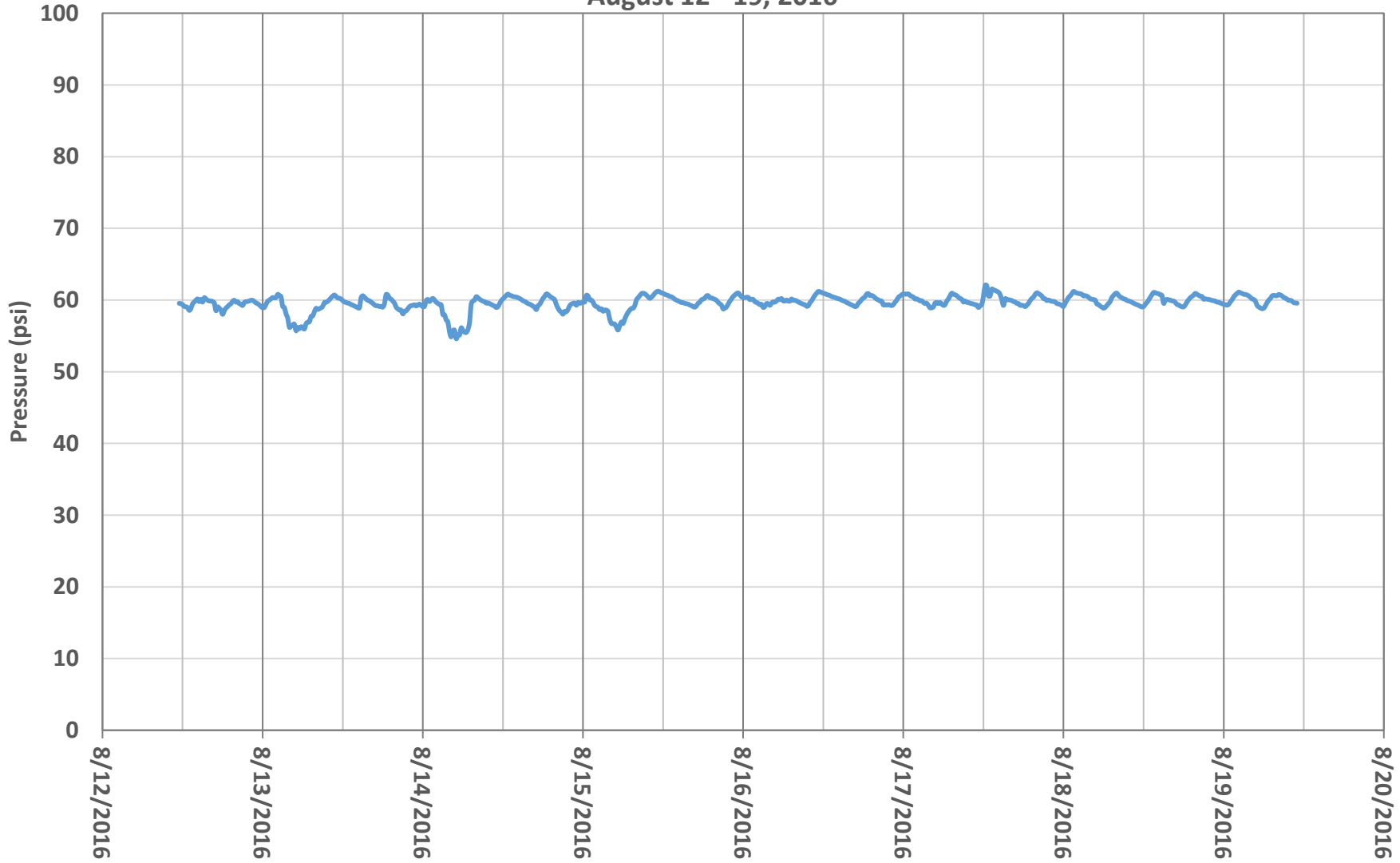


City of Fulshear

Pressure Recorder #2: PR203435

FM 1093 - **Ground Elevation 138'**

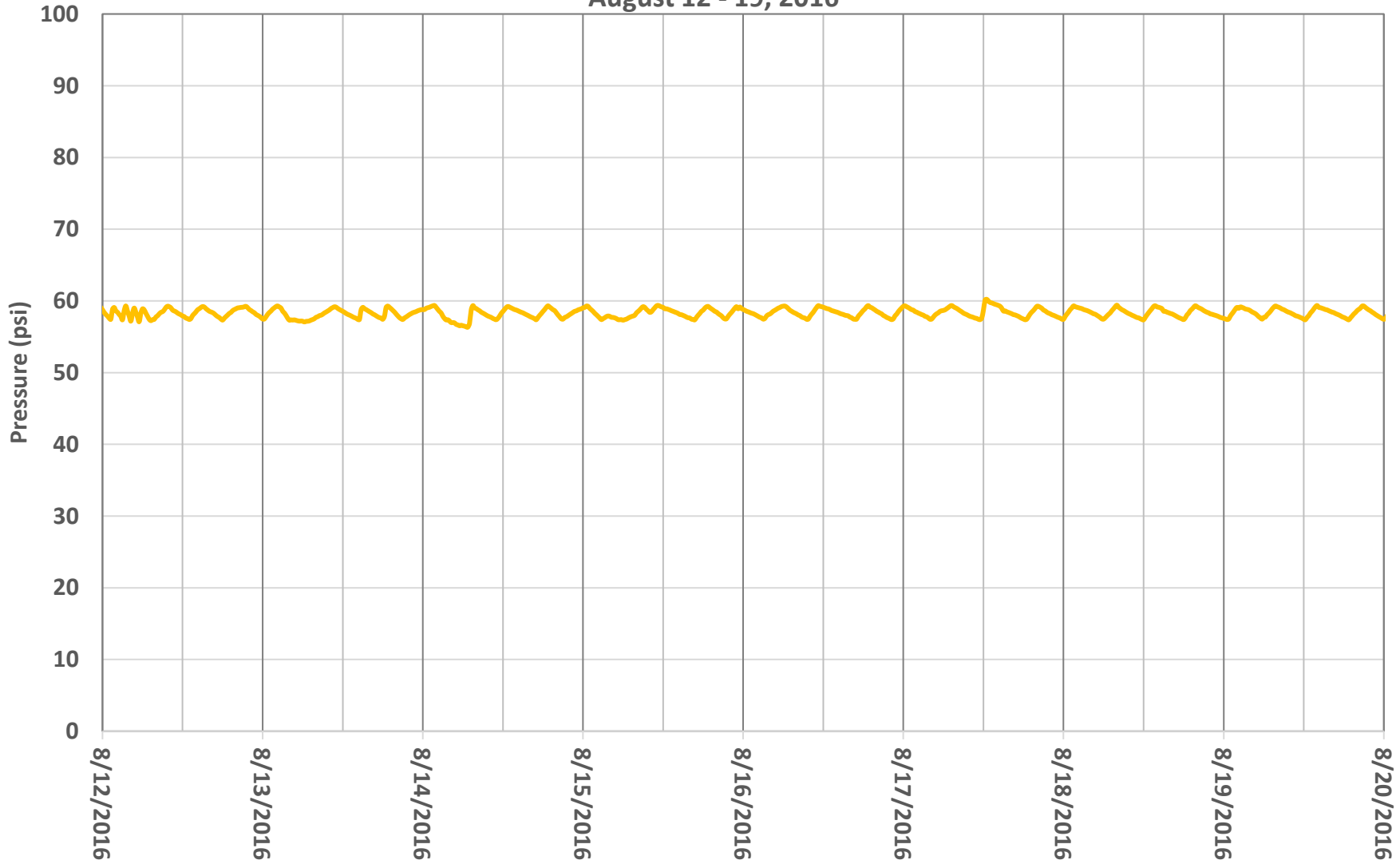
August 12 - 19, 2016





City of Fulshear

Pressure Recorder #3: PR1669
City Water Plant - **Ground Elevation 141'**
August 12 - 19, 2016



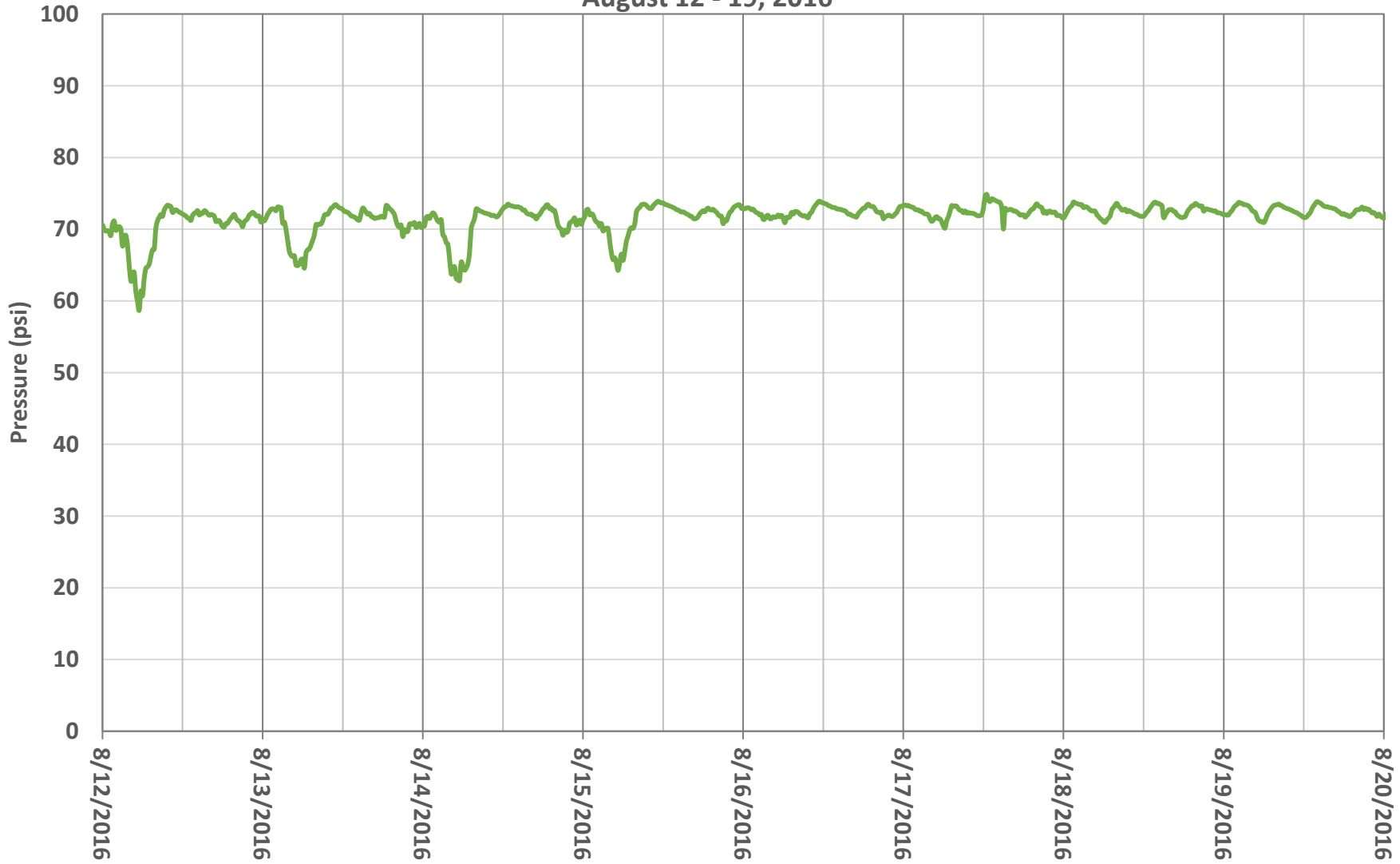


City of Fulshear

Pressure Recorder #4: PR204228

Valley Terrace at Trickle Creek - **Ground Elevation 110'**

August 12 - 19, 2016





APPENDIX C:

Water Capital Improvements Plan Projects

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 1

Phase: 2021

Project Name: **16-inch Huggins Transmission Line**

Project Description:

This project consists of the construction of a new 16-inch transmission line along extended Huggins Rd from Katy-Fulshear Road to FM 359.

