

WATER MASTER PLAN REPORT

Prepared for:

City of Bastrop



May 2022

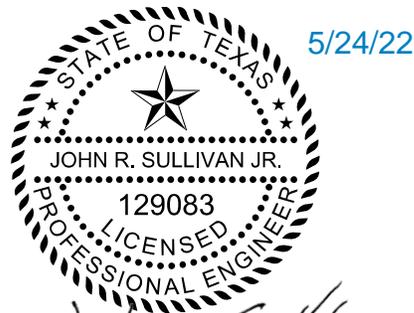
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WATER MASTER PLAN REPORT

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City of Bastrop



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

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FNI Project Number: BAS18568

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1.0 INTRODUCTION

The City of Bastrop (City) is a community located in central Texas, within Bastrop County. The City currently provides water service to approximately 10,000 people, though the population within the service area is projected to more than double over the next 25 years. To reduce reliance on alluvial wells and increase water supply reliability and resiliency, the City is in the process of developing a well field at the XS Ranch site, a 0.937 acre tract north of the City. The City contracted with Freese and Nichols, Inc. (FNI) to provide preliminary engineering services for new groundwater production, treatment, and transmission facilities. The scope of that project also included the development of a Water Master Plan.

The purpose of this project is to develop a capital improvement plan (CIP) for the water distribution system. Projected development assumptions were determined in coordination with City staff and utilized to project water demands. A hydraulic model of the water distribution system was created using geographic information system (GIS) data and City as-built records. FNI evaluated the existing system against Texas Commission on Environmental Quality (TCEQ) minimum requirements and developed planning criteria to determine the sizing of proposed system improvements. The hydraulic model was utilized to evaluate pump stations, storage tanks, distribution system capacity, and future system improvements. This report summarizes the results of this study, including the comprehensive water Capital Improvement Plan.

1.1 ABBREVIATIONS

Table 1-1 presents a list of acronyms that appear throughout the report.

Table 1-1: Acronyms

Acronym	Definition
AACE	American Association of Cost Engineers
AD	Average Day
avg.	Average
CCN	Certificate of Convenience and Necessity
CIP	Capital Improvement Plan
EST	Elevated Storage Tank
FNI	Freese and Nichols, Inc.
ft.	Foot/Feet
GIS	Geographic Information System
gpm	Gallons per Minute
gpcd	Gallons per Capita per Day
GST	Ground Storage Tank
HGL	Hydraulic Grade Line
LF	Linear Feet
MD	Maximum Day
MG	Million Gallons
MGD	Million Gallons per Day
PF	Peaking Factor
PH	Peak Hour
PZ	Pressure Zone
PS	Pump Station
psi	Pounds per Square Inch
Ref	Reference
SCADA	Supervisory Control and Data Acquisition
TCEQ	Texas Commission on Environmental Quality
WSC	Water Supply Corporation
WTP	Water Treatment Plant

1.2 KEY DEFINITIONS

The following is a list of key definitions utilized in this report.

- Average Day Demand – the total annual water use divided by the number of days in the year.
- Capacity Improvement – general project to improve the ability of the water system to convey projected water demands.
- Maximum Day Demand – the maximum quantity of water used system-wide on any one day of the year.
- Elevated Storage Tank – a water storage tank that sets the hydraulic grade of the pressure plane in which it operates. Tank can be either a true elevated tank (i.e., raised on a structure, typically 50-200 feet in the air) or a ground tank located at an elevation high enough to provide adequate pressure.
- Firm Pumping Capacity – the pumping capacity of a pump station with the largest pump offline and all other pumps running at the best efficiency point or rated capacity of each pump.
- Hydraulic Grade Line (HGL) – Energy of water or flow expressed in feet above mean sea level (i.e., head). Under pressure conditions the HGL is what the water surface elevation would be if unconfined.
- Peak Hour Demand – the peak rate at which water is required during any one hour of the year.
- Peaking Factor – recorded or projected peak demand divided by the average demand.
- Pressure – a measure of energy at a given location and time in the water system, typically measured in pounds per square inch (psi).
- Pressure Zone – an area of the water system that operates at a particular hydraulic grade.

2.0 WATER DISTRIBUTION SYSTEM

The existing water distribution system consists of a network of pipes, pump stations, and storage tanks that provides water service to City of Bastrop customers. The existing water distribution system is shown on **Figure 2-1**.

2.1 EXISTING WATER SYSTEM

The City of Bastrop’s water distribution system consists of three pressure zones, a network of water lines ranging in diameter from 2 inches to 16 inches, five ground storage tanks (GST), two elevated storage tanks (EST), one standpipe, five pump stations (PS), and six active groundwater wells. Water is drawn from five wells at the Willow Zone 1 and Zone 2 Pump Stations and two wells at the Bob Bryant Pump Station. The City also purchases water from Aqua Water Supply Corporation (WSC) at numerous delivery points throughout the system. Pressure Zone 1 operates at a hydraulic grade line (HGL) of 530 feet and serves the central portion of the city, including the downtown area. The Willow Zone 1 Pump Station provides water supply to Pressure Zone 1. The FM 150 GST provides elevated storage to the zone. Pressure Zone 2 operates at an HGL of 655 feet and serves the higher, eastern portion of the city. The Willow Zone 2 Pump Station provides water supply to the northern portion of the pressure zone and a small area west of the river. This pump station also pumps water to the FM 150 Standpipe, where it is repumped by the FM 150 Pump Station. The FM 150 EST provides elevated storage to Zone 2. A series of pressure reducing valves (PRV) on the eastern side of Pressure Zone 1 allow water to flow from Pressure Zone 2 into Pressure Zone 1. The HGL in Pressure Zone 3 is currently set by the Bob Bryant Pump Station, which provides water supply to the zone. When the wells at Bob Bryant are unable to keep up with demand, the City pumps water from the Willow Zone 2 Pump Station to the Bob Bryant GST. The Bob Bryant Pump Station also fills the FM 20 GST. The FM 20 Pump Station fills the FM 20 EST, which provides elevated storage to Zone 3. The FM 20 EST does not currently set the HGL; a PRV on the 16-inch water line east of the tank reduces pressure and sets the HGL for the zone. Summaries of the pressure zones, storage facilities, and pumping facilities are shown in **Table 2-1**, **Table 2-2**, and **Table 2-3**, respectively.

Table 2-1: Existing Pressure Zone Summary

Pressure Zone	Hydraulic Grade Line (HGL)	2021 Connections
Zone 1	535’	1,390
Zone 2	655’	350
Zone 3	655’	1,654

Table 2-2: Existing Water Storage Facilities

Pressure Zone	Tank	Storage Type	Capacity (MG)
Zone 1	Loop 150 GST	Elevated	0.23
	Willow Zone 1 GST	Ground	0.50
Zone 2	Loop 150 EST	Elevated	0.25
	Loop 150 Standpipe	Ground	1.00
	Willow Zone 2 GST	Ground	0.50
Zone 3	FM 20 EST	Elevated	0.25
	FM 20 GST	Ground	0.28
	Bob Bryant GST	Ground	0.29
Total			3.27

Table 2-3: Existing Water Pumping Facilities

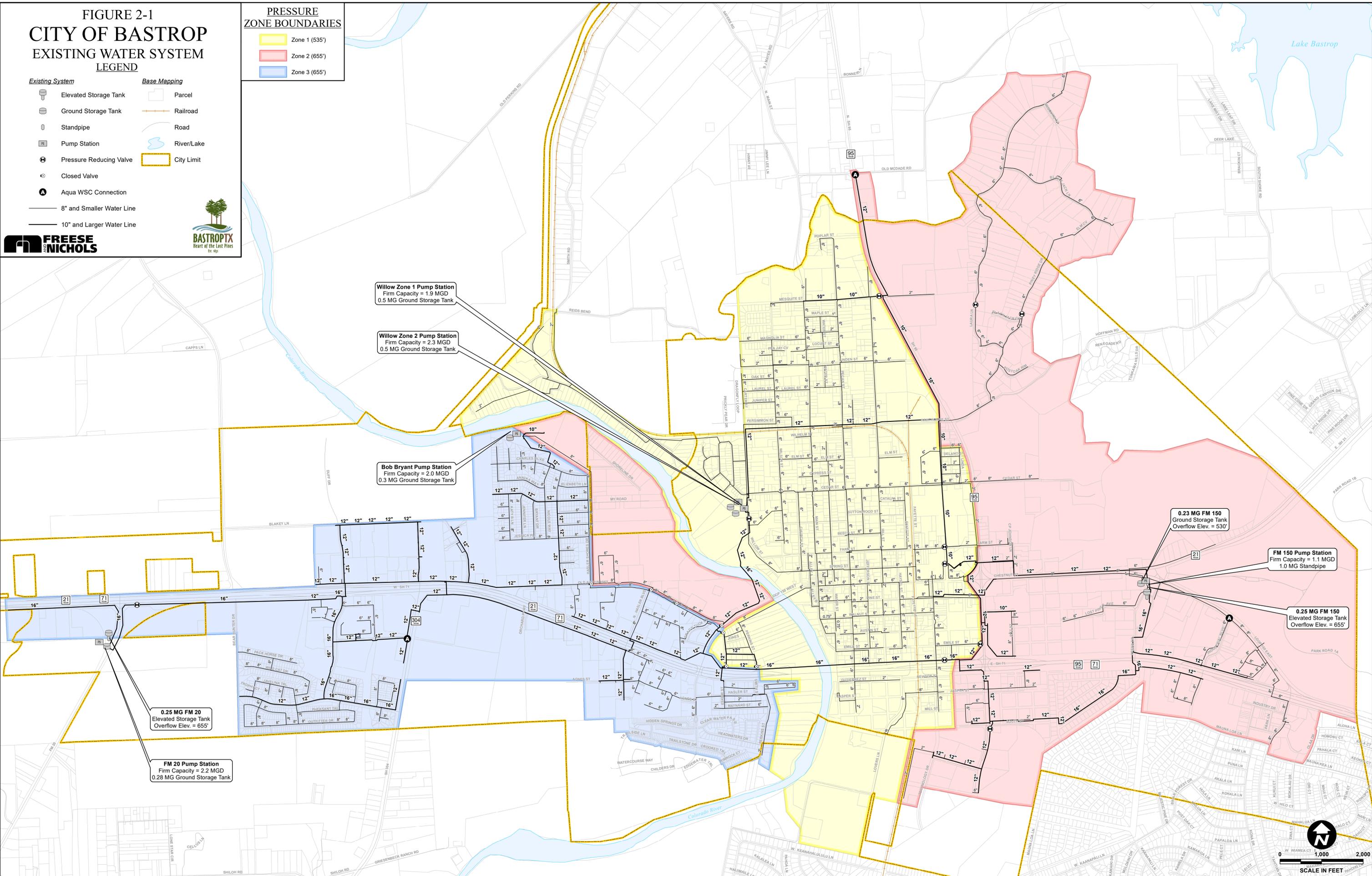
Pressure Zone	Pump Station	Pump Number	Rated Capacity	
			(gpm)	(MGD)
Zone 1	Willow Zone 1	1	750	1.08
		2	750	1.08
		3	540	0.78
	Willow Zone 1 Firm Capacity		1,290	1.86
	Willow Zone 1 Total Capacity		2,040	2.94
Zone 2	Willow Zone 2	1	800	1.15
		2	800	1.15
		3	800	1.15
	Willow Zone 2 Firm Capacity		1,600	2.30
	Willow Zone 2 Total Capacity		2,400	3.45
	FM 150	1	754	1.09
		2	754	1.09
	FM 150 Firm Capacity		754	1.09
	FM 150 Total Capacity		1,508	2.18
Zone 3	Bob Bryant	1	1,400	2.02
		2	1,400	2.02
	Bob Bryant Firm Capacity		1,400	2.02
	Bob Bryant Total Capacity		2,800	4.04
	FM 20	1	1,500	2.16
		2	1,500	2.16
	FM 20 Firm Capacity		1,500	2.16
	FM 20 Total Capacity		3,000	4.32

FIGURE 2-1
CITY OF BASTROP
EXISTING WATER SYSTEM
LEGEND

PRESSURE ZONE BOUNDARIES

- Zone 1 (535')
- Zone 2 (655')
- Zone 3 (655')

- | Existing System | Base Mapping |
|---------------------------|--------------|
| Elevated Storage Tank | Parcel |
| Ground Storage Tank | Railroad |
| Standpipe | Road |
| Pump Station | River/Lake |
| Pressure Reducing Valve | City Limit |
| Closed Valve | |
| Aqua WSC Connection | |
| 8" and Smaller Water Line | |
| 10" and Larger Water Line | |



Willow Zone 1 Pump Station
 Firm Capacity = 1.9 MGD
 0.5 MG Ground Storage Tank

Willow Zone 2 Pump Station
 Firm Capacity = 2.3 MGD
 0.5 MG Ground Storage Tank

Bob Bryant Pump Station
 Firm Capacity = 2.0 MGD
 0.3 MG Ground Storage Tank

0.25 MG FM 20
 Elevated Storage Tank
 Overflow Elev. = 655'

FM 20 Pump Station
 Firm Capacity = 2.2 MGD
 0.28 MG Ground Storage Tank

0.23 MG FM 150
 Ground Storage Tank
 Overflow Elev. = 530'

FM 150 Pump Station
 Firm Capacity = 1.1 MGD
 1.0 MG Standpipe

0.25 MG FM 150
 Elevated Storage Tank
 Overflow Elev. = 655'



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 SCALE IN FEET

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 Location: 1130 W. 9th St., Bastrop, LA 71222
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2.2 HYDRAULIC MODEL DEVELOPMENT

FNI created a hydraulic water model of the City’s water distribution system in Innowyze’s InfoWater® software. This section discusses the model development process, including model calibration to observed system conditions.

2.2.1 Distribution System Network

The model pipeline network was developed from the City’s GIS and available as-built drawings. The City provided a GIS geodatabase containing water system data, including pipe diameters. To allow proper connectivity, the network was reviewed using the following tools:

- Locate/Fix Nodes in Close Proximity – areas where nodes were within 5 feet of another node were reviewed. In cases where “undershoots” or “overshoots” were observed, the nodes were merged in order to connect pipes
- Locate/Fix Pipe Split Candidates – each instance where a pipe endpoint was within 10 feet of a pipe edge was reviewed. Pipes were connected in cases where invalid dead-ended pipes were observed.
- Locate/Fix Crossing/Intersecting Pipes – pipes that were crossing but not connected were reviewed.
- Locate Parallel Pipes – pipes that had the same “from” and “to” nodes were identified and reviewed for unintended duplicate pipes. No duplicate pipes were found. All pipes that were identified were valid parallel or looped pipes.
- Trace Network – the network was traced from various points throughout the system to ensure there were no disconnected portions of the system.

2.2.2 Facility Attributes

Each element of a model requires certain parameters to perform the necessary hydraulic calculations. Facility information was input into the model based on data provided by the City of Bastrop. The model requires a diameter, length, and roughness coefficient for each pipeline. The pipe diameter was imported from the geodatabase, and the length of each pipe was calculated based on its spatial location. Pipes were assigned a Hazen-Williams roughness coefficient (C-factors) of 110. Elevation values are required at model junctions to calculate pressures. The “Elevation Interpolation” command in InfoWater™ was used to assign elevations to all junctions in the model using 2-foot contour data. The City of Bastrop provided rated points for all pump stations. All elevated and ground storage tanks were modeled as having cylindrical geometry in accordance with values used by City utility staff. Equivalent cylindrical diameters

were calculated based on the total volume of each tank. Floor elevation, minimum level, and maximum level were input into the model for all tanks. Pressure zone boundary valves are not included in the hydraulic water model, rather closed valves are simulated by closing the respective pipe. Pressure zone boundaries were verified by City staff.

2.2.3 Demand Allocation

The allocation of water demands is a crucial step in developing a hydraulic model. The spatial location and relative magnitude of demands significantly impact the hydraulics of a water distribution system. An accurate distribution of demands facilitates the development of sound capital improvements. Demand was distributed using metered billing data provided by the City. The metered billing data included the water usage type and total consumption in gallons for every customer from October 2019 to September 2020, as well as the address and size of each meter. The active meters were geocoded using parcel and street centerline data. Geocoding is a GIS technique used to generate a geographic location (x-y coordinates) from an address. Water demands were allocated to the model by spatially joining the meters to the nearest model node using the Demand Allocator module. Existing average water usage was input to the model in the Demand1 field. The demands were then adjusted to match the demand experienced during the calibration period and are discussed further in **Section 2.3.5**.

2.2.4 Pressure Testing

Field pressure testing was conducted from September 17 to September 30, 2020. Ten pressure recorders were installed throughout the distribution system. Locations of the pressure recorders are illustrated on **Figure 2-2**. The City also provided Supervisory Control and Data Acquisition (SCADA) records during the pressure testing period. A summary of the observed pressure data is included on **Figure 2-3** with detailed graphs included in **Appendix A**. Water system pressures generally ranged from 55 to 115 pounds per square inch (psi). All pressures exceeded the minimum TCEQ requirement of 35 psi (with one momentary exception of 34 psi at one of the pressure recorders). The minimum and maximum recorded pressures at each pressure testing location are shown in **Table 2-4**.



Table 2-4: Pressure Testing Results

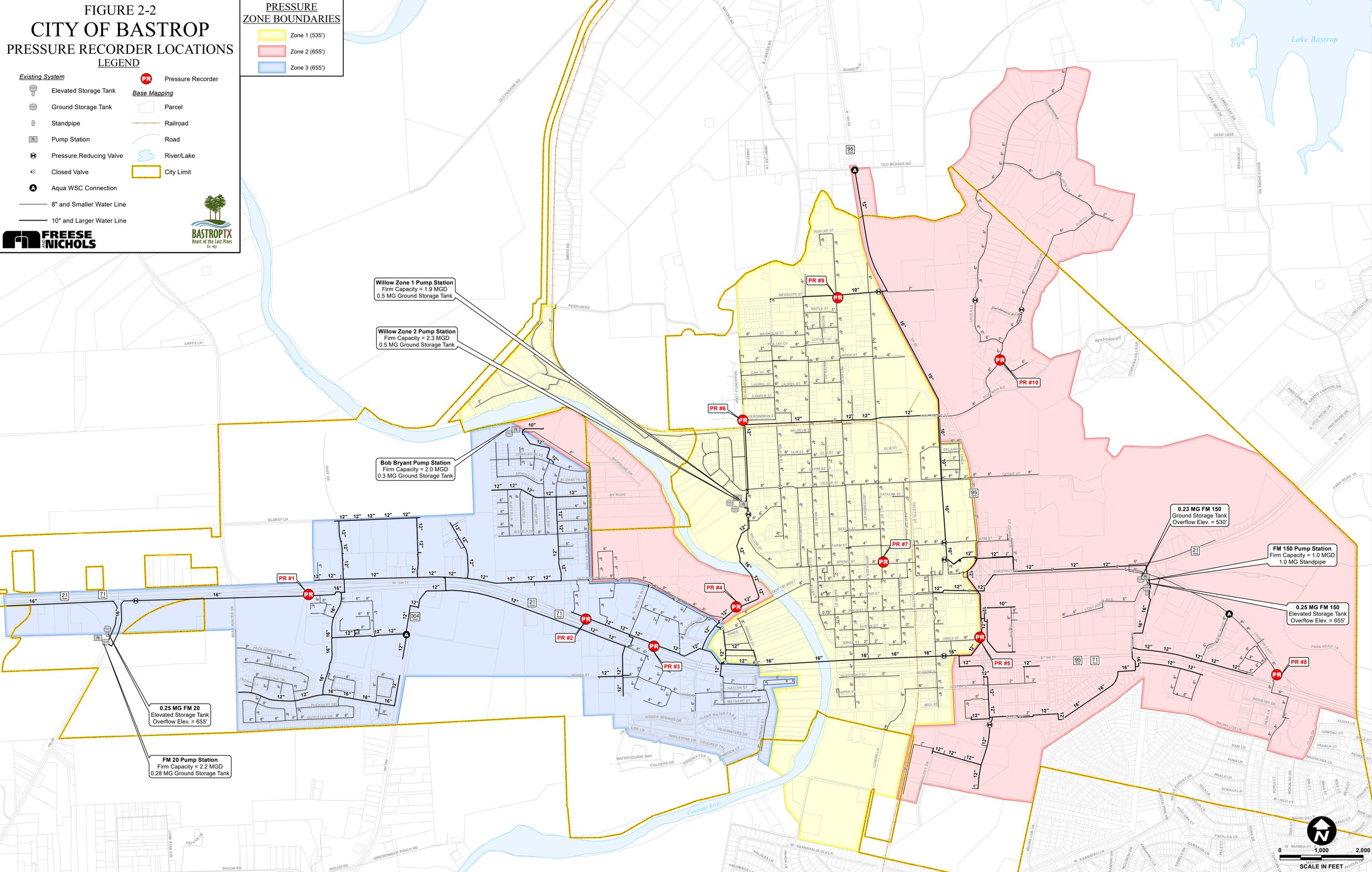
Pressure Zone	Pressure Recorder ID	Location	Minimum Pressure (psi)	Maximum Pressure (psi)	Average Pressure (psi)
Zone 1	6	1813 Carter St.	66	69	68
	7	Hill St. and Farm St.	68	71	70
	9	Mesquite St. and Pecan St.	70	73	72
Zone 2	4	114 TX-150 (Sugar Shack)	58	60	59
	5	Emile St. and Hwy 95	111	115	114
	8	Tahitian Dr. and SH-150 (Exxon/Circle K)	54	58	57
	10	Post Oak Rim and Piney Ridge Dr.	73	78	76
Zone 3	1	SH-71 Frontage Road (Lost Pines Toyota)	39	71	60
	2	SH-71 Frontage Road (Service King)	65	78	75
	3	SH-71 Frontage Road (Classic Bank)	34	77	69