Project Driver:

The existing 10-inch water line along Huggins Rd is undersized for future demands and should be replaced to provide additional capacity to and from the existing Water Plant No. 1.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	3,800	LF	\$ 160	\$ 608,000
2	30-inch Boring and Casing	900	LF	\$ 525	\$ 472,500
SUBTOTAL:					\$ 1,080,500
	CONTINGENCY			30%	\$ 324,200
SUBTOTAL:					\$ 1,404,700
	ENG/SURVEY			15%	\$ 210,800
SUBTOTAL:					\$ 1,615,500
Estimated Project Total:					\$ 1,615,500

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 2

Phase: 2021

Project Name: 12/16-inch FM 359 Transmission Line - Phase I

Project Description:

This project consists of the construction of new 12-inch and 16-inch transmission lines along FM 359 from FM 1093 to the southern section of the Fulshear Farms developments (FBC MUD 195).

Project Driver:

This project will deliver flow to the FM 1093 and FM 359 corridor and will complete a loop to deliver flow to enhance fire flow capacity.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	3,100	LF	\$ 160	\$ 496,000
2	12-inch Water Line & Appurtenances	8,000	LF	\$ 120	\$ 960,000
3	30-inch Boring and Casing	1,200	LF	\$ 525	\$ 630,000
				SUBTOTAL:	\$ 2,086,000
CONTINGENCY				30%	\$ 625,800
				SUBTOTAL:	\$ 2,711,800
ENG/SURVEY				15%	\$ 406,800
				SUBTOTAL:	\$ 3,118,600
Estimated Project Total:					\$ 3,118,600



City of Fulshear

Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 3

Phase: 2021

Project Name: 16-inch FM Katy-Fulshear Rd Transmission Line

Project Description:

This project consists of the construction of a 16-inch Transmission Line along Katy-Fulshear Road from FM 1093 to proposed Cross Creek Ranch Water Plant No. 3.

Project Driver:

The existing 8-inch water line along Katy-Fulshear Rd is undersized for future demands and should be replaced. This project will increase fire flow capacity and provide water system connectivity between the Cross Creek Ranch Water Plant No. 3 and City of Fulshear Water Plant No. 1.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	15,400	LF	\$ 160	\$ 2,464,000
2	30-inch Boring and Casing	1,600	LF	\$ 525	\$ 840,000
				SUBTOTAL:	\$ 3,304,000
			CONTINGENCY	30%	\$ 991,200
				SUBTOTAL:	\$ 4,295,200
			ENG/SURVEY	15%	\$ 644,300
				SUBTOTAL:	\$ 4,939,500
Estimated Project Total:					\$ 4,939,500

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 4

Phase: 2021

Project Name: **16-inch Katy-Fulshear/McKinnon Rd Transmission Line**

Project Description:

This project consists of the construction of a new 16-inch transmission line along Katy-Fulshear/ McKinnon Rd from FM 1093 to future Texas Heritage Parkway. This project also includes the construction of a new 16-inch transmission line along future Texas Heritage Parkway from FM 1093 to McKinnon Rd and also the extension of the existing 16-inch transmission line along FM 1093 to the Cross Creek Ranch system at approximately Cross Creek Ranch Blvd.

Project Driver:

The existing 8-inch water line along Katy-Fulshear/McKinnon Rd is undersized for future demands and should be replaced and extended. This project will deliver flow to the Fulshear Run and Harrison Interests South developments and provide an additional connection between the Cross Creek Ranch System and the City of Fulshear System. This will complete a loop in order to increase fire protection and increase supply redundancy.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	13,900	LF	\$ 160	\$ 2,224,000
2	30-inch Boring and Casing	3,100	LF	\$ 525	\$ 1,627,500
				SUBTOTAL:	\$ 3,851,500
				CONTINGENCY	30%
					\$ 1,155,500
				SUBTOTAL:	\$ 5,007,000
				ENG/SURVEY	15%
					\$ 751,100
				SUBTOTAL:	\$ 5,758,100
Estimated Project Total:					\$ 5,758,100

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 5

Phase: 2021

Project Name: **1.0 MG South Elevated Storage Tank**

Project Description:

This project includes the construction of a 1.0 MG elevated storage tank at an approximate location along McKinnon Rd between Bois D’arc Ln and future Texas Heritage Parkway. An exact location will be determined during engineering design.

Project Driver:

This project will serve short term growth in the city and provide required elevated storage.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.0 MG Elevated Storage Tank	1	LS	\$ 2,000,000	\$ 2,000,000
SUBTOTAL:					\$ 2,000,000
CONTINGENCY				30%	\$ 600,000
SUBTOTAL:					\$ 2,600,000
ENG/SURVEY				20%	\$ 520,000
SUBTOTAL:					\$ 3,120,000
Estimated Project Total:					\$ 3,120,000

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 6

Phase: 2021

Project Name: **12-inch James Ln Transmission Line**

Project Description:

This project consists of the construction of a new 12-inch transmission line along James Lane from FM 1093 to Meadow Wood Drive.

Project Driver:

This project will deliver flow to Fulbrook on Fulshear Creek in order to complete a loop and increase fire protection.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12-inch Water Line & Appurtenances	3,200	LF	\$ 120	\$ 384,000
2	24-inch Boring and Casing	700	LF	\$ 420	\$ 294,000
				SUBTOTAL:	\$ 678,000
CONTINGENCY				30%	\$ 203,400
				SUBTOTAL:	\$ 881,400
ENG/SURVEY				15%	\$ 132,300
				SUBTOTAL:	\$ 1,013,700
Estimated Project Total:					\$ 1,013,700

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 7

Phase: 2021

Project Name: **12-inch FM 359 Transmission Line - Phase II**

Project Description:

This project consists of the construction of a new 12-inch transmission line along FM 359 from the south section of Fulshear Farms (FBC MUD 195) to the north section of Fulshear Farms.

Project Driver:

This project will complete a loop to deliver flow to the northern section Fulshear Farms (FBC MUD 195).

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12-inch Water Line & Appurtenances	4,500	LF	\$ 120	\$ 540,000
2	24-inch Boring and Casing	1,300	LF	\$ 420	\$ 546,000
				SUBTOTAL:	\$ 1,086,000
			CONTINGENCY	30%	\$ 325,800
				SUBTOTAL:	\$ 1,411,800
			ENG/SURVEY	15%	\$ 211,800
				SUBTOTAL:	\$ 1,623,600
Estimated Project Total:					\$ 1,623,600

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 8

Phase: 2026

Project Name: **16-inch Bois D'Arc Lane Transmission Line**

Project Description:

This project consists of the construction of a new 16-inch transmission line south along Bois D'Arc Lane from McKinnon Road to Ellis Road.

Project Driver:

This project will serve future developments to the southeast part of the City.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	7,800	LF	\$ 160	\$ 1,248,000
2	30-inch Boring and Casing	1,800	LF	\$ 525	\$ 945,000
SUBTOTAL:					\$ 2,193,000
	CONTINGENCY			30%	\$ 657,900
SUBTOTAL:					\$ 2,850,900
	ENG/SURVEY			15%	\$ 427,700
SUBTOTAL:					\$ 3,278,600
Estimated Project Total:					\$ 3,278,600

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 9

Phase: 2026

Project Name: **16-inch Texas Heritage Parkway South Transmission Line - Phase I**

Project Description:

This project consists of the construction of a new 16-inch transmission line along future Texas Heritage Parkway from McKinnon Road to Ellis Road extension (future collector) and west along Ellis Road extension (future collector) from future Texas Heritage Parkway to Bois D'Arc Lane.

Project Driver:

This project will complete a loop to provide fire flow capacity and water service to the southeast Fulshear developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	15,200	LF	\$ 160	\$ 2,432,000
2	30-inch Boring and Casing	1,000	LF	\$ 525	\$ 525,000
SUBTOTAL:					\$ 2,957,000
	CONTINGENCY			30%	\$ 887,100
SUBTOTAL:					\$ 3,844,100
	ENG/SURVEY			15%	\$ 576,700
SUBTOTAL:					\$ 4,420,800
Estimated Project Total:					\$ 4,420,800



City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 10

Phase: 2026

Project Name: **12/16-inch West Fulshear Transmission Line**

Project Description:

This project consists of the construction of new 12 and 16-inch transmission lines along a future collector road west of Huggins Rd from FM 359 to Fulshear Lakes development.

Project Driver:

This project will provide additional capacity to west Fulshear developments and connect the proposed Water Plant No. 2 with the rest of the system.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	5,500	LF	\$ 160	\$ 880,000
2	12-inch Water Line & Appurtenances	5,700	LF	\$ 120	\$ 684,000
3	30-inch Boring and Casing	750	LF	\$ 525	\$ 393,750
4	24-inch Boring and Casing	750	LF	\$ 420	\$ 315,000
				SUBTOTAL:	\$ 2,272,800
	CONTINGENCY			30%	\$ 681,900
				SUBTOTAL:	\$ 2,954,700
	ENG/SURVEY			15%	\$ 443,300
				SUBTOTAL:	\$ 3,398,000
Estimated Project Total:					\$ 3,398,000



City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 11

Phase: 2026

Project Name: Water Plant No. 2

Project Description:

This project includes the construction of a new water plant (Water Plant No. 2) on a one-acre designated parcel in the Fulshear Polo Ranch development. In order to meet TCEQ requirements the groundwater well should be designed to produce approximately 4.0 MGD. The project also includes construction of a 3.0 MG ground storage tank and 5.75 MGD pump station.

Project Driver:

A one-acre parcel has been designated in Polo Ranch for construction of a water plant (Water Plant No. 2). This project will provide increased water supply to meet city-wide maximum day water demands.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	4 MGD Groundwater Well	1	LS	\$ 1,320,000	\$ 1,320,000
2	Pump Station - New 5.75 MGD	1	LS	\$ 5,750,000	\$ 5,750,000
3	3 MG Ground Storage Tank	1	LS	\$ 3,000,000	\$ 3,000,000
4	Water Plant Site Work & Yard Piping	1	LS	\$ 200,000	\$ 200,000
				SUBTOTAL:	\$ 10,270,000
				CONTINGENCY	30%
					\$ 3,081,000
				SUBTOTAL:	\$ 13,351,000
				ENG/SURVEY	20%
					\$ 2,670,200
				SUBTOTAL:	\$ 16,021,200
Estimated Project Total:					\$ 16,021,200

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 12

Phase: 2026

Project Name: 12-inch Future Polo Ranch Transmission Line

Project Description:

This project consists of the construction of a new 12-inch transmission line along a future collector road bisecting the Fulshear Polo Ranch development.

Project Driver:

This project will complete a loop to deliver flow to the western Fulshear developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12-inch Water Line & Appurtenances	7,800	LF	\$ 120	\$ 936,000
2	24-inch Boring and Casing	1,600	LF	\$ 420	\$ 672,000
				SUBTOTAL:	\$ 1,608,000
CONTINGENCY				30%	\$ 482,400
				SUBTOTAL:	\$ 2,090,400
ENG/SURVEY				15%	\$ 313,600
				SUBTOTAL:	\$ 2,404,000
Estimated Project Total:					\$ 2,404,000

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 13

Phase: 2026

Project Name: 16-inch North Fulshear Transmission Line – Phase I

Project Description:

This project consists of the construction of a new 16-inch transmission line along a future Prairie Parkway from FM 359 to the eastern edge of the southern Fulshear Farms development.