FIGURE 2-2
CITY OF BASTROP
PRESSURE RECORDER LOCATIONS
LEGEND

PRESSURE ZONE BOUNDARIES

- Zone 1 (535')
- Zone 2 (655')
- Zone 3 (655')

- Existing System**
- Elevated Storage Tank
 - Ground Storage Tank
 - Standpipe
 - Pump Station
 - Pressure Reducing Valve
 - Closed Valve
 - Aqua WSC Connection
 -
 -
- Base Mapping**
- Parcel
 - Railroad
 - Road
 - River/Lake
 - City Limit

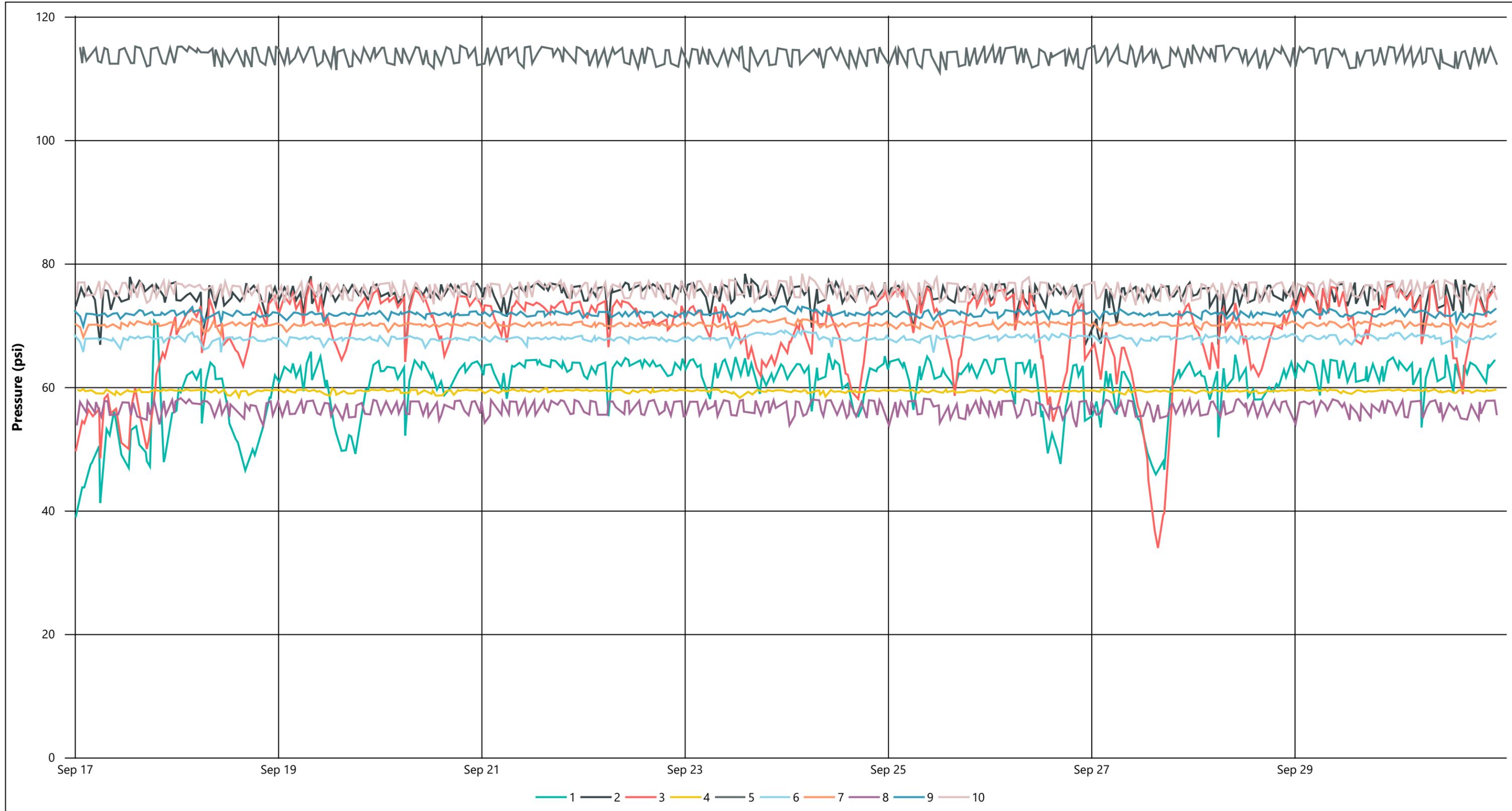


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 SCALE IN FEET

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Figure 2-3
City of Bastrop
Field Pressure Testing Results



2.2.5 Model Calibration

A steady-state simulation model calibration was performed to verify that the hydraulic model accurately represents real-world distribution system operations. The calibration process involved adjusting system operations and demand allocation to match known conditions. September 21, 2020 was selected for calibration, as there were minimal irregularities in the pressure testing results.

Demands were allocated to the model from averaged metered billing data provided by the City for the month of September 2020. Since daily demands were not available, the allocated demands were then scaled to match the total amount of water pumped on September 21, 2020 for calibration. This total demand was 1.94 MGD. During the calibration, adjustments were made to the model to match the observed conditions of September 21, 2020. The recorded and modeled pressures at each pressure testing location are shown in **Table 2-5**. The results show a good correlation between recorded and modeled values. This degree of calibration provides confidence in the accuracy of the model and is considered suitable for the development of a water system CIP and master planning purposes.

Table 2-5: Calibration Results

Pressure Zone	Pressure Recorder ID	Recorded Pressure (psi)	Modeled Pressure (psi)	Difference (psi)
Zone 1	6	68	71	3
	7	70	72	2
	9	72	74	2
Zone 2	4	59	59	0
	5	112	113	1
	8	56	58	2
	10	75	78	3
Zone 3	1	64	66	2
	2	76	76	0
	3	73	76	3

3.0 PROJECTED DEVELOPMENT AND WATER DEMAND

Projecting future growth within a service area is a critical first step in the master planning process. FNI coordinated with City staff and reviewed historical data to determine growth rates for the water distribution system and identify future developments.

3.1 WATER SERVICE AREA

The City of Bastrop’s existing Certificate of Convenience and Necessity (CCN) for water service contains most of the area within the city limits. However, there are numerous known upcoming developments that the City expects to serve. When projecting future growth for this study, FNI utilized a water service area that includes the existing water CCN boundary as well as the bounds of the known upcoming developments. **Figure 3-1** shows the extents of the water service area.

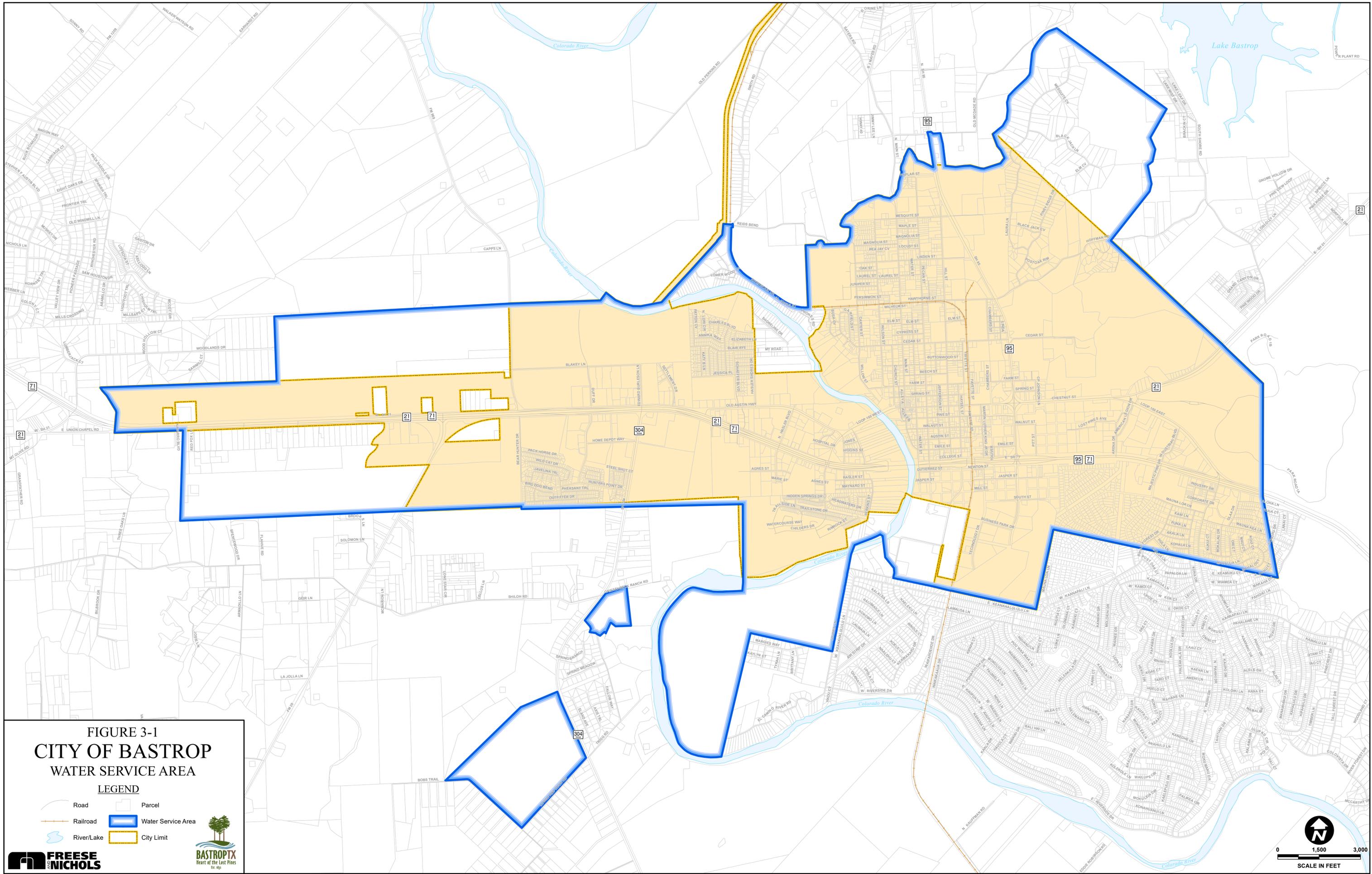
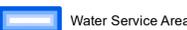


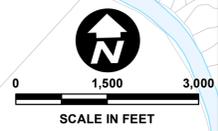
FIGURE 3-1
CITY OF BASTROP
WATER SERVICE AREA

LEGEND

-  Road
-  Parcel
-  Railroad
-  Water Service Area
-  River/Lake
-  City Limit



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3.2 HISTORICAL WATER DEMAND

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. Flow rates 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 was 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 sizes and locations of distribution facilities are generally determined based on this condition.

Reviewing historical water demands provides insight into selecting design criteria used to project future water demands. For this study, monthly water production data was provided by the City for January 2011 through July 2018. Production data is the measured flow pumped at each production facility. Historical average day demand was calculated for each year from 2011 to 2017 by dividing the annual usage in gallons by days in the year. Historical usage rates in gallons per capita per day (gpcd) were calculated by dividing the historical average day demand in gallons per day by the residential population for each year from 2011 through 2017. **Table 3-1** shows the historical average day demand in millions of gallons per day (MGD) and historical residential per capita usage.

Maximum day demand is calculated by multiplying average day demand by a peaking factor. To calculate historical maximum day to average day peaking factors, maximum day demand data from the City for the years 2011 through 2017 was divided by the calculated average day demand for the corresponding year. A summary of historical demands and peaking factors is shown in **Table 3-1**.



Table 3-1: Historical Water Production

Year	Population*	Annual Growth Rate (%)	Average Day Demand (MGD)	Average Day Demand (gpcd)	Maximum Day Demand (MGD)	Maximum Day to Average Day Peaking Factor
2011	7,358	-	1.47	200	2.27	1.55
2012	7,390	0.43%	1.29	175	2.12	1.64
2013	7,535	1.96%	1.26	168	2.04	1.61
2014	7,844	4.10%	1.23	157	2.08	1.69
2015	8,195	4.47%	1.27	155	2.32	1.82
2016	8,453	3.15%	1.32	156	2.31	1.75
2017	8,802	4.13%	1.41	160	2.82	2.00
Average	-	3.04%	-	167	-	1.72
Maximum	-	4.47%	1.47	200	2.82	2.00

*Population data taken from <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>

3.3 GROWTH PROJECTIONS

Based on discussions with the City during the Water System Coordination Meeting on March 14, 2019, an annual growth rate of 4.0% was selected for population within the water service area. This was assumed to remain constant throughout the 25-year planning period. The projected populations and water connections for the 2021, 2026, 2031, and 2046 planning years are presented in **Table 3-2**. City staff provided the 2021 population, and 2021 water connections were taken from billing meter data.

Table 3-2: Projected Population

Year	Population	Water Connections
2021	9,998	3,394
2026	12,164	4,129
2031	14,799	5,024
2046	26,653	9,048

City staff provided information on known upcoming developments to FNI. This information was used to spatially allocate future connections. **Figure 3-2** shows the location of each development as well as the number of anticipated living unit equivalents (LUEs). An LUE was assumed to be equal to one water connection, except in the case of multi-family development, which was assumed to equal 0.6 water connections.

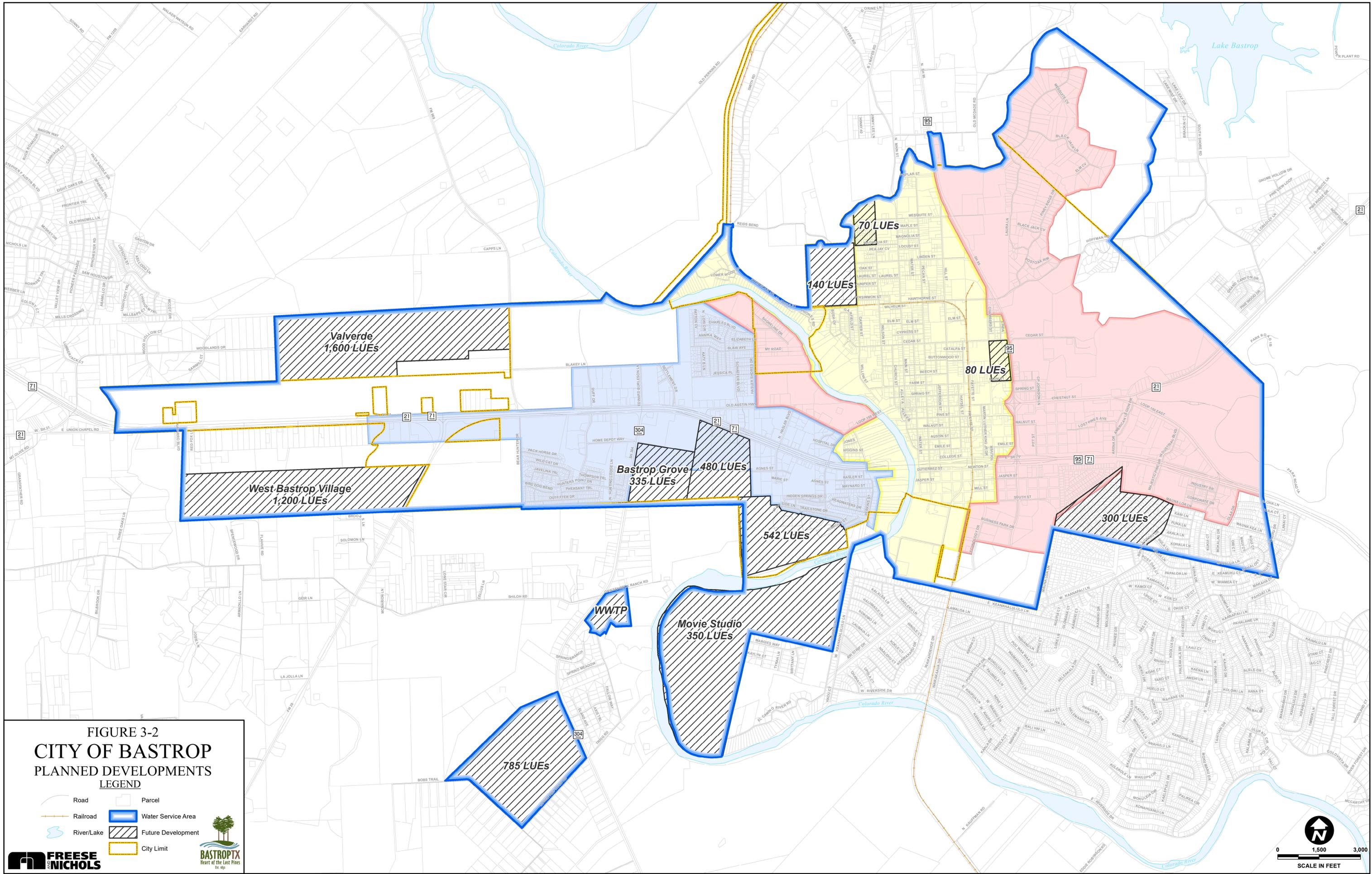


FIGURE 3-2
CITY OF BASTROP
PLANNED DEVELOPMENTS
LEGEND

- Road
- Parcel
- Railroad
- Water Service Area
- River/Lake
- Future Development
- City Limit

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3.4 WATER DEMAND PROJECTIONS

Water demands were projected for 2021, 2026, 2031, and 2046 conditions. The following design criteria were selected based on the historical data shown in **Table 3-1** and discussions with the City during the Water System Coordination Meeting on March 14, 2019: an average day demand of 200 gpcd, a maximum day to average day peaking factor of 2.0, and a peak hour to maximum day peaking factor of 2.0. The recommended planning criteria for the water system are summarized in **Table 3-3**. Additionally, the number of people per connection was calculated using the 2021 population and number of water connections, resulting in 2.95 people per connection.

Table 3-3: Water Planning Criteria

Average Day Demand (gpcd)	Maximum Day to Average Day Peaking Factor	Peak Hour to Maximum Day Peaking Factor	People per Connection
200	2.0	2.0	2.95

Table 3-4 shows the demand projections for 2021, 2026, 2031, and 2046 for each pressure zone. It is important to note that the pressure zone boundaries were assumed to change after the 2021 planning period. The customers served by the current extents of Pressure Zone 3 would be served by Pressure Zone 1 in the 2026, 2031, and 2046 planning periods. This pressure zone change is discussed in greater detail in **Section 4.4**. FNI assumed that Pressure Zone 2 would increase by 100 connections each planning period, based on discussions with City staff during a meeting on July 9, 2021. FNI also assumed that 25%, 40%, and 100% of the connections from the Valverde and West Bastrop Village developments (2,800 connections in total) would be added by 2026, 2031, and 2046, respectively. These developments account for all of the anticipated growth in Pressure Zone 3. The remainder of the anticipated growth in connections was attributed to Pressure Zone 1 according to the 4% annual growth discuss earlier in this report.



Table 3-4: Projected Water Demands

Year	Pressure Zone	Connections	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Peak Hour Demand (MGD)
2021	Zone 1	1,390	0.82	1.64	3.28
	Zone 2	350	0.21	0.41	0.82
	Zone 3	1,654	0.97	1.95	3.90
	Total	3,394	2.00	4.00	8.00
2026	Zone 1	2,979	1.76	3.51	7.02
	Zone 2	450	0.27	0.53	1.06
	Zone 3	700	0.41	0.82	1.65
	Total	4,129	2.43	4.87	9.73
2031	Zone 1	3,354	1.98	3.95	7.90
	Zone 2	550	0.32	0.65	1.30
	Zone 3	1,120	0.66	1.32	2.64
	Total	5,024	2.96	5.92	11.84
2046	Zone 1	5,598	3.30	6.60	13.20
	Zone 2	650	0.38	0.77	1.53
	Zone 3	2,800	1.65	3.30	6.60
	Total	9,048	5.33	10.67	21.33

4.0 HYDRAULIC ANALYSIS AND SYSTEM EVALUATION

The existing water distribution system was evaluated to assess current production, pumping, and storage capacity. This analysis is performed to determine if there are any existing system deficiencies and to provide a baseline for the current level of service. The water distribution system was also evaluated with consideration for future water service. Various combinations of improvements and modifications were investigated to determine the most appropriate approach for meeting projected demands. Parameters used in developing the improvement plan included maintaining proper residual pressure, increasing available fire flow, providing system redundancy, and serving future development areas.