Project Driver:

This project will deliver flow to Fulshear Farms, Harrison Interests North and a proposed North Elevated Storage Tank.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	9,000	LF	\$ 160	\$ 1,440,000
2	30-inch Boring and Casing	1,300	LF	\$ 525	\$ 682,500
				SUBTOTAL:	\$ 2,122,500
				CONTINGENCY	30%
					\$ 636,800
				SUBTOTAL:	\$ 2,759,300
				ENG/SURVEY	15%
					\$ 413,900
				SUBTOTAL:	\$ 3,173,200
Estimated Project Total:					\$ 3,173,200



City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 14

Phase: 2026

Project Name: 16-inch Fulshear Farms Transmission Line Loop

Project Description:

This project consists of the construction of a new 16-inch transmission line from 359 through the southern Fulshear Farms developments to the eastern edge of Fulshear Farms.

Project Driver:

This project will provide looping and reliable water service to Fulshear Farms development.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	8,400	LF	\$ 160	\$ 1,344,000
2	30-inch Boring and Casing	400	LF	\$ 525	\$ 210,000
				SUBTOTAL:	\$ 1,554,000
			CONTINGENCY	30%	\$ 466,200
				SUBTOTAL:	\$ 2,020,200
			ENG/SURVEY	15%	\$ 303,100
				SUBTOTAL:	\$ 2,323,300
Estimated Project Total:					\$ 2,323,300

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 15

Phase: 2026

Project Name: 16-inch Transmission Line Loop

Project Description:

This project consists of the construction of a new 16-inch north Fulshear transmission line loop.

Project Driver:

This project will complete a north system loop and deliver flow to and from the proposed 1.0 MG North Elevated Storage Tank.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	19,100	LF	\$ 160	\$ 3,056,000
2	30-inch Boring and Casing	2,100	LF	\$ 525	\$ 1,102,500
SUBTOTAL:					\$ 4,158,500
	CONTINGENCY			30%	\$ 1,247,600
SUBTOTAL:					\$ 5,406,100
	ENG/SURVEY			15%	\$ 811,000
SUBTOTAL:					\$ 6,217,100
Estimated Project Total:					\$ 6,217,100



City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 17

Phase: 2026

Project Name: 16-inch/12-inch Texas Heritage Parkway South Transmission Line - Phase II

Project Description:

This project consists of the construction of a new 16-inch transmission line along future Texas Heritage Parkway from Ellis Rd ext. to Winner-Foster Rd.

Project Driver:

This project will deliver flow to the Foster Farms development.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	6,000	LF	\$ 160	\$ 960,000
2	12-inch Water Line & Appurtenances	6,000	LF	\$ 120	\$ 720,000
3	30-inch Boring and Casing	400	LF	\$ 525	\$ 210,000
4	24-inch Boring and Casing	400	LF	\$ 420	\$ 168,000
				SUBTOTAL:	\$ 2,058,000
			CONTINGENCY	30%	\$ 617,400
				SUBTOTAL:	\$ 2,675,400
			ENG/SURVEY	15%	\$ 401,400
				SUBTOTAL:	\$ 3,076,800
Estimated Project Total:					\$ 3,076,800

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 18

Phase: 2036

Project Name: **Water Plant No. 3**

Project Description:

This project includes the construction of a new water plant (Water Plant No. 3). In order meet TCEQ requirements the groundwater well should be designed to produce approximately 4.0 MGD. The project also includes construction of a 3.0 MG ground storage tank and 5.75 MGD pump station.

Project Driver:

This project will provide increased water supply to meet city-wide maximum day water demands.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	4 MGD Groundwater Well	1	LS	\$ 1,320,000	\$ 1,320,000
2	Pump Station - New 5.75 MGD	1	LS	\$ 5,750,000	\$ 5,750,000
3	3 MG Ground Storage Tank	1	LS	\$ 3,000,000	\$ 3,000,000
4	Water Plant Site Work & Yard Piping	1	LS	\$ 200,000	\$ 200,000
				SUBTOTAL:	\$ 10,270,000
				CONTINGENCY	30%
					\$ 3,081,000
				SUBTOTAL:	\$ 13,351,000
				ENG/SURVEY	20%
					\$ 2,670,200
				SUBTOTAL:	\$ 16,021,200
Estimated Project Total:					\$ 16,021,200

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 19

Phase: 2036

Project Name: 16-inch South Fulshear Transmission Line – Phase I

Project Description:

This project consists of the construction of a new 16-inch transmission line connecting the existing water system to the proposed Water Plant No. 4.

Project Driver:

This project will connect the existing system to the proposed Water Plant No. 4.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	5,500	LF	\$ 160	\$ 880,000
2	30-inch Boring and Casing	400	LF	\$ 525	\$ 210,000
				SUBTOTAL:	\$ 1,090,000
CONTINGENCY				30%	\$ 327,000
				SUBTOTAL:	\$ 1,417,000
ENG/SURVEY				15%	\$ 212,600
				SUBTOTAL:	\$ 1,629,600
Estimated Project Total:					\$ 1,629,600

City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 20

Phase: 2036

Project Name: Water Plant No. 4

Project Description:

This project includes the construction of a new water plant (Water Plant No. 4) in the Fulbrook on Fulshear Creek development. In order meet TCEQ requirements the groundwater well should be designed to produce approximately 4.0 MGD. The project also includes construction of a 3.0 MG ground storage tank and 5.75 MGD pump station.

Project Driver:

A one-acre parcel has been designated in Fulbrook on Fulshear Creek development for construction of a water plant (Water Plant No. 4). This project will provide increased water supply to meet city-wide maximum day water demands.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	4 MGD Groundwater Well	1	LS	\$ 1,320,000	\$ 1,320,000
2	Pump Station - New 5.75 MGD	1	LS	\$ 5,750,000	\$ 5,750,000
3	3 MG Ground Storage Tank	1	LS	\$ 3,000,000	\$ 3,000,000
4	Water Plant Site Work & Yard Piping	1	LS	\$ 200,000	\$ 200,000
				SUBTOTAL:	\$ 10,270,000
			CONTINGENCY	30%	\$ 3,081,000
				SUBTOTAL:	\$ 13,351,000
			ENG/SURVEY	20%	\$ 2,670,200
				SUBTOTAL:	\$ 16,021,200
Estimated Project Total:					\$ 16,021,200



City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 21

Phase: 2036

Project Name: 1.5 MG West Elevated Storage Tank

Project Description:

This project includes the construction of a new 1.5 MG elevated storage tank to the west of the city.

Project Driver:

This project will serve growth and provide required elevated storage capacity. An approximate location in the west part of the City along FM 1093 was utilized for this study due to its optimal hydraulics and proximity to existing and future developments. An exact location will be determined during engineering design.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.5 MG Elevated Storage Tank	1	LS	\$ 3,000,000	\$ 3,000,000
				SUBTOTAL:	\$ 3,000,000
CONTINGENCY				30%	\$ 900,000
				SUBTOTAL:	\$ 3,900,000
ENG/SURVEY				20%	\$ 780,000
				SUBTOTAL:	\$ 4,680,000
				Estimated Project Total:	\$ 4,680,000



Water Capital Improvement Cost Estimate **July 10, 2018**

Construction Project Number: 22 **Phase: 2036**

Project Name: 12-inch Bois D'Arc Lane Transmission Line

Project Description:

This project consists of the construction of a new 12-inch transmission line along Bois D'Arc Lane from Ellis Road to Winner-Foster Road.

Project Driver:

This project will serve the southern Fulshear developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12-inch Water Line & Appurtenances	11,300	LF	\$ 120	\$ 1,356,000
2	24-inch Boring and Casing	2,000	LF	\$ 420	\$ 840,000
SUBTOTAL:					\$ 2,196,000
CONTINGENCY				30%	\$ 658,800
SUBTOTAL:					\$ 2,854,800
ENG/SURVEY				15%	\$ 428,300
SUBTOTAL:					\$ 3,283,100

Estimated Project Total: \$ 3,283,100



City of Fulshear



Water Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: **23**

Phase: 2036

Project Name: **16-inch South Fulshear Transmission Line**

Project Description:

This project consists of the construction of a new 16-inch transmission line along Winner-Foster Road to future Texas Heritage Parkway.

Project Driver:

This project will complete a loop to deliver flow and serve the southern Fulshear developments and provide additional capacity to Foster Farms.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16-inch Water Line & Appurtenances	24,300	LF	\$ 160	\$ 3,888,000
2	30-inch Boring and Casing	2,000	LF	\$ 525	\$ 1,050,000
				SUBTOTAL:	\$ 4,938,000
				CONTINGENCY	30%
					\$ 1,481,400
				SUBTOTAL:	\$ 6,419,400
				ENG/SURVEY	15%
					\$ 963,000
				SUBTOTAL:	\$ 7,382,400

Estimated Project Total: \$ 7,382,400



APPENDIX D:

Wastewater Capital Improvements Plan Projects

City of Fulshear



Wastewater Capital Improvement Cost Estimate **July 10, 2018**

Construction Project Number: 1 **Phase: 2021**

Project Name: 3.0 MGD Cross Creek Ranch WWTP Expansion to 4.0 MGD

Project Description:

This project consists of the expansion of the existing 1.5 MGD Cross Creek Ranch WWTP to 4.0 MGD and decommissioning the existing 0.5 MGD package plant.

Project Drivers:

This project will provide additional treatment capacity for short term growth within the City of Fulshear system and provide sufficient capacity for the buildout of the Cross Creek Ranch development.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	3.0 MGD Cross Creek Ranch WWTP Expansion	1	LS	\$ 24,000,000	\$ 24,000,000
				SUBTOTAL:	\$ 24,000,000
				CONTINGENCY	30%
					\$ 7,200,000
				SUBTOTAL:	\$ 31,200,000
				ENG/SURVEY	20%
					\$ 6,240,000
				SUBTOTAL:	\$ 37,440,000

Estimated Project Total: \$ 37,440,000

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 2

Phase: 2021

Project Name: 9.3 MGD WWTP Diversion Lift Station and 20-inch Force Main

Project Description:

This project consists of the construction of a new diversion lift station with 9.3 MGD of pumping capacity and 14.6 MGD of wet well capacity. This project also includes a 20-inch Force Main along FM 1093 from the diversion lift station to the existing Cross Creek Ranch WWTP.

Project Drivers:

The existing City of Fulshear WWTP is located on a site that does not have sufficient room for future expansion to serve anticipated growth within the city. This project will divert flows from the existing WWTP to the Cross Creek Ranch WWTP and allow the City to decommission the existing WWTP in future.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	9.3 MGD Lift Station with 14.6 MGD Wet Well	1	EA	\$ 4,290,000	\$ 4,290,000
2	20-inch Force Main	11,300	LF	\$ 200	\$ 2,260,000
3	32-inch Boring and Casing	1,500	LF	\$ 560	\$ 840,000
4	60-inch Diameter Manhole	3	EA	\$ 14,000	\$ 42,000
				SUBTOTAL:	\$ 7,432,000
				CONTINGENCY	30%
					\$ 2,229,600
				SUBTOTAL:	\$ 9,661,600
				ENG/SURVEY	20%
					\$ 1,932,400
				SUBTOTAL:	\$ 11,594,000
Estimated Project Total:					\$ 11,594,000

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 4

Phase: 2021

Project Name: **30-inch Texas Heritage Parkway Interceptor**

Project Description:

This project consists of the construction of a new 30-inch interceptor along the future Texas Heritage Parkway to the Cross Creek Ranch WWTP.