4.1 PLANNING CRITERIA

The determination of the planning criteria is an important process, as it guides the identification of potential CIP projects. Criteria for analyzing existing, new, and replacement facilities were developed in accordance with Texas Commission on Environmental Quality (TCEQ) standards as outlined in *TAC Chapter 290: Public Drinking Water, Subchapter D: Rules and Regulations for Public Water Systems*.

4.1.1 TCEQ Minimum System Requirements

Water distribution systems are evaluated by pressure zone, except for water production and total storage, which are evaluated on a system-wide basis. The minimum TCEQ production requirement is 0.6 gpm/connection, unless the system has less than 50 connections, in which case the requirement increases to 1.5 gpm/connection. For distribution pumping, if a pressure plane has at least 200 gallons per connection of elevated storage, the resulting TCEQ pumping requirement is 0.6 gpm/connection. If the pressure plane has less than 200 gallons per connection of elevated storage, the TCEQ distribution pumping requirement increases to 2.0 gpm/connection or at least 1,000 gpm total with the ability to meet peak hour demands in the pressure plane with the largest pump out of service (i.e. firm capacity). The minimum TCEQ elevated storage capacity requirement is 100 gallons per connection and the total storage capacity requirement is 200 gallons per connection. Minimum production, pumping, and storage requirements per TCEQ are summarized in **Table 4-1**. Existing storage and pumping capacities were evaluated and compared to the TCEQ requirements. These are summarized in **Table 4-2** through **Table 4-5**. The City of Bastrop meets all TCEQ requirements for the existing water distribution system.

Table 4-1: Minimum TCEQ Requirements

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

Table 4-2: TCEQ Requirement vs. City Total Storage Capacity

TCEQ Requirement (gal per cxn)	Number of Connections	Required Total Storage (MG)	Available Total Storage (MG)	TCEQ Requirement Met?
200	3,394	0.68	3.29	Yes

Table 4-3: TCEQ Requirement vs. City Production Capacity

TCEQ Requirement (gpm per cxn)	Number of Connections	Required Production Capacity (gpm)	Available Production Capacity ⁽¹⁾ (gpm)	TCEQ Requirement Met?
0.6	3,394	2,036	2,810	Yes

(1) Available production capacity is based on a total well capacity of 1,965 gpm at the Willow site and a total well capacity of 845 gpm at the Bob Bryant site.

Table 4-4: TCEQ Requirement vs. City Elevated Storage Capacity

Pressure Zone	TCEQ Requirement (gal per cxn)	Number of Connections	Required Elevated Storage Volume (MG)	Available Elevated Storage Volume ⁽¹⁾ (MG)	TCEQ Requirement Met?
Zone 1	100	1,390	0.14	1.23	Yes
Zone 2	100	350	0.04	0.25	Yes
Zone 3	100	1,654	0.17	0.25	Yes

(1) Elevated storage capacity in Zone 1 includes the 1.0 MG FM 150 Standpipe.

Table 4-5: TCEQ Requirement vs. City Distribution Pumping Capacity

Pressure Zone	TCEQ Requirement	Number of Connections	Required Pumping Capacity (gpm)	Available Pumping Capacity (gpm)	TCEQ Requirement Met?
Zone 1	0.6 gpm per connection	1,390	834	2,040	Yes
Zone 2	0.6 gpm per connection	350	210	3,908	Yes
Zone 3	Peak hour demand	1,654	2,707	4,300	Yes

4.1.2 Recommended Storage and Pumping Criteria

In addition to TCEQ requirements, additional planning criteria were developed in coordination with City staff to assess pumping and storage recommendations for the water distribution system. These criteria are typically more stringent than the minimum TCEQ requirements and take into consideration additional factors including operational flexibility and system redundancy.

For production capacity, FNI recommends that the City maintain 100% of maximum day demands. For distribution pumping capacity, FNI recommends that each pressure zone provide firm capacity to meet 125% of maximum day demands. Recommended ground storage capacity is based on providing the storage equivalent of 8 hours of maximum day demand. The design criterion used to analyze elevated storage tank (EST) capacity is 200 gallons per connection. This criterion not only lowers the City’s pumping requirements from TCEQ, but also provides the volume required to provide adequate equalization storage for peak hour demands and emergency storage for fire protection. It is typically assumed that half of the elevated storage tank capacity is used to meet peak hourly demands in excess of the maximum day rate (equalization volume), while the other half of the tank is used for fire protection and emergency conditions (fire/emergency volume). A summary of recommended storage and pumping requirements is included in **Table 4-6**.

Table 4-6: Recommended Storage and Pumping Criteria

System Component	Recommended Criteria
Production Capacity	100% of Maximum Day Demand
Distribution Pumping	125% of Maximum Day Demand
Elevated Storage	200 gallons/connection
Ground Storage	8 Hours of Maximum Day Demand

4.2 STORAGE AND PUMPING EVALUATION

The recommended planning criteria were utilized to evaluate the existing water distribution system under the projected flow conditions for all planning periods. The recommended planning criteria for production capacity, distribution pumping, elevated storage, and ground storage are evaluated in **Table 4-7**, **Table 4-8**, **Table 4-9**, and **Table 4-10**. Values in excess of the criteria are highlighted in **red**. Connections are projected based on revised pressure zone boundaries, discussed in further detail in **Section 4.4**.

Table 4-7: Recommended Production Capacity

Year	Maximum Day Demand (MGD)	Recommended Production Capacity (MGD)	Available Production Capacity ⁽¹⁾ (MGD)
2021	4.00	4.00	4.05
2026	4.87	4.87	6.00
2031	5.92	5.92	6.00
2046	10.66	10.66	6.00

(1) Available production capacity assumes that the Simsboro Aquifer Water Treatment Plant will be online by 2026.

Table 4-8: Recommended Firm Pumping Capacity

Year	Pressure Zone	Connections	Maximum Day Demand (MGD)	Recommended Firm Pumping Capacity 125% MD Demand (MGD)	Available Firm Pumping Capacity (MGD)	Available Total Pumping Capacity (MGD)
2021	Zone 1	1,390	1.64	2.05	1.86	2.94
	Zone 2	350	0.41	0.52	4.48	5.63
	Zone 3	1,654	1.95	2.44	6.19	8.35
2026 ⁽¹⁾	Zone 1	2,979	3.51	4.39	4.95	6.97
	Zone 2	450	0.53	0.66	4.48	5.63
	Zone 3	700	0.82	1.03	2.16	4.32
2031 ⁽¹⁾	Zone 1	3,354	3.95	4.94	4.95	6.97
	Zone 2	550	0.65	0.81	4.48	5.63
	Zone 3	1,120	1.32	1.65	2.16	4.32
2046 ⁽¹⁾	Zone 1	5,598	6.60	8.25	4.95	6.97
	Zone 2	650	0.77	0.96	4.48	5.63
	Zone 3	2,800	3.30	4.12	2.16	4.32

(1) The 2026, 2031, and 2046 capacities reflect the proposed pressure zone boundary change.

Table 4-9: Recommended Elevated Storage

Year	Pressure Zone	Connections	Recommended Elevated Storage Volume ⁽¹⁾ (MG)	Available Elevated Storage Volume (MG)
2021	Zone 1	1,390	0.28	1.23
	Zone 2	350	0.07	0.25
	Zone 3	1,654	0.33	0.25
2026	Zone 1	2,979	0.60	1.23
	Zone 2	450	0.09	0.25
	Zone 3	700	0.14	0.25
2031	Zone 1	3,354	0.67	1.23
	Zone 2	550	0.11	0.25
	Zone 3	1,120	0.22	0.25
2046	Zone 1	5,598	1.12	1.23
	Zone 2	650	0.13	0.25
	Zone 3	2,800	0.56	0.25

(1) The recommended elevated storage volume for Zone 3 in 2021 was calculated using 100 gallons per connection rather than the recommended 200 gallons per connection.

Table 4-10: Recommended Ground Storage

Pump Station	Firm Capacity by 2046 (MGD)	Recommended Ground Storage Volume ⁽¹⁾ (MG)	Available Ground Storage Volume (MG)
Willow Zone 1	4.20	1.40	0.50
Willow Zone 2	2.11	0.70	0.50
Bob Bryant	4.20	0.70	0.29
FM 20	4.50	0.75	0.25
FM 150	1.00	0.33	1.00

(1) Recommended ground storage volume for the Bob Bryant and FM 20 pump stations was based on 4 hours of firm pumping capacity rather than 8 hours because each pump station has a secondary supply source.

4.3 EXISTING DISTRIBUTION SYSTEM ANALYSIS

A hydraulic analysis was performed using the calibrated model under existing demand conditions to evaluate system operations and residual pressures throughout the distribution system. Steady-state analyses were performed with 2021 maximum day demands and peak hour demands. Peak hour demand represents the single hour of the year with the highest system demand. Peak hour simulations are used

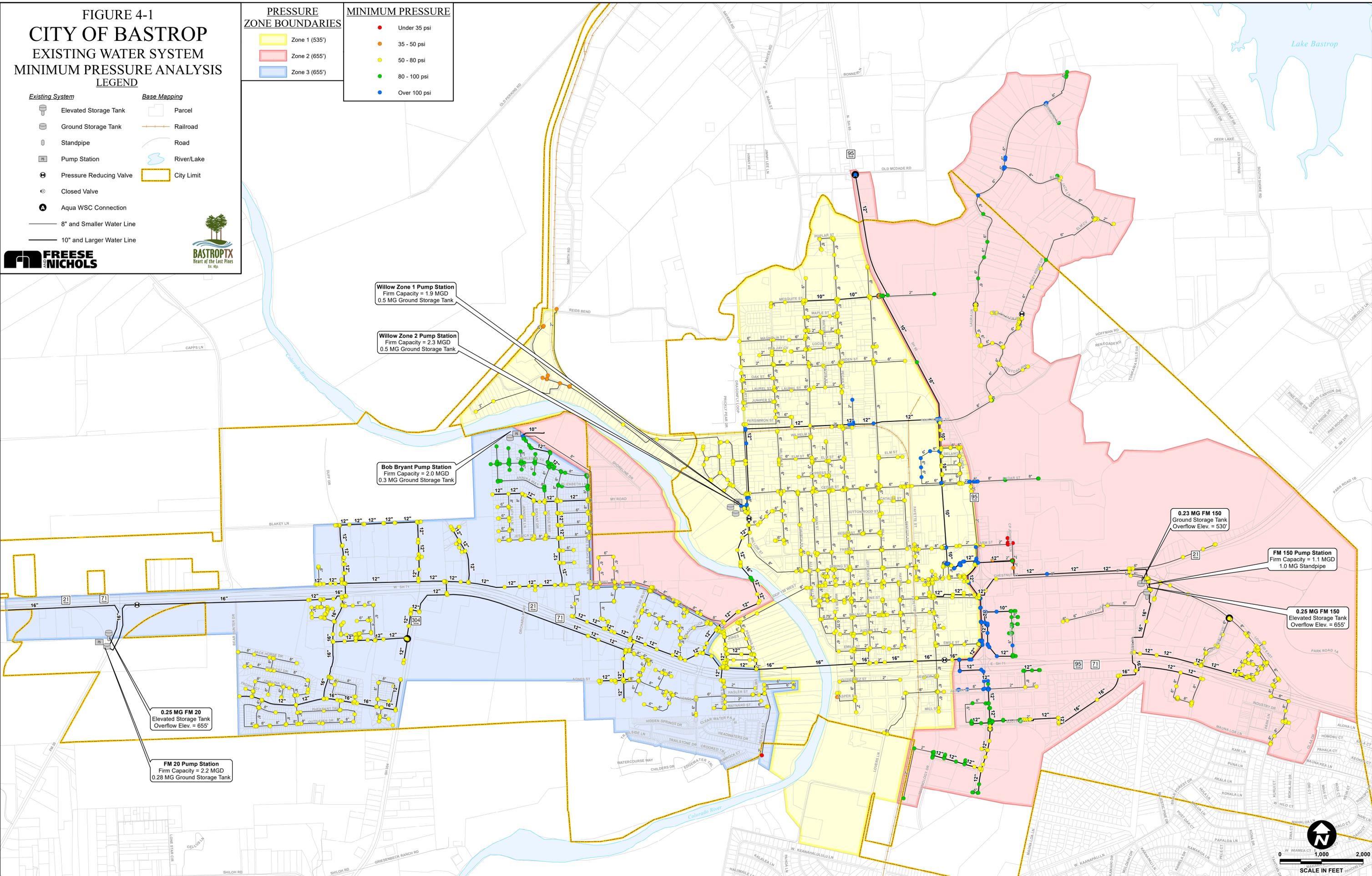
to assess the ability of the distribution system to maintain residual pressures because the highest demand period typically induces the lowest pressure due to increased headloss throughout the system. **Figure 4-1** shows the minimum pressure observed in the model under 2021 demand conditions. This map helped identify potential problem areas in the system and was used as a tool to verify that reasonable pressure ranges were maintained throughout the system. The TCEQ minimum required pressure within a distribution system is 35 psi under non-emergency demand conditions. As seen on **Figure 4-1**, most of the system has minimum pressures above 50 psi, well above the minimum requirement. A small area just north of Chestnut Street and east of SH 95 has pressures slightly below 35 psi during existing peak demand conditions.

To evaluate the fire suppression capabilities of the system, a fire flow analysis was conducted under 2021 maximum day demand conditions. TCEQ requires a minimum residual pressure of 20 psi during emergency demand conditions. For fire flow analysis, a steady-state model run was utilized to calculate the available fire flow at each node in the system while maintaining a minimum pressure of 20 psi. **Figure 4-2** shows the results of the fire flow simulation. The majority of the water system can provide at least 1,000 gpm, which is a typical residential fire flow demand. Available fire flows below 1,000 gpm are due to small diameter lines in isolated areas. Upsizing of smaller lines and reduction of dead-end lines by providing looping are two 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.

FIGURE 4-1
CITY OF BASTROP
EXISTING WATER SYSTEM
MINIMUM PRESSURE ANALYSIS
LEGEND

PRESSURE ZONE BOUNDARIES		MINIMUM PRESSURE	
 Zone 1 (535')	 Zone 2 (655')	 Under 35 psi	 35 - 50 psi
 Zone 3 (655')		 50 - 80 psi	 80 - 100 psi
		 Over 100 psi	

Existing System	Base Mapping
Elevated Storage Tank	Parcel
Ground Storage Tank	Railroad
Standpipe	Road
Pump Station	River/Lake
Pressure Reducing Valve	City Limit
Closed Valve	
Aqua WSC Connection	
8" and Smaller Water Line	
10" and Larger Water Line	



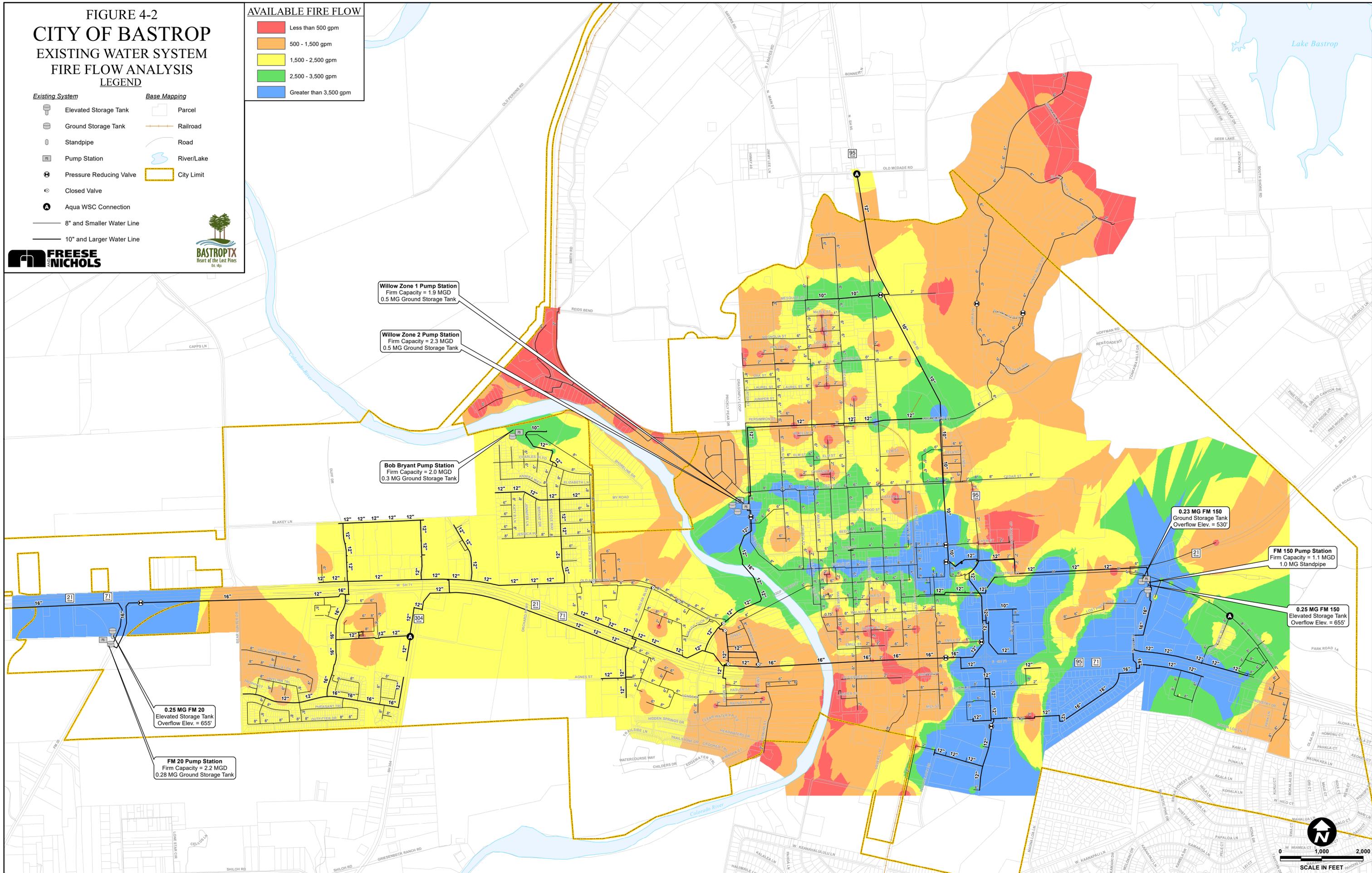
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 Date: 04/19/2024
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FIGURE 4-2
CITY OF BASTROP
EXISTING WATER SYSTEM
FIRE FLOW ANALYSIS
LEGEND

AVAILABLE FIRE FLOW

- Less than 500 gpm
- 500 - 1,500 gpm
- 1,500 - 2,500 gpm
- 2,500 - 3,500 gpm
- Greater than 3,500 gpm

- | | |
|---------------------------|---------------------|
| Existing System | Base Mapping |
| Elevated Storage Tank | Parcel |
| Ground Storage Tank | Railroad |
| Standpipe | Road |
| Pump Station | River/Lake |
| Pressure Reducing Valve | City Limit |
| Closed Valve | |
| Aqua WSC Connection | |
| 8" and Smaller Water Line | |
| 10" and Larger Water Line | |