Project Drivers:

This project will serve wastewater flows from Jordan Ranch and other northern Fulshear developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	30-inch Sewer Interceptor	21,800	LF	\$ 270	\$ 5,886,000
2	42-inch Boring and Casing	400	LF	\$ 735	\$ 294,000
3	72-inch Diameter Manhole	29	EA	\$ 18,000	\$ 522,000
				SUBTOTAL:	\$ 6,702,000
			CONTINGENCY	30%	\$ 2,010,600
				SUBTOTAL:	\$ 8,712,600
			ENG/SURVEY	15%	\$ 1,306,900
				SUBTOTAL:	\$ 10,019,500
Estimated Project Total:					\$ 10,019,500

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 5

Phase: 2021

Project Name: 2.6 MGD West Fulshear Lift Station

Project Description:

This project consists of the construction of a new 2.6 MGD West Fulshear Lift Station.

Project Drivers:

The existing force main that the lift station will pump into was completed in early 2018. This project would serve developments in west Fulshear such as Polo Ranch and Fulshear Lakes.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	2.6 MGD Lift Station	1	EA	\$ 1,040,000	\$ 1,040,000
				SUBTOTAL:	\$ 1,040,000
				CONTINGENCY	30%
				SUBTOTAL:	\$ 1,352,000
				ENG/SURVEY	15%
				SUBTOTAL:	\$ 1,554,800
Estimated Project Total:					\$ 1,554,800

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 6

Phase: 2021

Project Name: **15/18-inch West Fulshear Interceptor Phase I**

Project Description:

This project consists of the construction of a new 15/18-inch interceptor.

Project Drivers:

This interceptor will serve developments in west Fulshear, primarily Polo Ranch.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18-inch Sewer Interceptor	3,500	LF	\$ 162	\$ 567,000
2	15-inch Sewer Interceptor	2,400	LF	\$ 135	\$ 324,000
3	24-inch Boring and Casing	200	LF	\$ 420	\$ 84,000
4	60-inch Diameter Manhole	9	EA	\$ 14,000	\$ 126,000
				SUBTOTAL:	\$ 1,101,000
		CONTINGENCY		30%	\$ 330,300
				SUBTOTAL:	\$ 1,431,300
		ENG/SURVEY		15%	\$ 214,700
				SUBTOTAL:	\$ 1,646,000

Estimated Project Total: \$ 1,646,000

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 7

Phase: 2026

Project Name: 3.5 MGD Regional Wastewater Treatment Facility

Project Description:

This project is a proposed 3.5 MGD Regional WWTP that will replace the existing City of Fulshear WWTP. A contiguous 30-acre parcel of land would be needed to construct this project and facilitate future expansions.

Project Drivers:

This project is intended to serve existing and future developments within the City of Fulshear and its ETJ.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	3.5 MGD Regional WWTP	1	LS	\$ 27,000,000	\$ 27,000,000
2	Regional WWTP Land Acquisition	30	AC	\$ 50,000	\$ 1,500,000
SUBTOTAL:					\$ 28,500,000
	CONTINGENCY			30%	\$ 8,550,000
SUBTOTAL:					\$ 37,050,000
	ENG/SURVEY			20%	\$ 7,410,000
SUBTOTAL:					\$ 44,460,000
Estimated Project Total:					\$ 44,460,000

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 8

Phase: 2026

Project Name: 30/36/48/54-inch Bois D'Arc Interceptor - Phase I

Project Description:

This project consists of the construction of a new 30/36/48/54-inch interceptor along Bois D'Arc Ln from FM 1093 to the proposed Fulshear Regional Treatment Facility (project 7).

Project Drivers:

This project will convey flows from eastern Fulshear developments as well as the Diversion Lift Station to the new Fulshear Regional WWTP.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	54-inch Sewer Interceptor	6,600	LF	\$ 486	\$ 3,207,600
2	48-inch Sewer Interceptor	2,000	LF	\$ 432	\$ 864,000
3	36-inch Sewer Interceptor	2,200	LF	\$ 324	\$ 712,800
4	30-inch Sewer Interceptor	4,400	LF	\$ 270	\$ 1,188,000
5	42-inch Boring and Casing	2,000	LF	\$ 735	\$ 1,470,000
6	72-inch Diameter Manhole	19	EA	\$ 18,000	\$ 342,000
7	20-inch Force Main	500	LF	\$ 200	\$ 100,000
				SUBTOTAL:	\$ 7,884,400
				CONTINGENCY	30%
				SUBTOTAL:	\$ 10,249,800
				ENG/SURVEY	15%
				SUBTOTAL:	\$ 11,787,300
Estimated Project Total:					\$ 11,787,300

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 9

Phase: 2026

Project Name: Expansion of the Diversion Lift Station from 9.3 MGD to 14.6 MGD

Project Description:

This project consists of the expansion of the Diversion Lift Station (Project 2) from 9.3 MGD to 14.6 MGD and construction of a 16-inch force main parallel to the proposed 20-inch force main (Project 2) along FM 1093 from the existing WWTP. This project also includes a connection from the proposed 20-inch force main along FM 1093 to the Bois D'Arc Interceptor (Project 8).

Project Drivers:

This project will divert flow from the existing City of Fulshear WWTP service area through the future interceptors (Project 8) to the new Fulshear Regional Treatment Facility (Project 7).

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	5.3 MGD Lift Station Expansion	1	EA	\$ 1,590,000	\$ 1,590,000
2	16-inch Force Main	6,400	LF	\$ 160	\$ 1,024,000
3	20-inch Force Main	500	LF	\$ 200	\$ 100,000
				SUBTOTAL:	\$ 2,714,000
				CONTINGENCY	30%
					\$ 814,200
				SUBTOTAL:	\$ 3,528,200
				ENG/SURVEY	20%
					\$ 705,700
				SUBTOTAL:	\$ 4,233,900
Estimated Project Total:					\$ 4,233,900

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 10

Phase: 2026

Project Name: Existing City of Fulshear WWTP Decommission

Project Description:

This project includes decommissioning of the existing City of Fulshear WWTP on FM 1093. Decommissioning of the existing City of Fulshear WWTP on FM 1093 will include an environmental assessment, environmental remediation/disposal and demolition.