Willow Zone 1 Pump Station
 Firm Capacity = 1.9 MGD
 0.5 MG Ground Storage Tank

Willow Zone 2 Pump Station
 Firm Capacity = 2.3 MGD
 0.5 MG Ground Storage Tank

Bob Bryant Pump Station
 Firm Capacity = 2.0 MGD
 0.3 MG Ground Storage Tank

0.25 MG FM 20
 Elevated Storage Tank
 Overflow Elev. = 655'

FM 20 Pump Station
 Firm Capacity = 2.2 MGD
 0.28 MG Ground Storage Tank

0.23 MG FM 150
 Ground Storage Tank
 Overflow Elev. = 530'

FM 150 Pump Station
 Firm Capacity = 1.1 MGD
 1.0 MG Standpipe

0.25 MG FM 150
 Elevated Storage Tank
 Overflow Elev. = 655'



0 1,000 2,000
 SCALE IN FEET

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 Date: 04/18/2018
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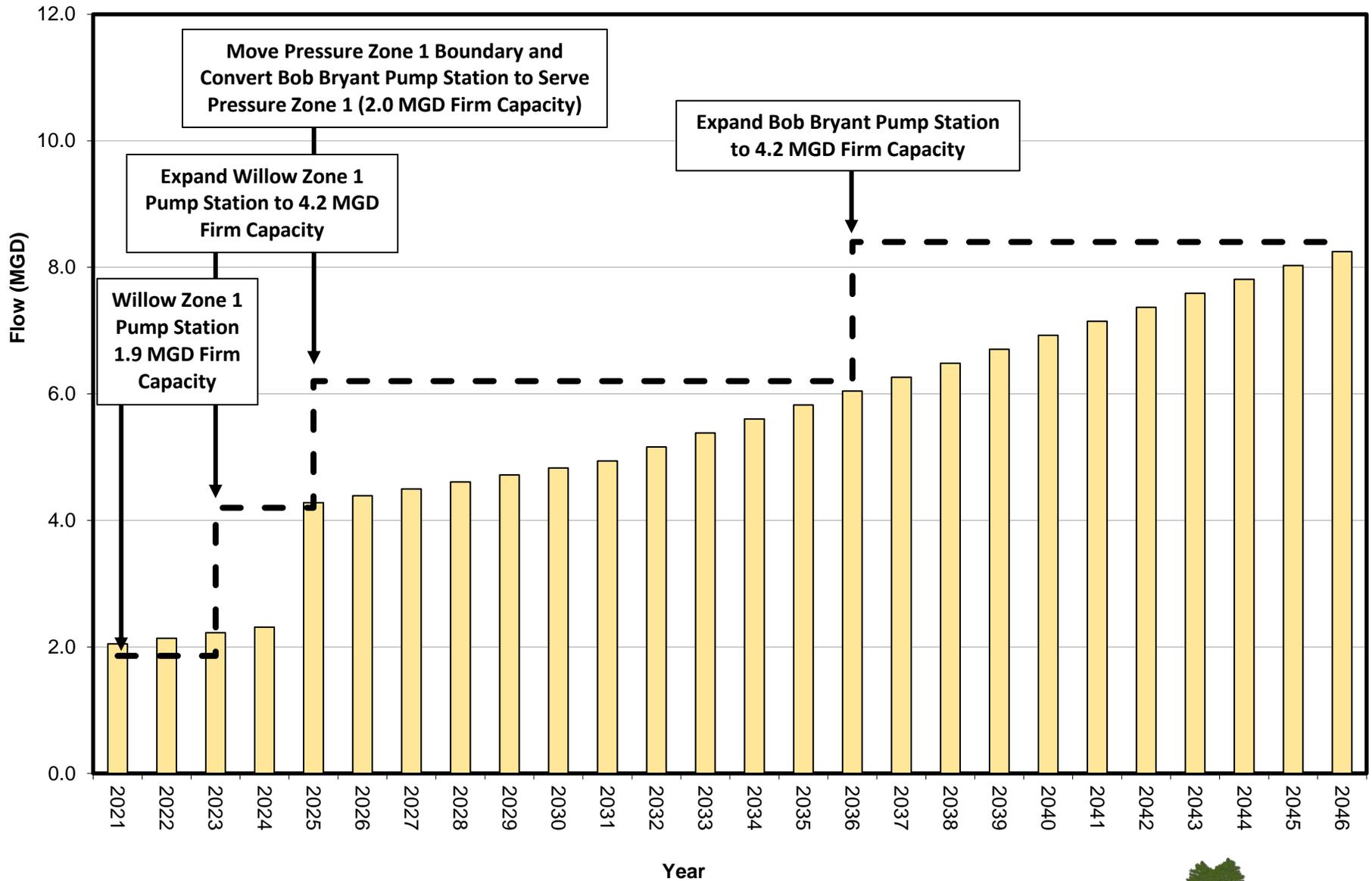
4.4 FUTURE SYSTEM ANALYSIS AND RECOMMENDED IMPROVEMENTS

Water system improvements were developed to address existing system issues and accommodate growth through the 2046 planning period based on the recommended planning criteria. Recommended improvements were then phased for each planning period to meet planning criteria requirements under projected development conditions. All projects are developed in accordance with TCEQ requirements and the planning criteria outlined in **Section 4.1**. Challenges facing the water system include optimizing system operations, replacing aging infrastructure, providing adequate storage and pumping to meet future demands, and providing service to areas of future growth with limited existing infrastructure.

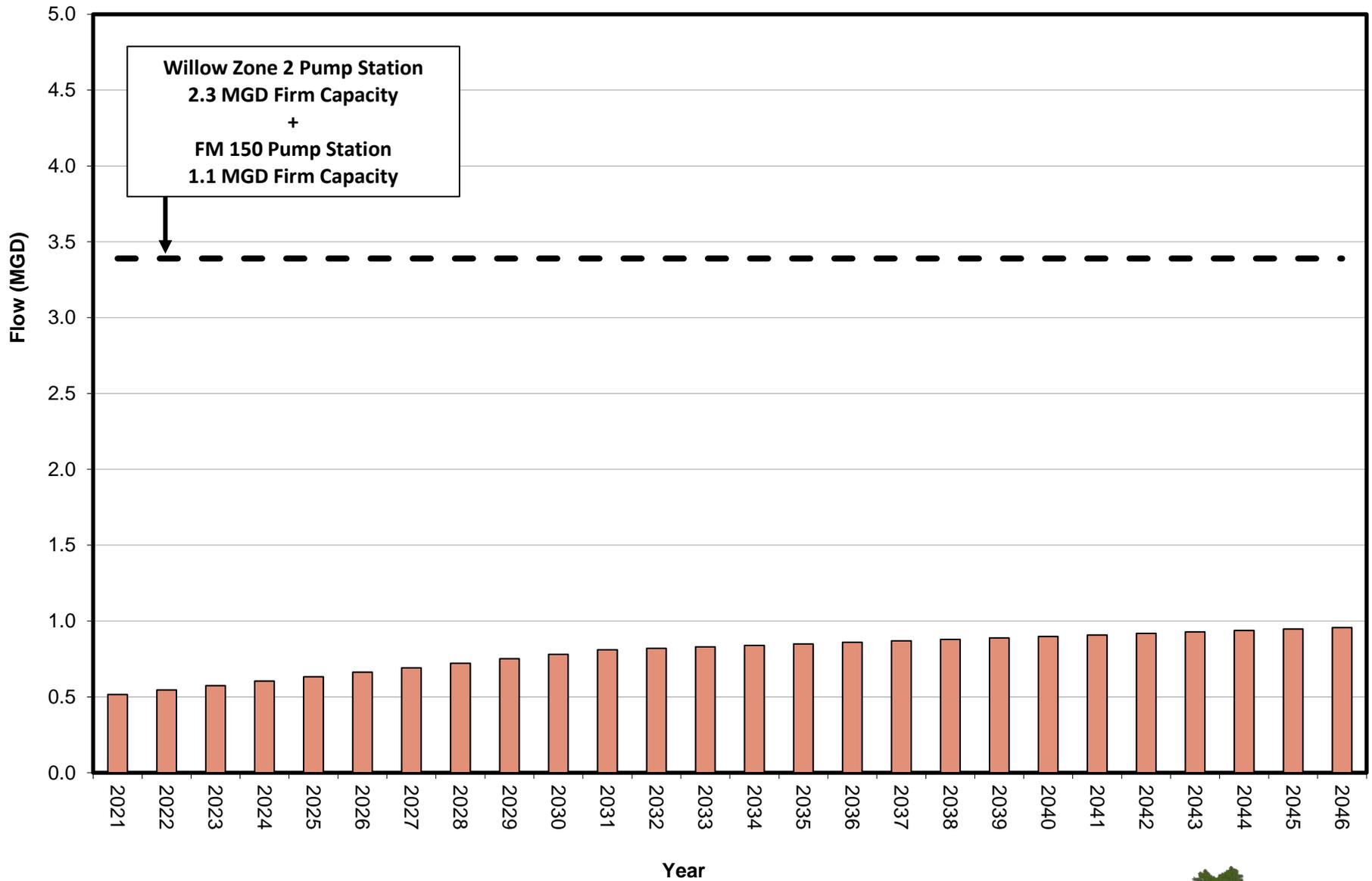
Pressure Zone 1 requires more pumping to serve existing customers and to allow for future growth. Additionally, the existing ground storage tanks at the Willow site are in poor condition and in need of replacement. FNI recommends replacing the Willow ground storage tanks and expanding the pumping capacity of the Willow Zone 1 Pump Station. The area currently served by Pressure Zone 3 east of FM 969 has elevations similar to those in Pressure Zone 1. The FM 20 EST has an overflow elevation of 655 feet, necessitating a PRV to prevent pressures in Zone 3 from exceeding recommended limits. FNI recommends moving the boundary of Pressure Zone 1 to FM 969 by opening the valves along Old Austin Highway, Eskew Street, and SH 71. Pressure Zone 1 would then include downtown and all of the area currently served by Pressure Zone 3 with the exception of the areas west of FM 969. The Zone 1 HGL of 530 feet is appropriate for these customers. This allows the FM 20 EST to serve future customers in Pressure Zone 3 in the short term. FNI recommends constructing a new elevated storage tank south of Blakey Lane to serve customers in Zone 1 and provide adequate storage capacity to meet the recommended storage criteria. The demand projections shown previously in this report reflect this pressure zone change for the 2026, 2031, and 2046 planning periods.

Additionally, FNI recommended increased production capacity and new pumping and storage infrastructure based on the results of the evaluation presented in **Section 4.2**. New water lines are recommended to serve areas with anticipated future development. Once these improvements were added to the existing water system, hydraulic analyses were performed to evaluate system operations and residual pressure for the proposed distribution system. **Figure 4-3, Figure 4-4, and Figure 4-5** present the proposed timing of pumping improvements by pressure zone. **Figure 4-6, Figure 4-7, and Figure 4-8** present the proposed timing of storage improvements by pressure zone. Minimum pressure results are shown for 2046 planning period on **Figure 4-9**, and results of the 2046 fire flow analysis are shown on **Figure 4-10**.

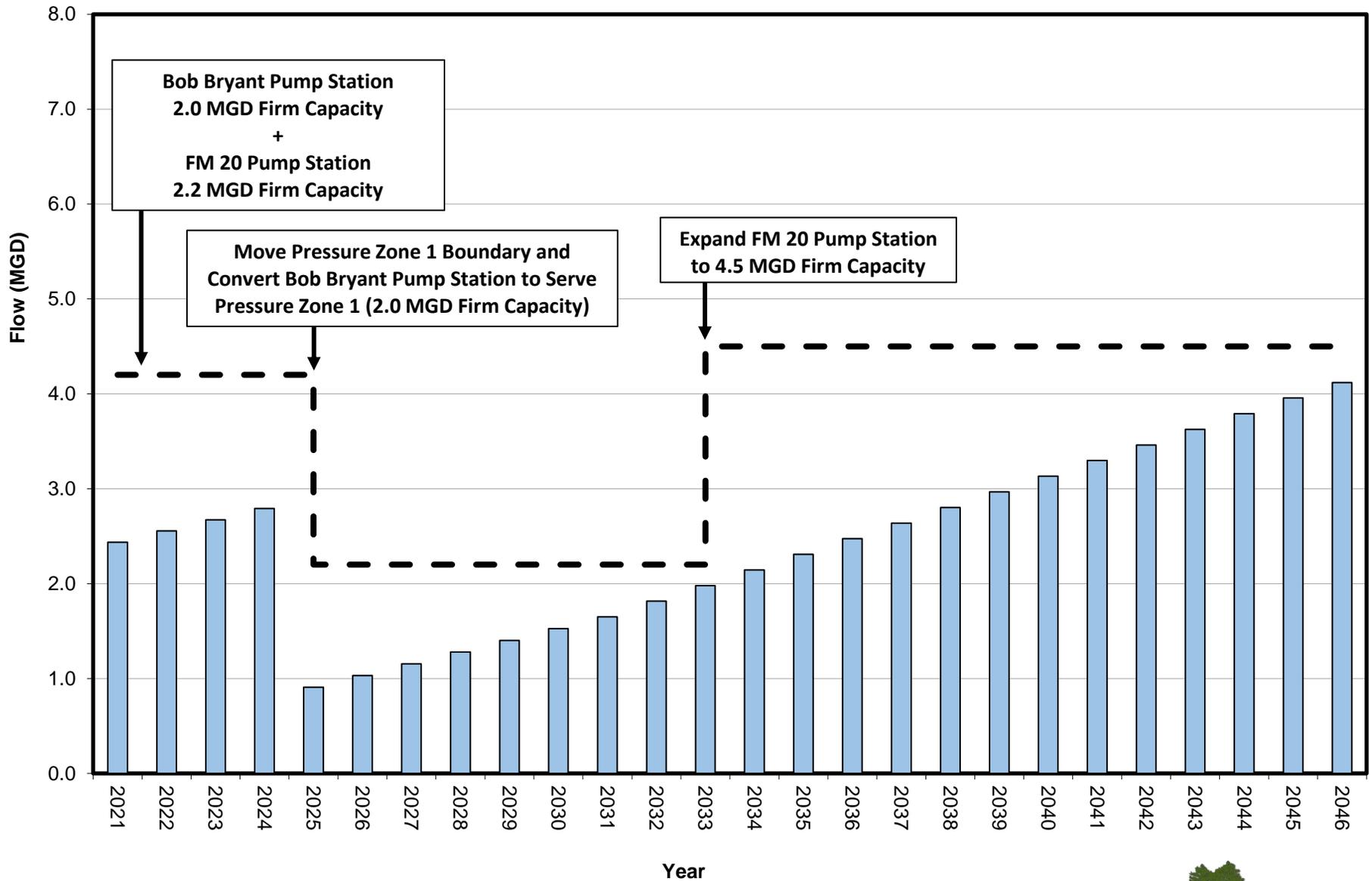
**Figure 4-3: Distribution Pumping Recommendations
Pressure Zone 1**



**Figure 4-4: Distribution Pumping Recommendations
Pressure Zone 2**



**Figure 4-5: Distribution Pumping Recommendations
Pressure Zone 3**



**Figure 4-6: Elevated Storage Recommendations
Pressure Zone 1**

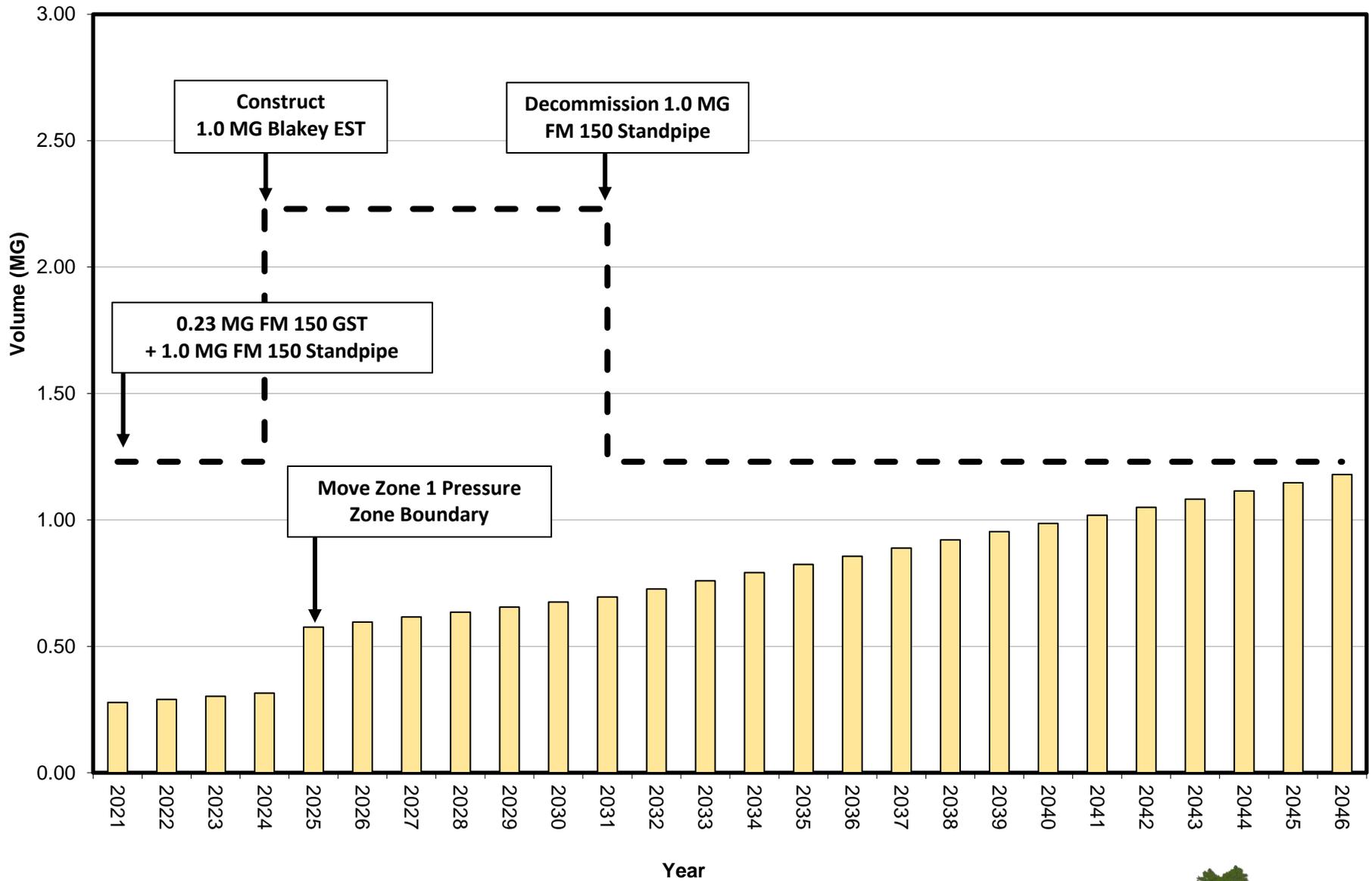
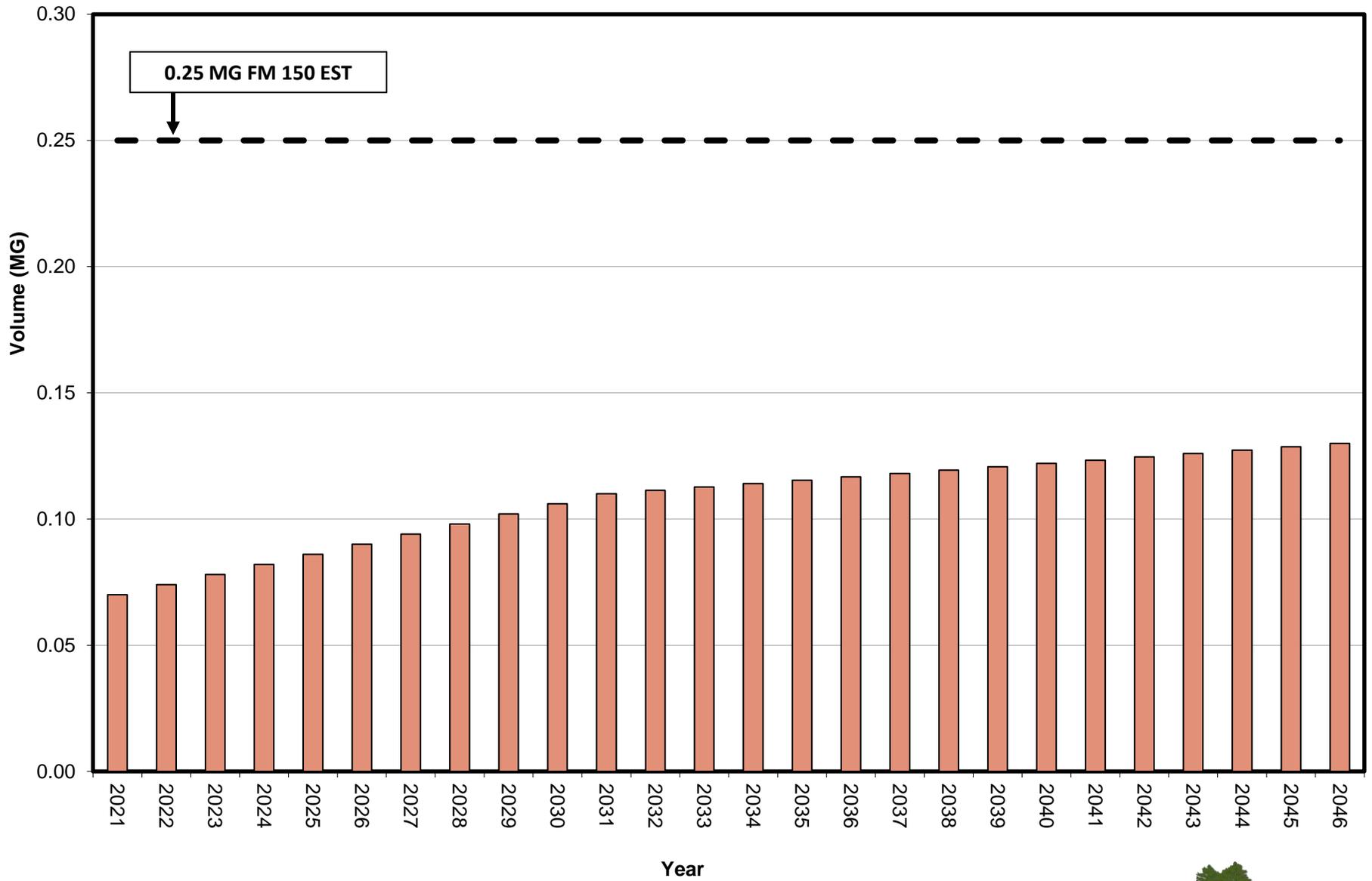
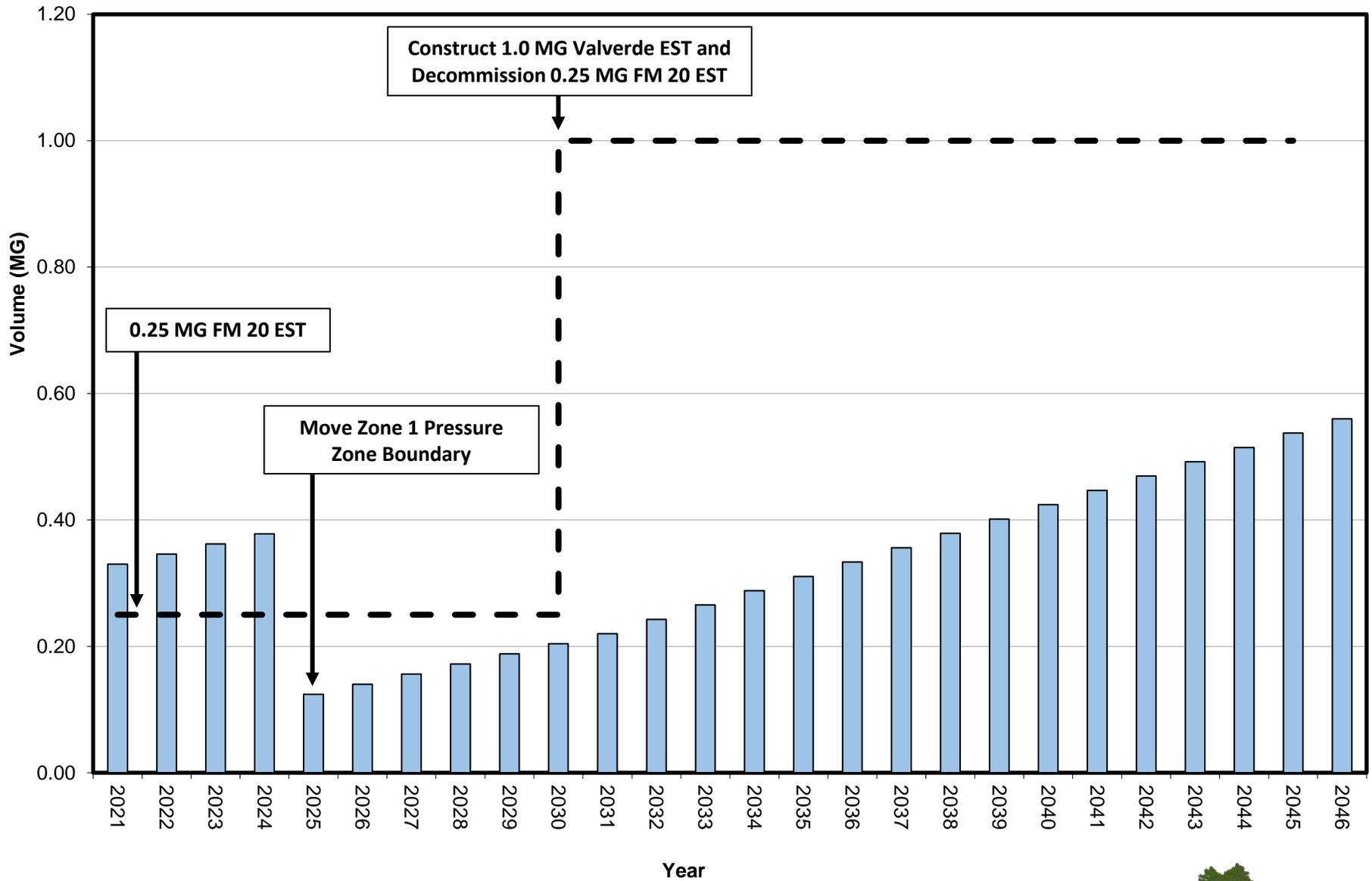