Project Drivers:

The existing City of Fulshear WWTP must be decommissioned due to the extension of the Westpark Tollway.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	WWTP - Decommission	1	LS	\$ 300,000	\$ 300,000
SUBTOTAL:					\$ 300,000
	CONTINGENCY			30%	\$ 90,000
SUBTOTAL:					\$ 390,000
	ENG/SURVEY			15%	\$ 58,500
SUBTOTAL:					\$ 448,500
Estimated Project Total:					\$ 448,500

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 11

Phase: 2026

Project Name: 12-inch Fulshear Polo Ranch and McCann Interceptor Phase II

Project Description:

This project consist of the construction of a 12-inch Interceptor in west Fulshear.

Project Drivers:

This project will serve Fulshear Polo Ranch Phase II and additional developments in west Fulshear.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12-inch Sewer Interceptor	1,500	LF	\$ 108	\$ 162,000
2	48-inch Diameter Manhole	4	EA	\$ 9,250	\$ 37,000
				SUBTOTAL:	\$ 199,000
				CONTINGENCY	30%
				SUBTOTAL:	\$ 258,700
				ENG/SURVEY	15%
				SUBTOTAL:	\$ 297,600
Estimated Project Total:					\$ 297,600

Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 12

Phase: 2026

Project Name: 18-inch FM 359 Interceptor - Phase II

Project Description:

This project consists of the construction of a new 18-inch Interceptor along FM 359 from Hunt Rd to FM 359 Interceptor (Project 3).

Project Drivers:

This project will serve the northern Fulshear Farms development.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18-inch Sewer Interceptor	4,400	LF	\$ 162	\$ 712,800
2	60-inch Diameter Manhole	7	EA	\$ 14,000	\$ 98,000
SUBTOTAL:					\$ 810,800
				CONTINGENCY 30%	\$ 243,300
SUBTOTAL:					\$ 1,054,100
				ENG/SURVEY 15%	\$ 158,200
SUBTOTAL:					\$ 1,212,300
Estimated Project Total:					\$ 1,212,300

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 13

Phase: 2036

Project Name: 21-inch Harrison Interests Interceptor - Phase I

Project Description:

This project consists of the construction of a new 21-inch Interceptor along McKinnon Rd from Harrison Interests South to Bois D'Arc Interceptor (Project 8).

Project Drivers:

This project will convey flows from earlier phases of the Harrison Interests development.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	21-inch Sewer Interceptor	2,400	LF	\$ 189	\$ 453,600
2	60-inch Diameter Manhole	4	EA	\$ 14,000	\$ 56,000
				SUBTOTAL:	\$ 509,600
			CONTINGENCY	30%	\$ 152,900
				SUBTOTAL:	\$ 662,500
			ENG/SURVEY	15%	\$ 99,400
				SUBTOTAL:	\$ 761,900
Estimated Project Total:					\$ 761,900

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 14

Phase: 2036

Project Name: 18-inch Harrison Interests Interceptor - Phase II

Project Description:

This project consists of the construction of a new 18-inch Interceptor along Ellis Rd ext. from Harrison Interests South.

Project Drivers:

This project will convey flows from the later phases of Harrison Interests South to the Bois D'Arc Interceptor (Project 8).

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	18-inch Sewer Interceptor	4,100	LF	\$ 162	\$ 664,200
2	30-inch Boring and Casing	200	LF	\$ 525	\$ 105,000
3	60-inch Diameter Manhole	8	EA	\$ 14,000	\$ 112,000
				SUBTOTAL:	\$ 881,200
				CONTINGENCY	30%
				SUBTOTAL:	\$ 1,145,600
				ENG/SURVEY	15%
				SUBTOTAL:	\$ 1,317,500
Estimated Project Total:					\$ 1,317,500



Wastewater Capital Improvement Cost Estimate July 10, 2018

Construction Project Number: 15 Phase: 2036

Project Name: **Regional WWTP Expansion from 3.5 MGD to 6.5 MGD**

Project Description:

This project is an expansion of the Regional WWTP (Project 7) from 3.5 MGD to 6.5 MGD.

Project Drivers:

This 3.0 MGD expansion will be needed to provide sufficient treatment capacity for proposed future developments.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL			
1	3.0 MGD Regional WWTP Expansion	1	LS	\$ 24,000,000	\$ 24,000,000			
				SUBTOTAL:	\$ 24,000,000			
				CONTINGENCY	30%	\$ 7,200,000		
				SUBTOTAL:				\$ 31,200,000
				ENG/SURVEY	20%	\$ 6,240,000		
				SUBTOTAL:				\$ 37,440,000
Estimated Project Total:				\$ 37,440,000				

City of Fulshear



Wastewater Capital Improvement Cost Estimate

July 10, 2018

Construction Project Number: 16

Phase: 2036

Project Name: 21/24-inch Foster Farms Interceptor

Project Description:

This project consists of the construction of a new 21-inch Interceptor along Winner-Foster Rd from Foster Farms to Bois D'Arc Ln and 24-inch Interceptor along Bois D'Arc Ln to the proposed 6.5 MGD Fulshear Regional Treatment Facility (project 15)

Project Drivers:

This project will convey flows from Foster Farms to the proposed Regional WWTP.

Opinion of Probable Construction Cost

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24-inch Sewer Interceptor	4,700	LF	\$ 216	\$ 1,015,200
2	21-inch Sewer Interceptor	4,500	LF	\$ 189	\$ 850,500
3	34-inch Boring and Casing	400	LF	\$ 595	\$ 238,000
4	60-inch Diameter Manhole	13	EA	\$ 14,000	\$ 182,000
SUBTOTAL:					\$ 2,285,700
CONTINGENCY				30%	\$ 685,800
SUBTOTAL:					\$ 2,971,500
ENG/SURVEY				15%	\$ 445,800
SUBTOTAL:					\$ 3,417,300
Estimated Project Total:					\$ 3,417,300