Figure 4-7: Elevated Storage Recommendations
Pressure Zone 2



**Figure 4-8: Elevated Storage Recommendations
Pressure Zone 3**



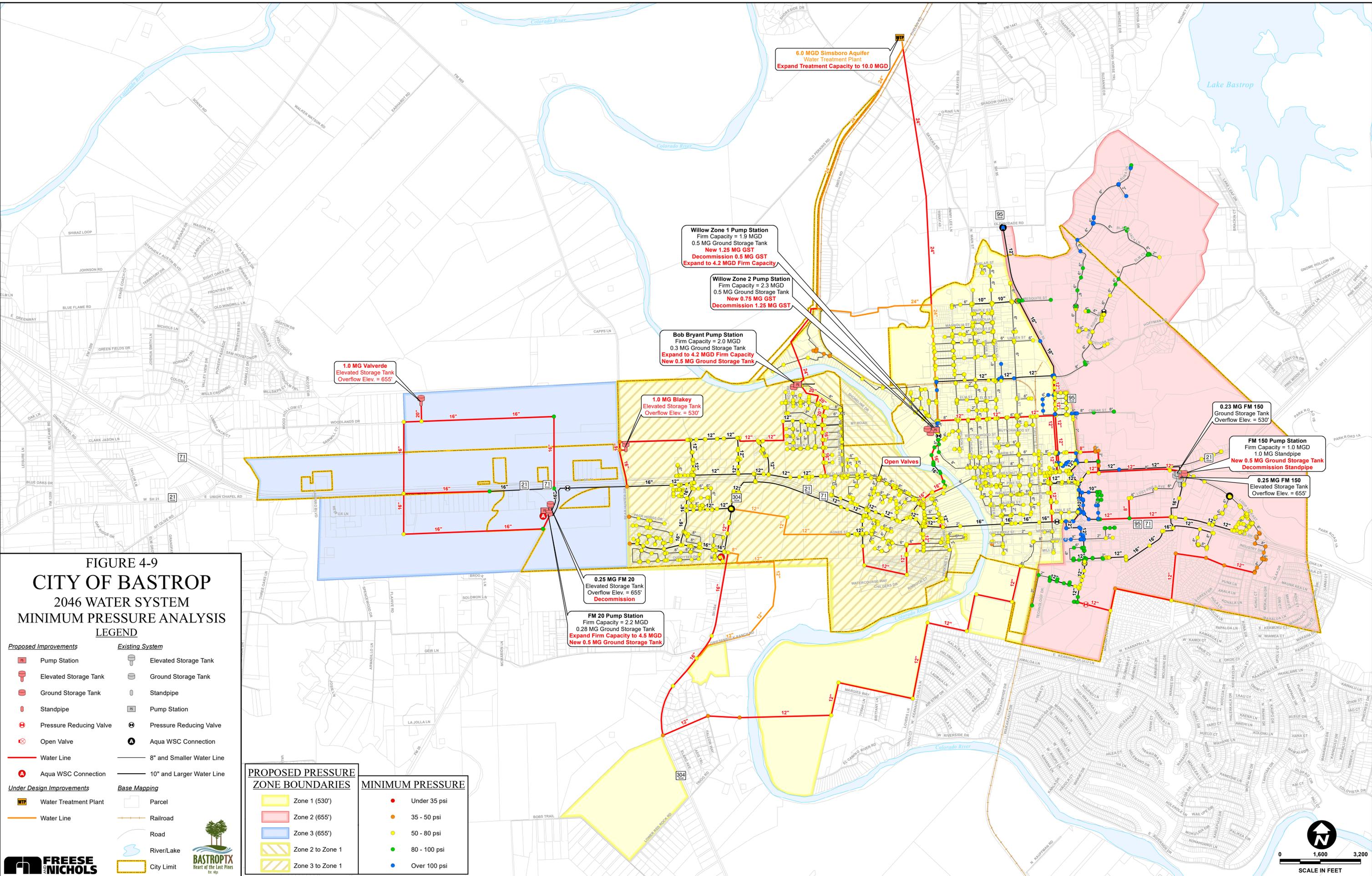


FIGURE 4-9
CITY OF BASTROP
2046 WATER SYSTEM
MINIMUM PRESSURE ANALYSIS
LEGEND

Proposed Improvements	Existing System
Pump Station	Elevated Storage Tank
Elevated Storage Tank	Ground Storage Tank
Ground Storage Tank	Standpipe
Standpipe	Pump Station
Pressure Reducing Valve	Pressure Reducing Valve
Open Valve	Aqua WSC Connection
Water Line	8" and Smaller Water Line
Aqua WSC Connection	10" and Larger Water Line
Under Design Improvements	Base Mapping
Water Treatment Plant	Parcel
Water Line	Railroad
	Road
	River/Lake
	City Limit

PROPOSED PRESSURE ZONE BOUNDARIES	MINIMUM PRESSURE
Zone 1 (530')	Under 35 psi
Zone 2 (655')	35 - 50 psi
Zone 3 (655')	50 - 80 psi
Zone 2 to Zone 1	80 - 100 psi
Zone 3 to Zone 1	Over 100 psi

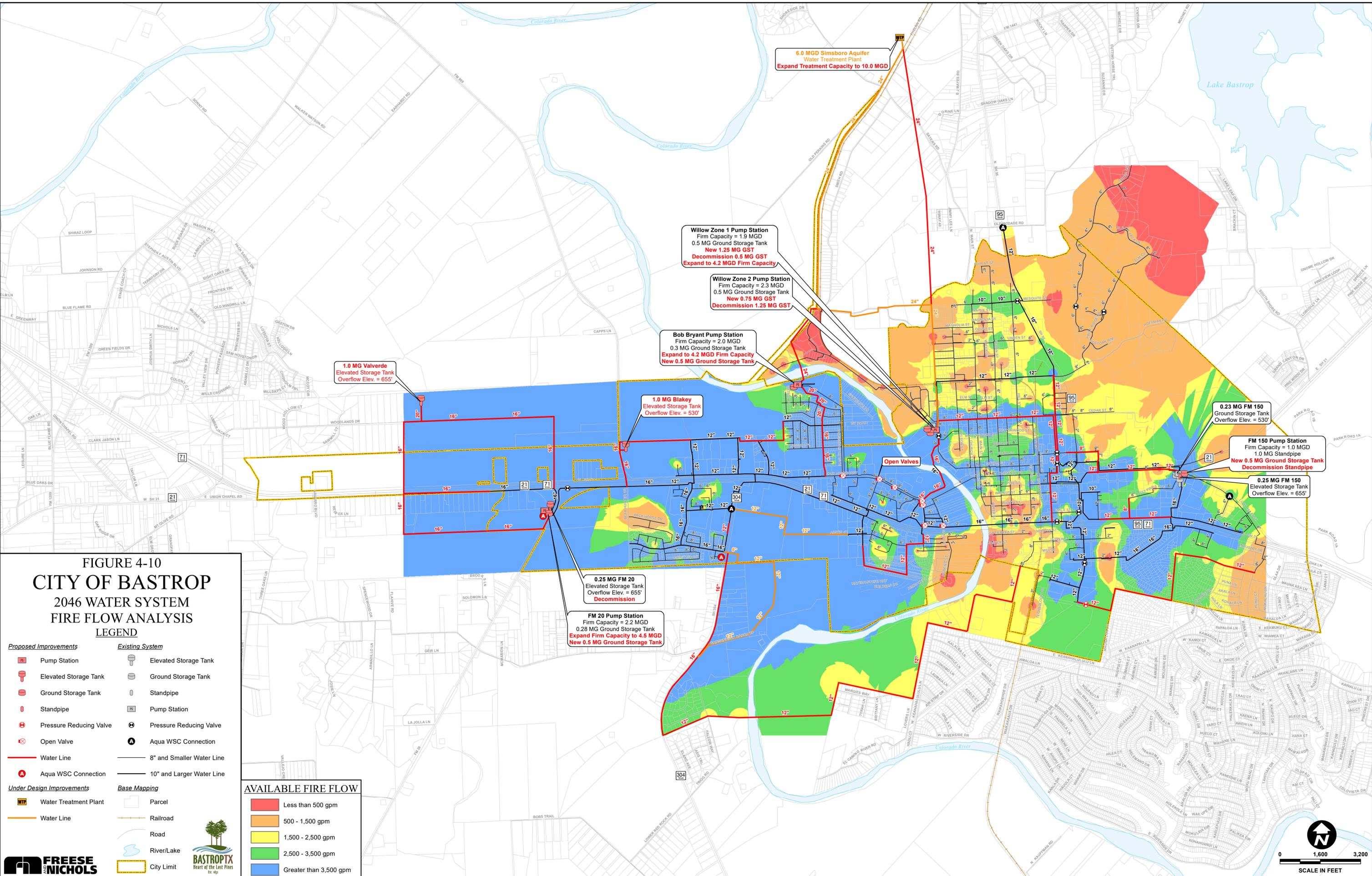


FIGURE 4-10
CITY OF BASTROP
 2046 WATER SYSTEM
 FIRE FLOW ANALYSIS
 LEGEND

Proposed Improvements	Existing System
Pump Station	Elevated Storage Tank
Elevated Storage Tank	Ground Storage Tank
Ground Storage Tank	Standpipe
Standpipe	Pump Station
Pressure Reducing Valve	Pressure Reducing Valve
Open Valve	Aqua WSC Connection
Water Line	8" and Smaller Water Line
Aqua WSC Connection	10" and Larger Water Line
Under Design Improvements	Base Mapping
Water Treatment Plant	Parcel
Water Line	Railroad
	Road
	River/Lake
	City Limit

AVAILABLE FIRE FLOW

	Less than 500 gpm
	500 - 1,500 gpm
	1,500 - 2,500 gpm
	2,500 - 3,500 gpm
	Greater than 3,500 gpm

5.0 CAPITAL IMPROVEMENT PLAN

The goal of the capital improvement plan is to address existing deficiencies in the distribution system, as well as provide capacity for future development. The recommended phased system improvements and estimated project costs are discussed in this section.

5.1 PHASED SYSTEM IMPROVEMENTS

All projects are developed in accordance with TCEQ standards and the recommended planning criteria as outlined in **Section 4.1**. Projects are prioritized and phased by planning period based on hydraulic requirements and projected development. Project implementation may vary, and final prioritization will be determined by City staff and the design engineer. Phasing for new water lines may change based on timing of development.

Locations for new transmission mains and other recommended improvements shown were investigated for feasibility but generalized for hydraulic analysis and planning purposes. Specific alignments and sites will be determined as part of the design process. Unless specified, the recommended diameters are for full pipe replacement and include decommissioning the existing line. In-depth analysis is recommended as part of the design process to determine the condition of the existing line and the cost effectiveness of full replacement or rehabilitation and parallel for each project.

Figure 5-1 shows the developed CIP projects to remedy all identified system deficiencies through the 2046 planning period. Projects initially designated for the short-term planning period are shown in red, intermediate projects are shown in blue, and projects phased for the long-term planning period are shown in green. Detailed descriptions of each project are included below.

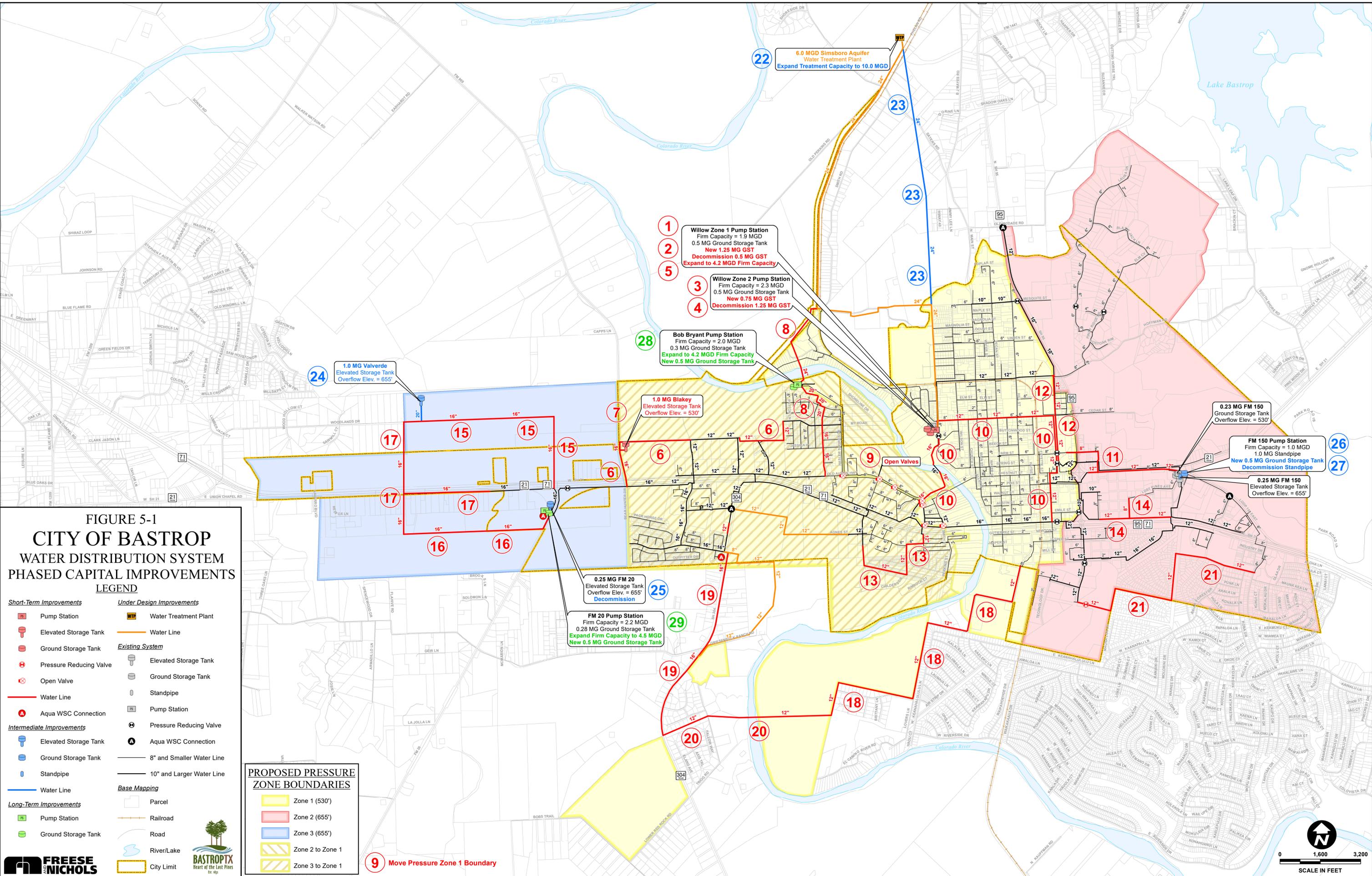


FIGURE 5-1
CITY OF BASTROP
WATER DISTRIBUTION SYSTEM
PHASED CAPITAL IMPROVEMENTS

LEGEND

Short-Term Improvements	Under Design Improvements
Pump Station	Water Treatment Plant
Elevated Storage Tank	Water Line
Ground Storage Tank	Existing System
Pressure Reducing Valve	Elevated Storage Tank
Open Valve	Ground Storage Tank
Water Line	Standpipe
Aqua WSC Connection	Pump Station
Intermediate Improvements	Pressure Reducing Valve
Elevated Storage Tank	Aqua WSC Connection
Ground Storage Tank	8" and Smaller Water Line
Standpipe	10" and Larger Water Line
Water Line	Base Mapping
Long-Term Improvements	Parcel
Pump Station	Railroad
Ground Storage Tank	Road
River/Lake	City Limit

PROPOSED PRESSURE ZONE BOUNDARIES

- Zone 1 (530')
- Zone 2 (655')
- Zone 3 (655')
- Zone 2 to Zone 1
- Zone 3 to Zone 1

9 Move Pressure Zone 1 Boundary

5.1.1 Short-term Improvements (2022-2025)

Project 1: 1.25 MG Willow Zone 1 Ground Storage Tank

This project includes construction of a new 1.25 MG GST at the Willow site. This project is triggered by the poor condition of the existing ground storage tank.

Project 2: Decommission Willow Zone 1 Ground Storage Tank

This project decommissions the existing 0.5 MG GST due to poor condition.

Project 3: 1.25 MG Willow Zone 2 Ground Storage Tank

This project includes construction of a new 1.25 MG GST at the Willow site. This project is triggered by the poor condition of the existing ground storage tank.

Project 4: Decommission Willow Zone 2 Ground Storage Tank

This project decommissions the existing 0.5 MG GST due to poor condition.

Project 5: Willow Zone 1 Pump Station Expansion

This project involves an expansion of the Willow Zone 1 Pump Station firm capacity to 4.2 MGD by replacing the three existing pumps. This project is proposed to provide additional pumping capacity to meet recommended pumping criteria in Pressure Zone 1.

Project 6: 16/12-inch Blakey Lane Water Line

This project involves the construction of a new 16-inch water line, connecting to the existing 12-inch water line along Blakey Lane and the existing 16-inch water line along SH 71. It also involves the construction of a new 12-inch water line, connecting to the existing 12-inch water lines along Blair Avenue and Blakey Lane. This project is proposed to serve customers in the western portion of Pressure Zone 1, connect to the proposed Zone 1 Elevated Storage Tank, and to increase system efficiency and reliability.

Project 7: 1.0 MG Blakey Elevated Storage Tank

This project includes construction of a new 1.0 MG elevated storage tank and 20-inch water line to connect to the existing water system. The new tank will be constructed at the southeast corner of Blakey Lane and FM 969 with an overflow elevation of 530 feet. The tank will serve customers in Pressure Zone 1, once the proposed Pressure Zone 1 boundary change has taken place. This project is proposed to provide elevated storage for customers in Pressure Zone 1.

Project 8: 24/20/16-inch Bob Bryant Transmission Lines

This project involves the construction of a 24-inch line connecting the Bob Bryant Pump station to the 24-inch transmission line from the Simsboro Aquifer WTP. It also involves the construction of 20/16-inch water lines downstream of the Bob Bryant Pump Station and along Charles Boulevard and Schaefer Boulevard. This project is proposed to increase the transmission capacity of the Bob Bryant Pump Station to serve growth.

Project 9: Move Pressure Zone 1 Boundary

This project involves moving the boundary of Pressure Zone 1 to the west by opening the valves along Old Austin Highway, Eskew Street, and SH 71. Pressure Zone 1 would then include downtown and all of the area currently served by Pressure Zone 3 with the exception of the areas west of FM 969. This project is proposed to improve system efficiency and to serve growth in Pressure Zones 1 and 3 while continuing to meet recommended system design criteria.

Project 10: 20/16/12-inch Downtown Water Lines

This project involves the construction of 20/16/12-inch water lines in the downtown area of Pressure Zone 1. The proposed 20-inch water line will replace the existing 10-inch water line connecting the Willow Zone 1 Pump Station to the existing 8-inch water line along Willow Street. The proposed 16-inch water line will replace the existing 12-inch water line crossing the Colorado River, with the exception of the existing 16-inch section. The proposed 12-inch water line will replace the existing 8/6-inch water lines along Willow and Cedar Streets. It will continue south along Chambers Street to Chestnut Street, replacing the existing 8-inch water lines. It will then replace the existing 6-inch water line along Martin Luther King Drive and connect to the existing 16-inch water line on the north side of SH 71. This project is proposed to increase transmission and distribution capacity in the downtown area of Pressure Zone 1.

Project 11: 12/8-inch Chestnut Street Water Lines

This project involves the construction of a 12-inch water line along Chestnut Street that replaces the existing 10-inch water line along Chestnut Street and an 8-inch water line along Farm and Pitt Streets that replaces a 2-inch water line. This project is proposed to increase transmission capacity to and from the FM 150 Ground Storage Tank.

Project 12: 12-inch Chambers Street Water Line

This project involves the construction of a 12-inch water line that replaces the existing 10-inch water line along Chambers Street. This project is proposed to increase transmission capacity to Pressure Zone 2 from the Willow Zone 2 Pump Station.

Project 13: 12-inch Driftwood Lane Water Line

This project involves the construction of a new 12-inch water line along Driftwood Lane, connecting to the existing 12-inch water lines along Hasler Boulevard and South Eskew. This project is proposed to increase reliability for the water system and provide redundancy for water customers in the event of an emergency.

Project 14: 12/8-inch Lost Pines Ave Water Lines

This project involves the construction of 12/8-inch water lines connecting to the existing 12-inch water lines along SH 71 and the existing 6-inch water line along Lost Pines Ave. This project is proposed to increase system efficiency and reliability in Pressure Zone 2.

Project 15: 16-inch Valverde Water Line

This project involves construction of a new 16-inch water line, connecting to the existing 16-inch water line along SH 71 and continuing north and west through the proposed Valverde development. This project is proposed to serve customers in the Valverde development.

Project 16: 16-inch West Bastrop Village Water Line

This project involves construction of a new 16-inch water line, connecting to the existing 16-inch water line along FM 20 and continuing south and west through the proposed West Bastrop Village development. This project is proposed to serve customers in the West Bastrop Village development.

Project 17: 16-inch SH 71 Water Line

This project involves the construction of a new 16-inch water line that connects proposed 16-inch water lines in the Valverde and West Bastrop Village developments. It also connects to the existing 16-inch water line along SH 71. This project is proposed to improve system connectivity and reliability.

Project 18: 12-inch Lovers Lane Water Line

This project involves the construction of a new 12-inch water line, connecting to the existing 8-inch water line along Lovers Lane. This project is proposed to serve customers in the southern portion of the City.

Project 19: 16/12-inch SH 304 Water Lines

This project involves the construction of new 16/12-inch water lines, connecting to the existing 12-inch water line along SH 304. The new 12-inch water line is connecting two existing sections of 12-inch line. This project is proposed to serve customers in the southern portion of the City and to increase system efficiency and reliability.

Project 20: 12-inch Movie Studio Water Line

This project involves the construction of a new 12-inch water line that connects proposed 16-inch water lines. This project is proposed to improve system connectivity and reliability.

Project 21: 12-inch Mauna Loa Lane Water Line

This project involves the construction of a new 12-inch water line along Mauna Loa Lane, connecting to the existing 12-inch water line along Jackson Street and the existing 8-inch water line along Tahitian Drive. This project is proposed to serve customers in the southern portion of Pressure Zone 2 and to increase system efficiency and reliability.

5.1.2 Intermediate-term Improvements (2026-2030)

Project 22: 4.0 MGD Simsboro Water Treatment Plant Expansion

This project involves expanding the production capacity of the Simsboro Aquifer WTP to 10.0 MGD. This project is proposed to meet recommended production capacity requirements and provide additional capacity to serve growth.

Project 23: 24-inch WTP Secondary Transmission Line

This project involves the construction of a 24-inch water line from the Simsboro Aquifer Water Treatment Plant, connecting to a 24-inch water line along Carter Street that is currently under design. This project is proposed to provide redundancy for water customers in the event of an emergency.

Project 24: 1.0 MG Valverde Elevated Storage Tank

This project includes construction of a new 1.0 MG elevated storage tank and 20-inch water line to connect to the existing water system. The new tank will be constructed at the northwest corner of the Valverde development with an overflow elevation of 655 feet. The tank will serve customers in Pressure Zone 3. This project is proposed to provide elevated storage for customers in Pressure Zone 3.

Project 25: Decommission FM 20 Elevated Storage Tank

This project involves the decommissioning of the 0.25 MG FM 20 Elevated Storage Tank. This project is proposed to optimize system operations once the new Zone 3 Elevated Storage Tank is online.

Project 26: 0.5 MG FM 150 Ground Storage Tank

This project involves the construction of a new 0.5 MG ground storage tank at the FM 150 Pump Station. This project is proposed to meet ground storage requirements at the FM 150 Pump Station once the existing standpipe has been decommissioned.

Project 27: Decommission FM 150 Standpipe

This project involves the decommissioning of the 1.0 MG FM 150 standpipe. This project is proposed to improve water quality in the water system and increase operational efficiency once the standpipe has reached the end of its expected service life.

5.1.3 Long-term Improvements (2031-2046)

Project 28: Bob Bryant Pump Station Expansion to 4.2 MGD

This project involves an expansion of the Bob Bryant Pump Station firm capacity to 4.2 MGD by adding a third pump. This project also includes the construction of a new 0.50 MG GST.

Project 29: FM 20 Pump Station Expansion to 4.5 MGD

This project involves an expansion of the FM 20 Pump Station firm capacity to 4.5 MGD by adding a third pump. This project also includes the construction of a new 0.50 MG GST. This project is proposed to provide additional pumping capacity to serve growth in Pressure Zone 3.

5.2 PLANNING LEVEL PROJECT COST ESTIMATES

Planning level cost estimates were developed for the recommended improvements. Estimates are developed to be conservative for budgeting purposes, but actual project costs may vary. The costs are provided as estimates based on previous, similar engineering experience, in 2022 dollars, and include an allowance for engineering, surveying, and contingencies. The project cost estimates do not include an allowance for land or right of way acquisition, adjacent lines impacted by the project, individual service connections, permitting, construction allowances, or other unique project specific costs beyond "typical" project requirements. Unit costs were developed based on engineering experience and analysis of recent, local bid tabs. These unit costs account for various appurtenances included with each item and are higher than the simple cost of the material. Additionally, unit costs incorporate existing market conditions, and future changes to material supply and construction demand will affect project costs. These costs are for planning and budgeting purposes only and are not to be considered as a detailed opinion of probable construction cost. **Table 5-1** summarizes the estimated project costs by planning period. Detailed and itemized descriptions of all the CIP projects and associated costs are shown in **Appendix B**.

Table 5-1: CIP Cost Estimate Summary

Project Number	Project Name	Project Cost
Short-term (2022-2025)		
1	1.25 MG Willow Zone 1 Ground Storage Tank	\$3,543,600
2	Decommission Willow Zone 1 Ground Storage Tank	\$443,100
3	1.25 MG Willow Zone 2 Ground Storage Tank	\$3,543,600
4	Decommission Willow Zone 2 Ground Storage Tank	\$443,100
5	Willow Zone 1 Pump Station Expansion	\$4,832,100
6	16/12-inch Blakey Lane Water Line	\$4,040,600
7	1.0 MG Blakey Elevated Storage Tank	\$8,234,900
8	24/20/16-inch Bob Bryant Transmission Lines	\$5,827,600
9	Move Pressure Zone 1 Boundary	\$0
10	20/16/12-inch Downtown Water Lines	\$6,279,500
11	12/8-inch Chestnut Street Water Lines	\$2,437,900
12	12-inch Chambers Street Water Line	\$1,643,000
13	12-inch Driftwood Lane Water Line	\$2,177,000
14	12/8-inch Lost Pines Ave Water Lines	\$1,072,800
15	16-inch Valverde Water Line	\$4,072,000
16	16-inch West Bastrop Village Water Line	\$2,628,700
17	16-inch SH 71 Water Line	\$4,144,600
18	12-inch Lovers Lane Water Line	\$4,291,000
19	16/12-inch SH 304 Water Lines	\$3,525,200
20	12-inch Movie Studio Water Line	\$2,445,100
21	12-inch Mauna Loa Lane Water Line	\$3,508,200
Short-term Total		\$69,133,600
Intermediate-term (2026-2030)		
22	4.0 MGD Simsboro Water Treatment Plant Expansion	\$8,053,500
23	24-inch WTP Secondary Transmission Line	\$6,685,500
24	1.0 MG Valverde Elevated Storage Tank	\$8,488,500
25	Decommission FM 20 Elevated Storage Tank	\$443,100
26	0.5 MG FM 150 Ground Storage Tank	\$2,416,100
27	Decommission FM 150 Standpipe	\$443,100
Intermediate-term Total		\$26,529,800
Long-term (2031-2046)		
28	Bob Bryant Pump Station Expansion to 4.2 MGD	\$2,818,800
29	FM 20 Pump Station Expansion to 4.5 MGD	\$2,818,800
Long-term Total		\$5,637,600
CIP Total		\$101,301,000

APPENDIX A:
Pressure Testing Data



Figure A-1 City of Bastrop Field Pressure Testing Results

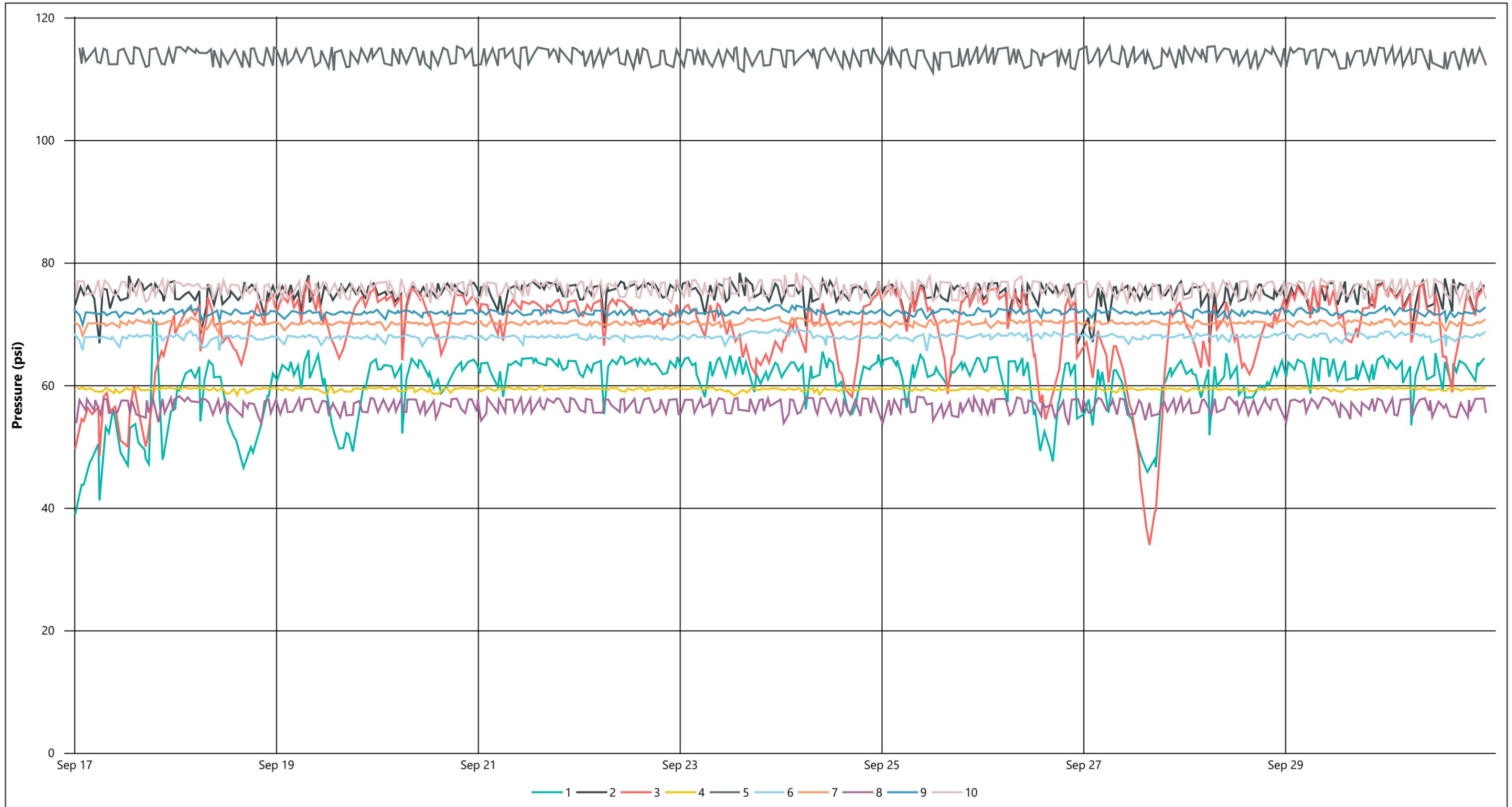




Figure A-2 City of Bastrop Field Pressure Testing Results Pressure Zone 1

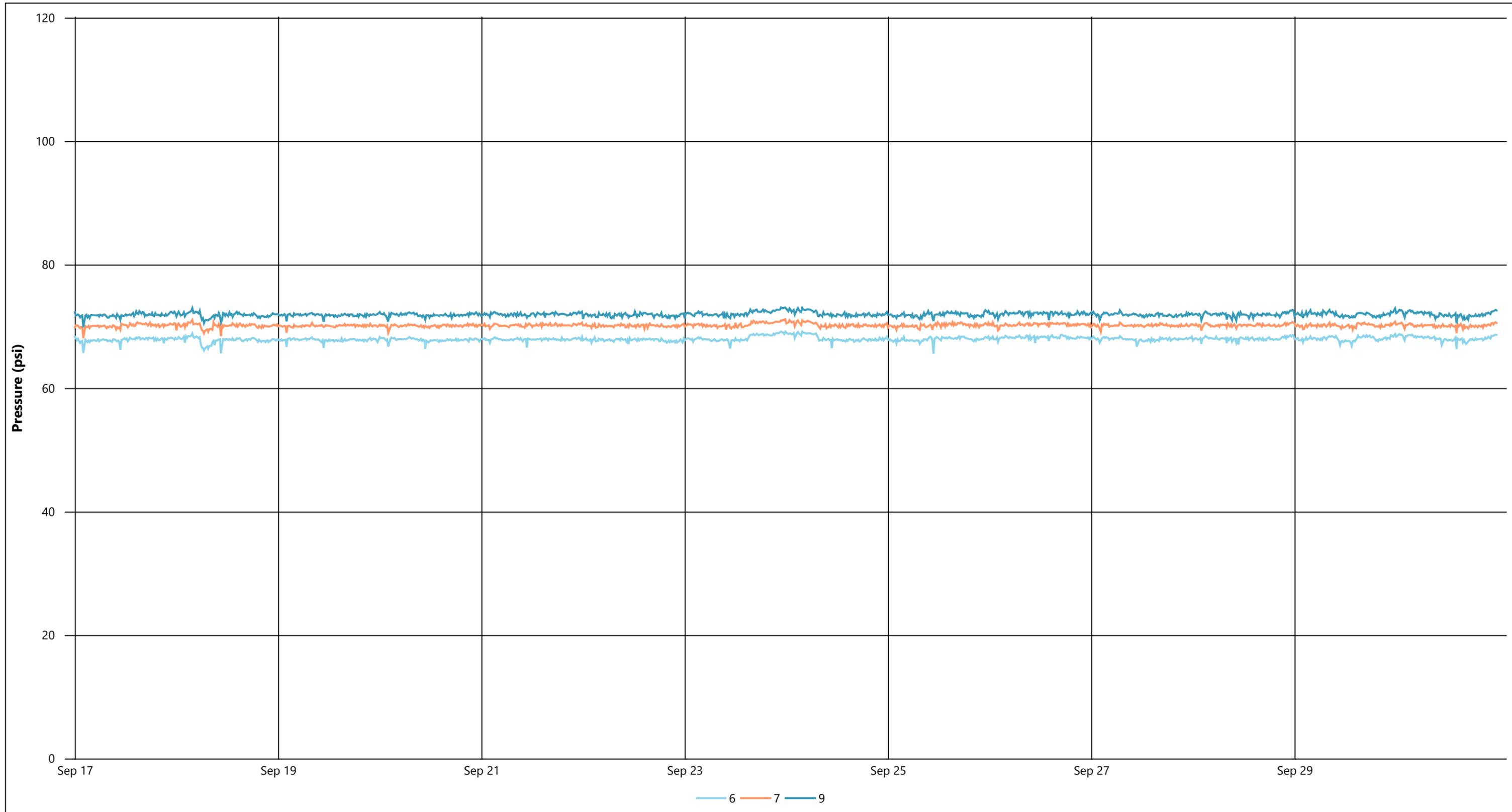




Figure A-3 City of Bastrop Field Pressure Testing Results Pressure Zone 2

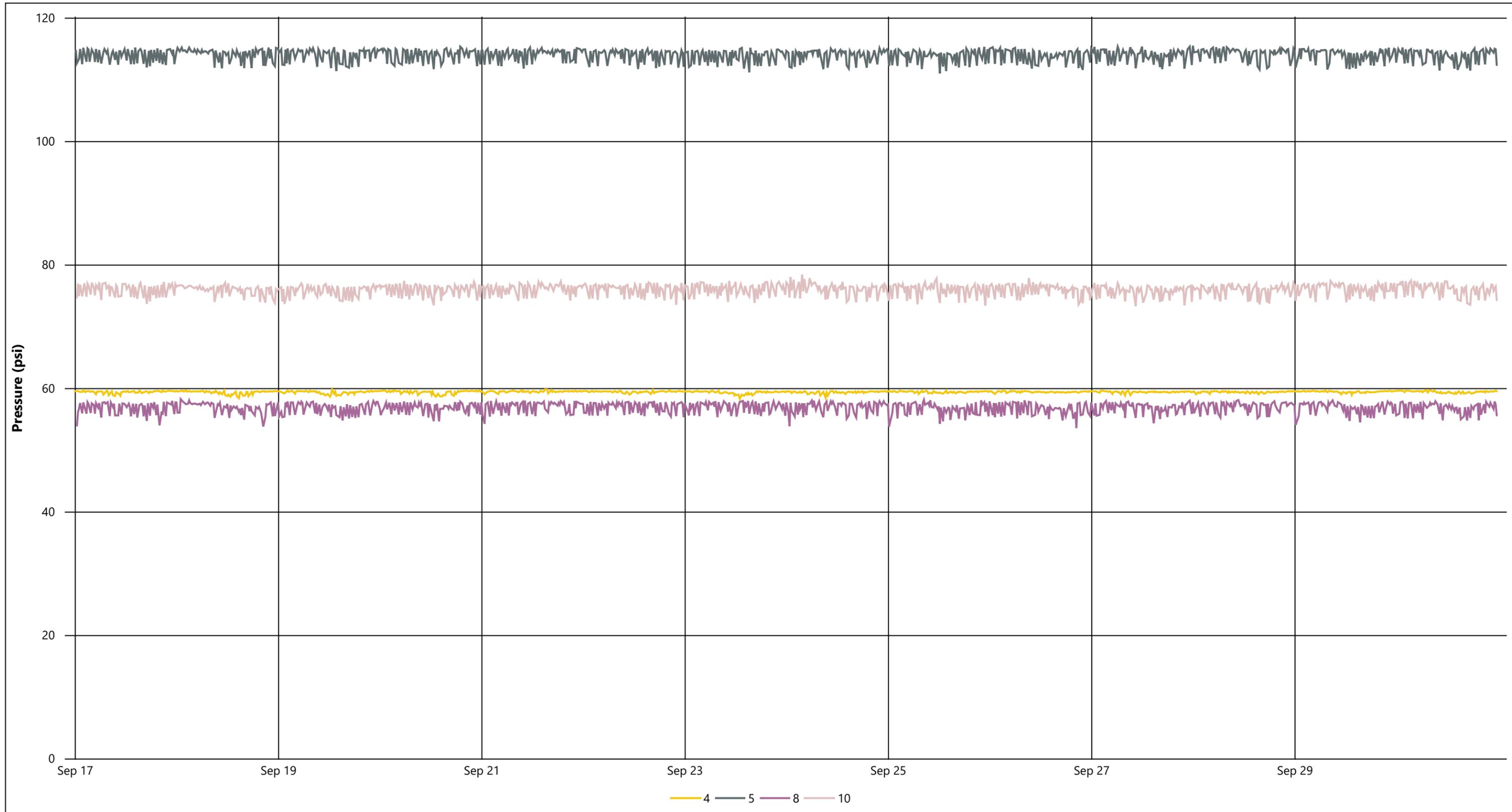




Figure A-4 City of Bastrop Field Pressure Testing Results Pressure Zone 3

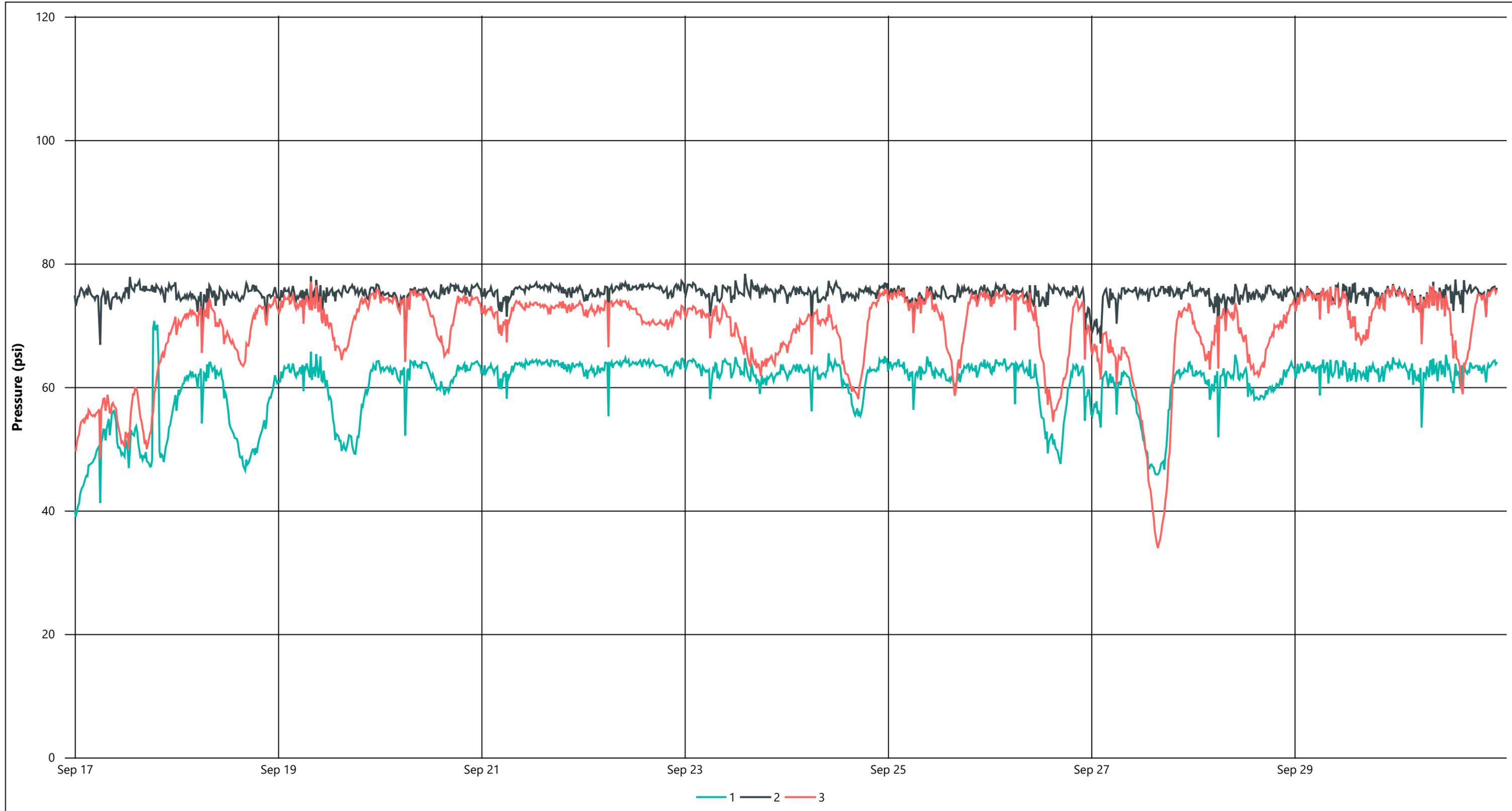
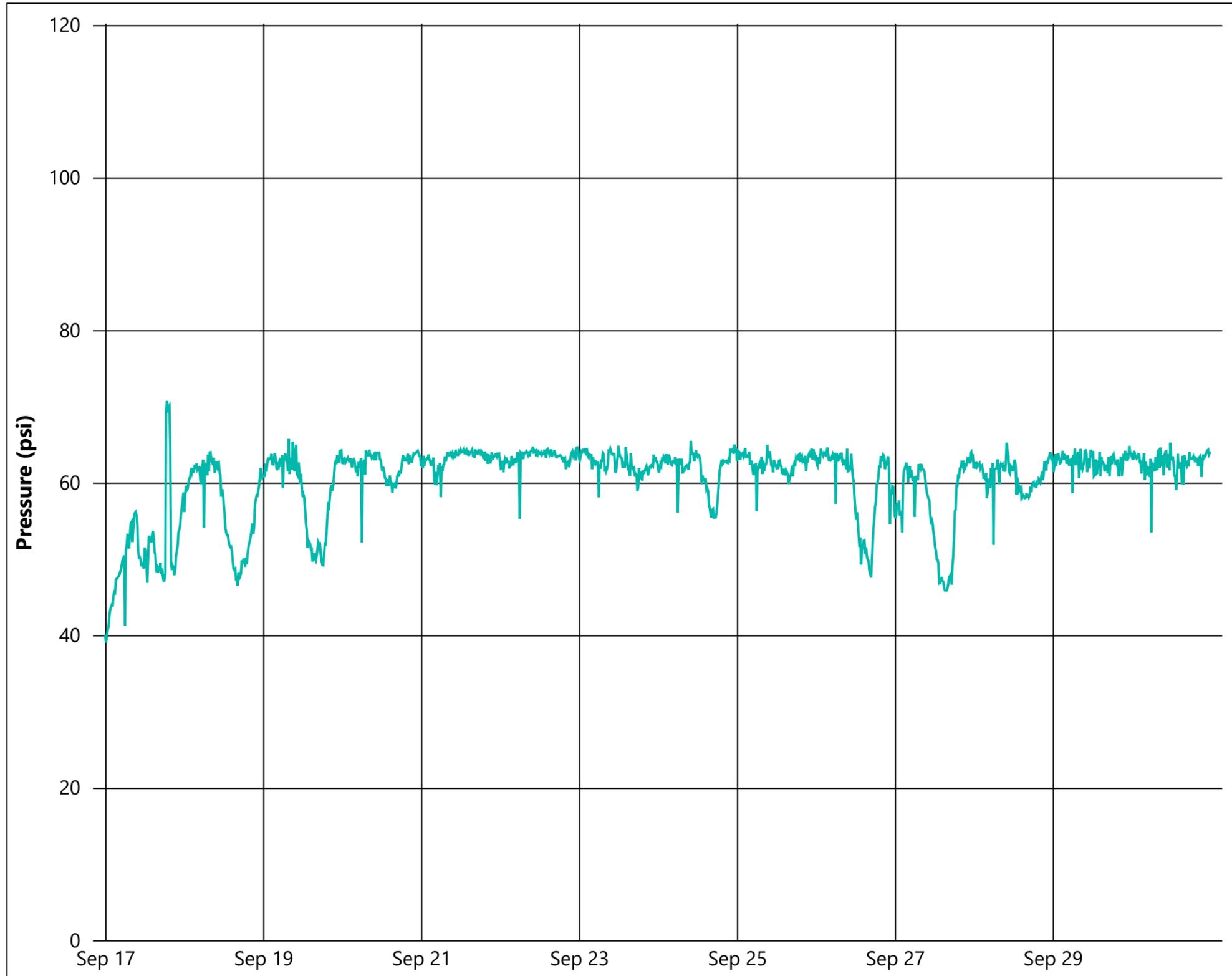


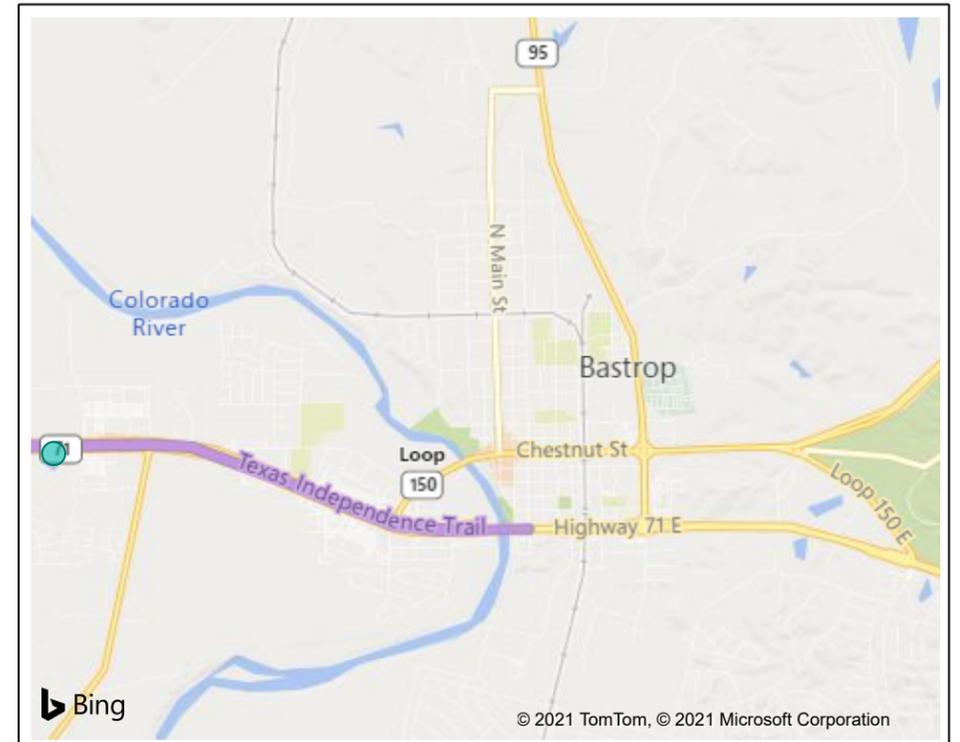


Figure A-5
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 1



Address

SH-71 Frontage Road (Lost Pines Toyota)



Pressure Zone

Zone 3 (655')

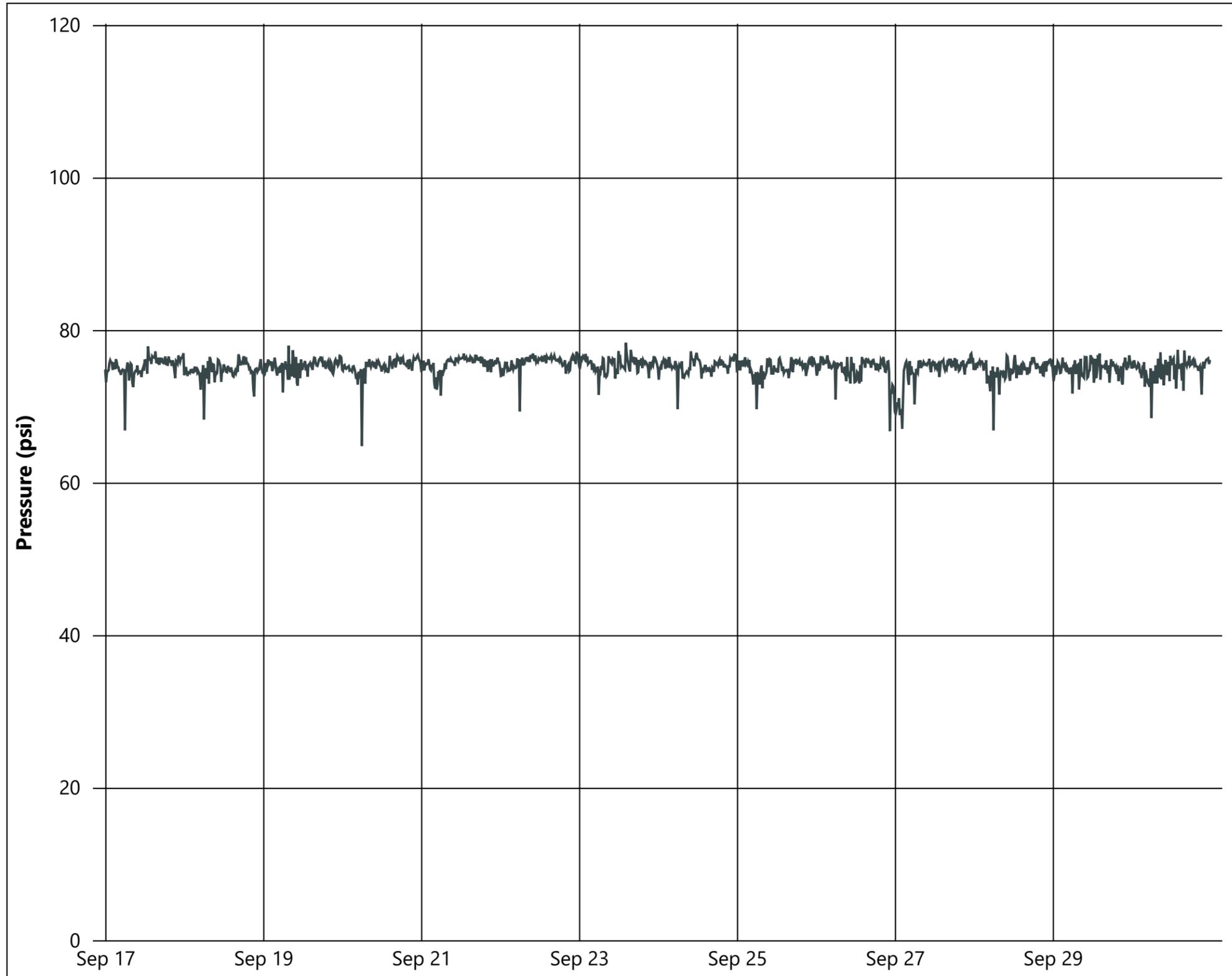
Statistics

Min: 39 psi
Max: 71 psi
Avg: 60 psi

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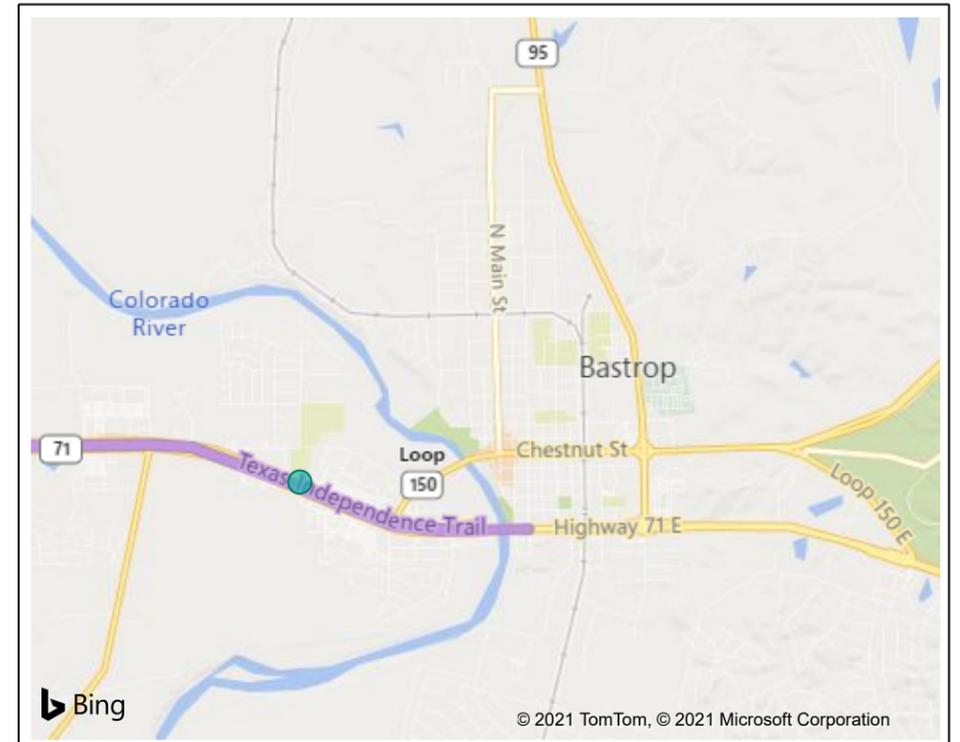


Figure A-6
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 2



Address

SH-71 Frontage Road (Service King)



Pressure Zone

Zone 3 (655')

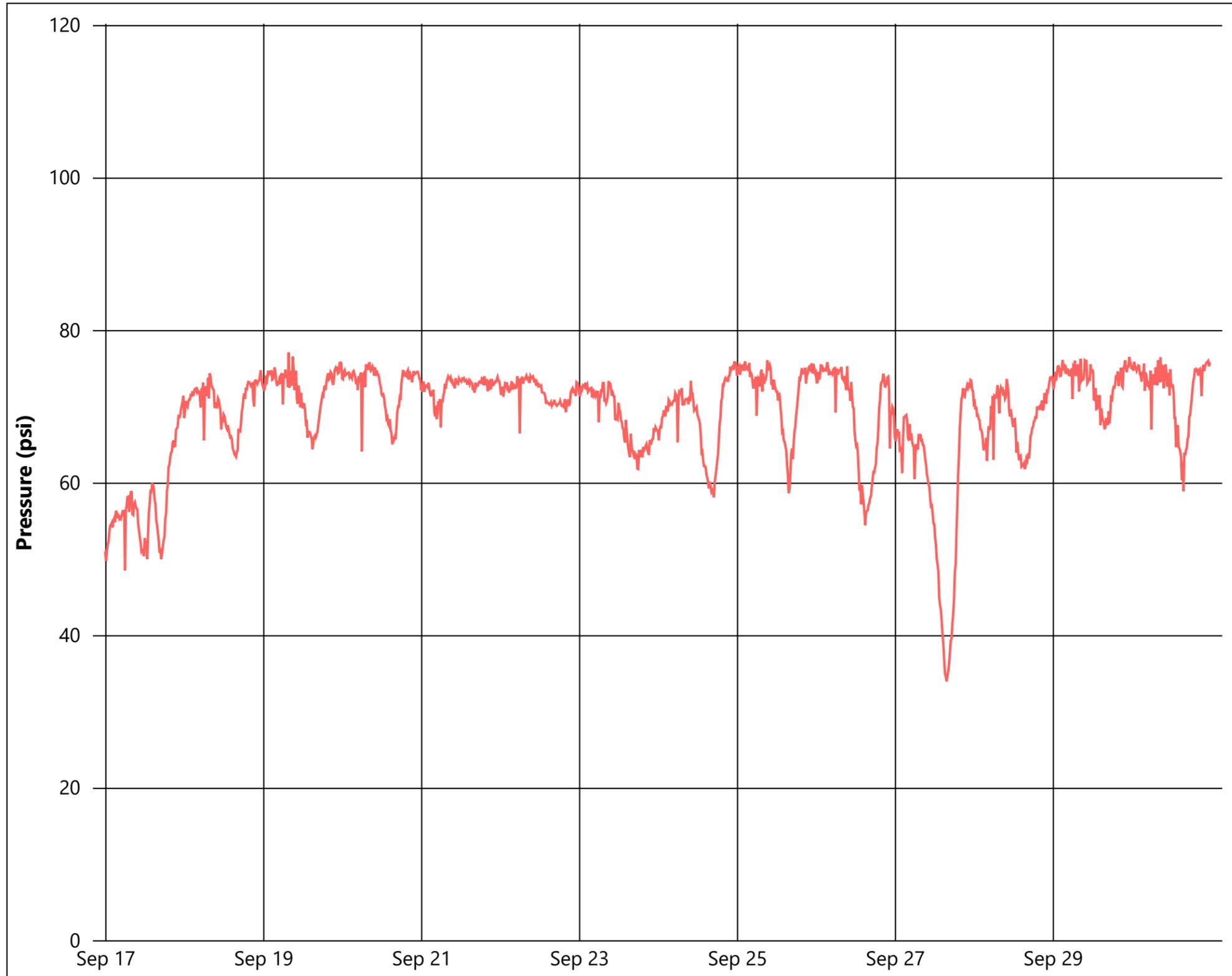
Statistics

Min: 65 psi
Max: 78 psi
Avg: 75 psi

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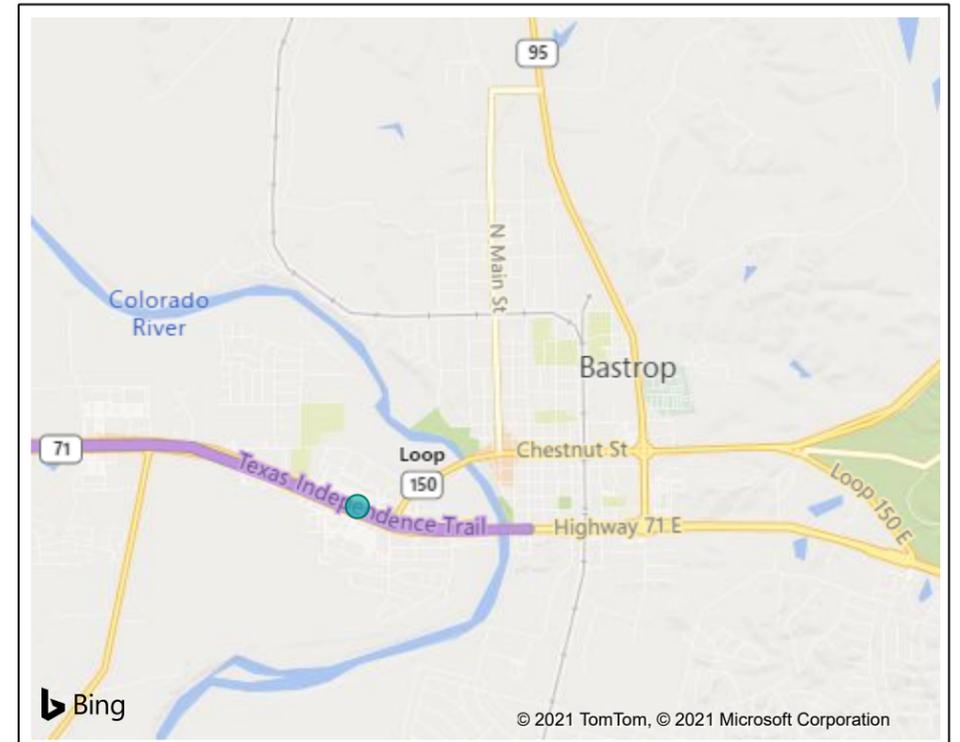


Figure A-7
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 3



Address

SH-71 Frontage Road (Classic Bank)



Pressure Zone

Zone 3 (655')

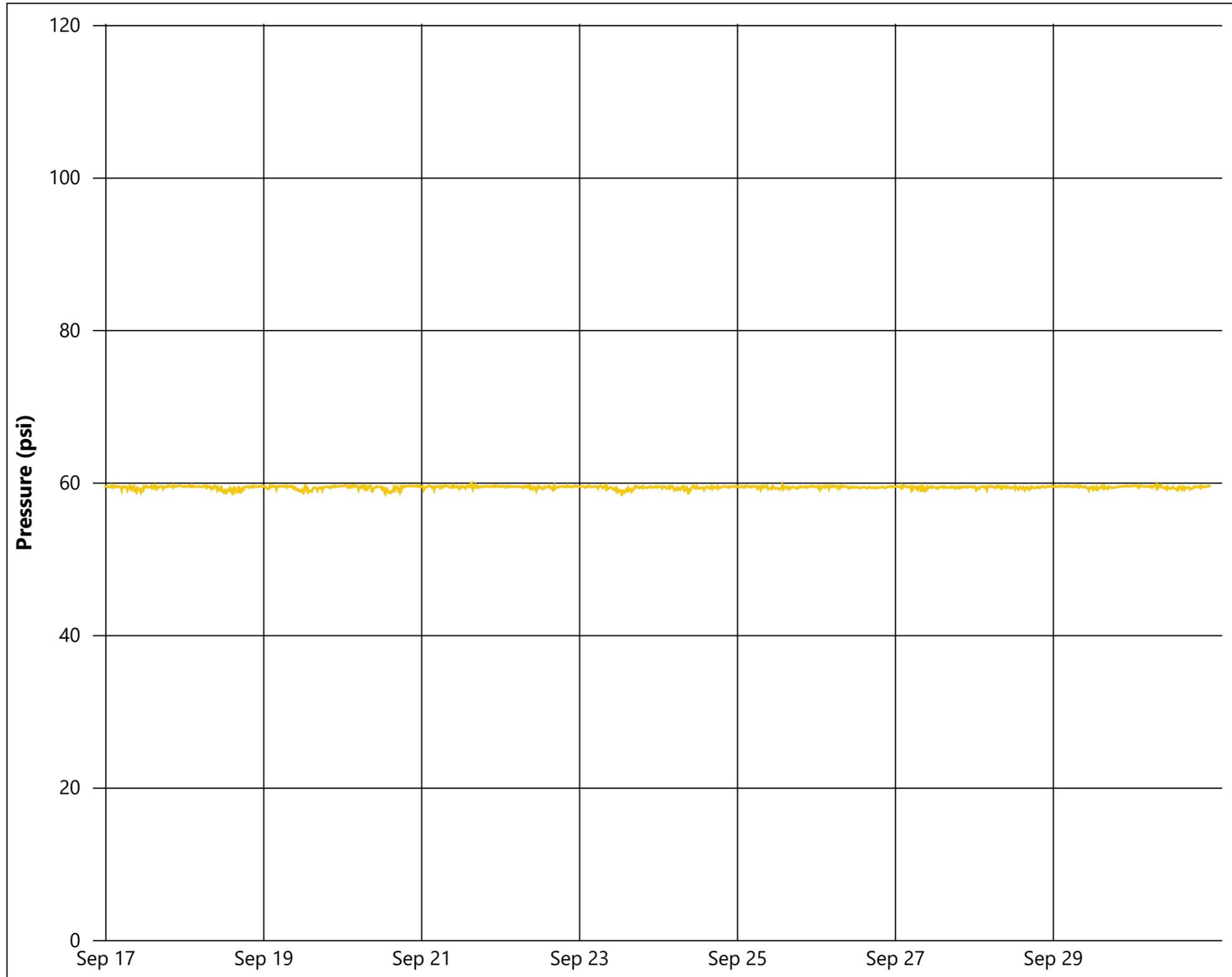
Statistics

Min: 34 psi
Max: 77 psi
Avg: 69 psi

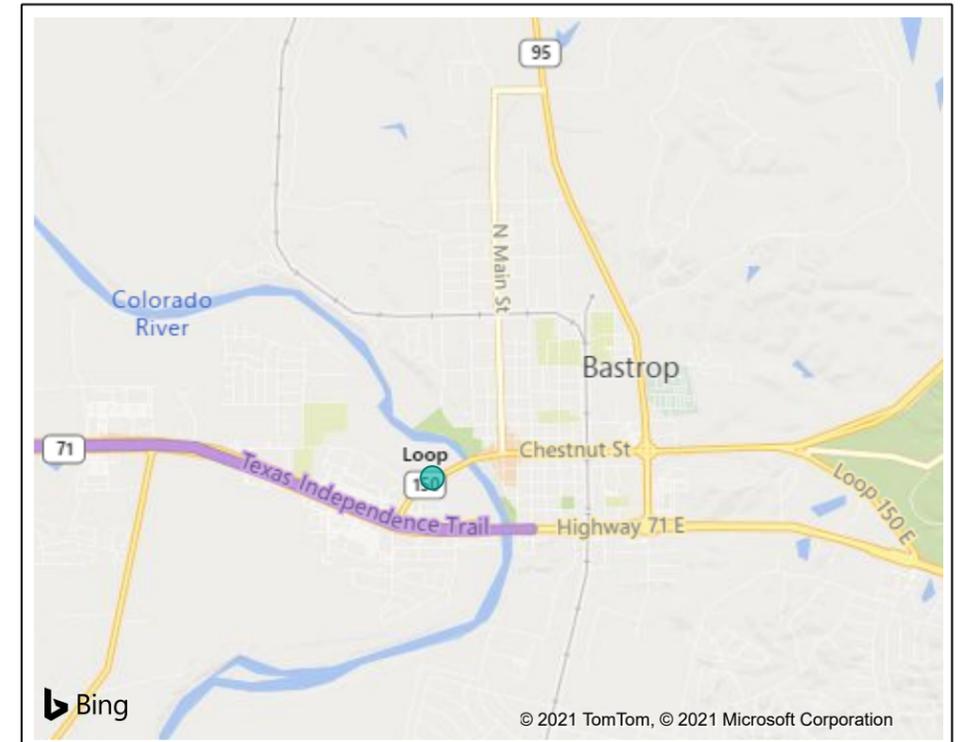
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Figure A-8
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 4



Address
114 TX-150 (Sugar Shack)



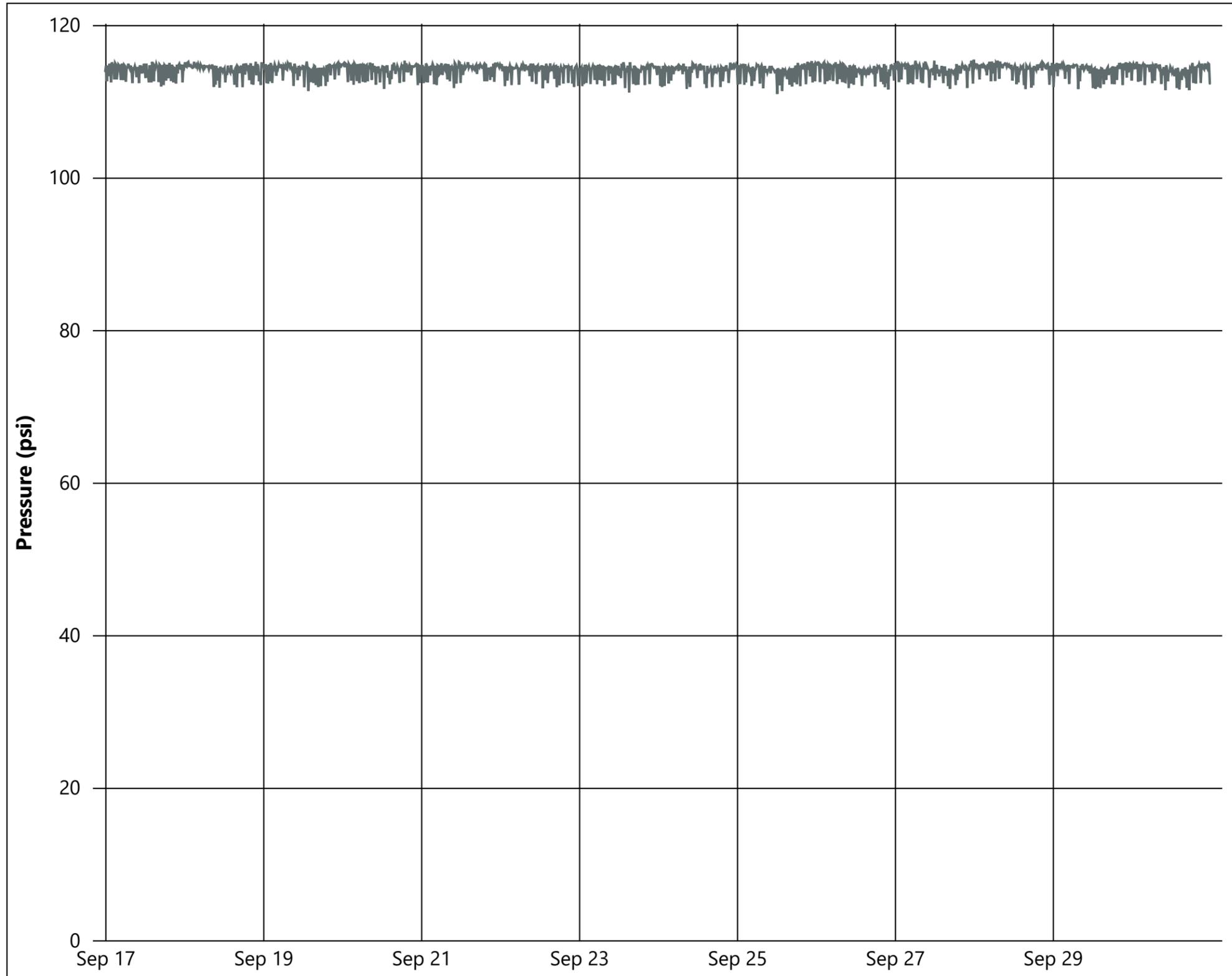
Pressure Zone
Zone 2 (655')

Statistics
Min: 58 psi
Max: 60 psi
Avg: 59 psi

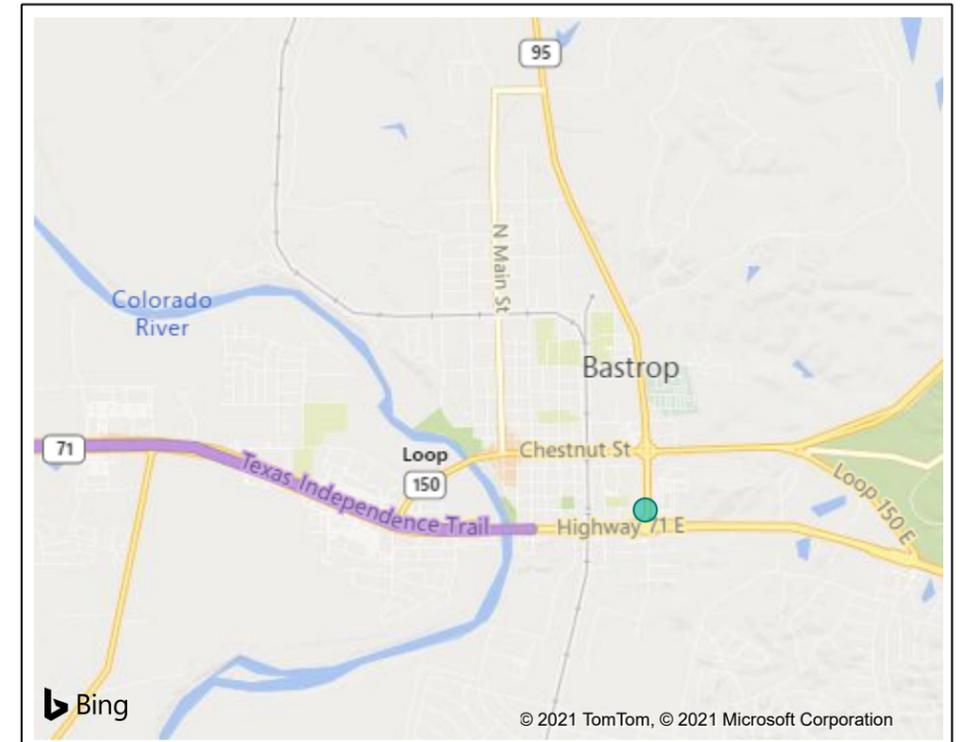
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Figure A-9
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 5



Address
Emile St and Hwy 95



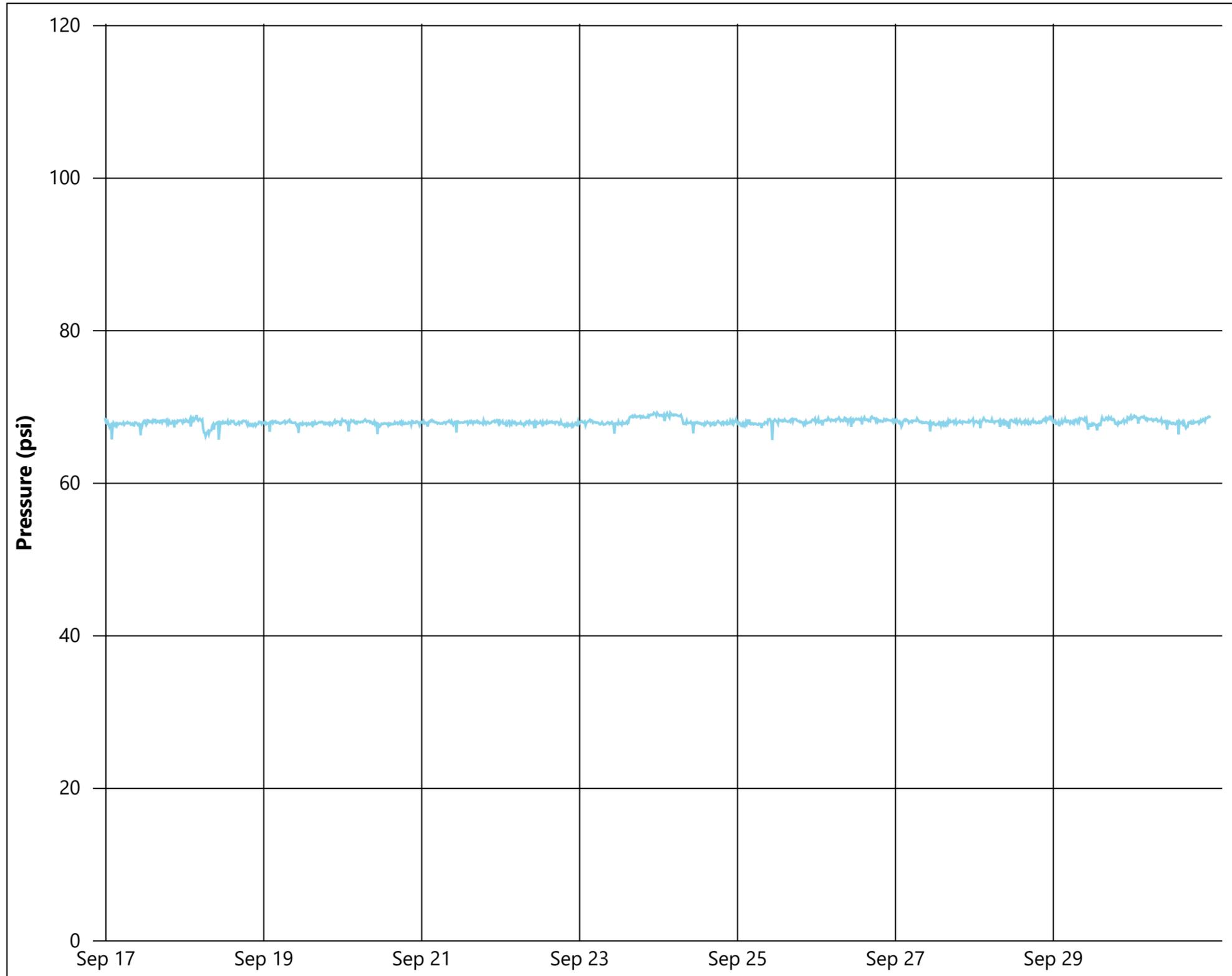
Pressure Zone
Zone 2 (655')

Statistics
Min: 111 psi
Max: 115 psi
Avg: 114 psi

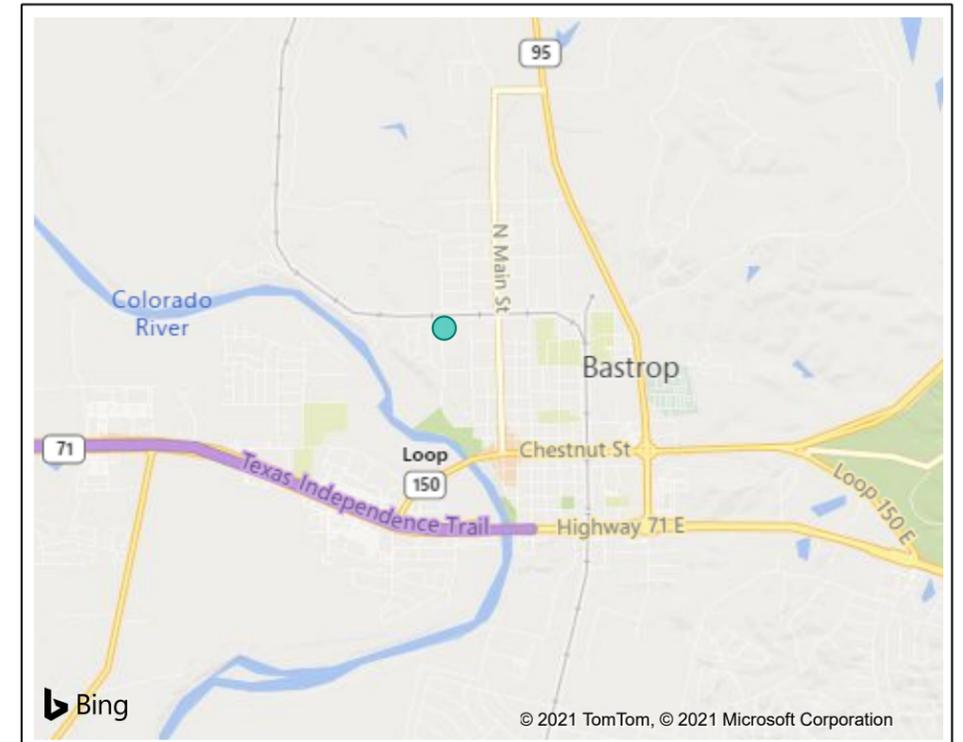
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Figure A-10
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 6



Address
1813 Carter St



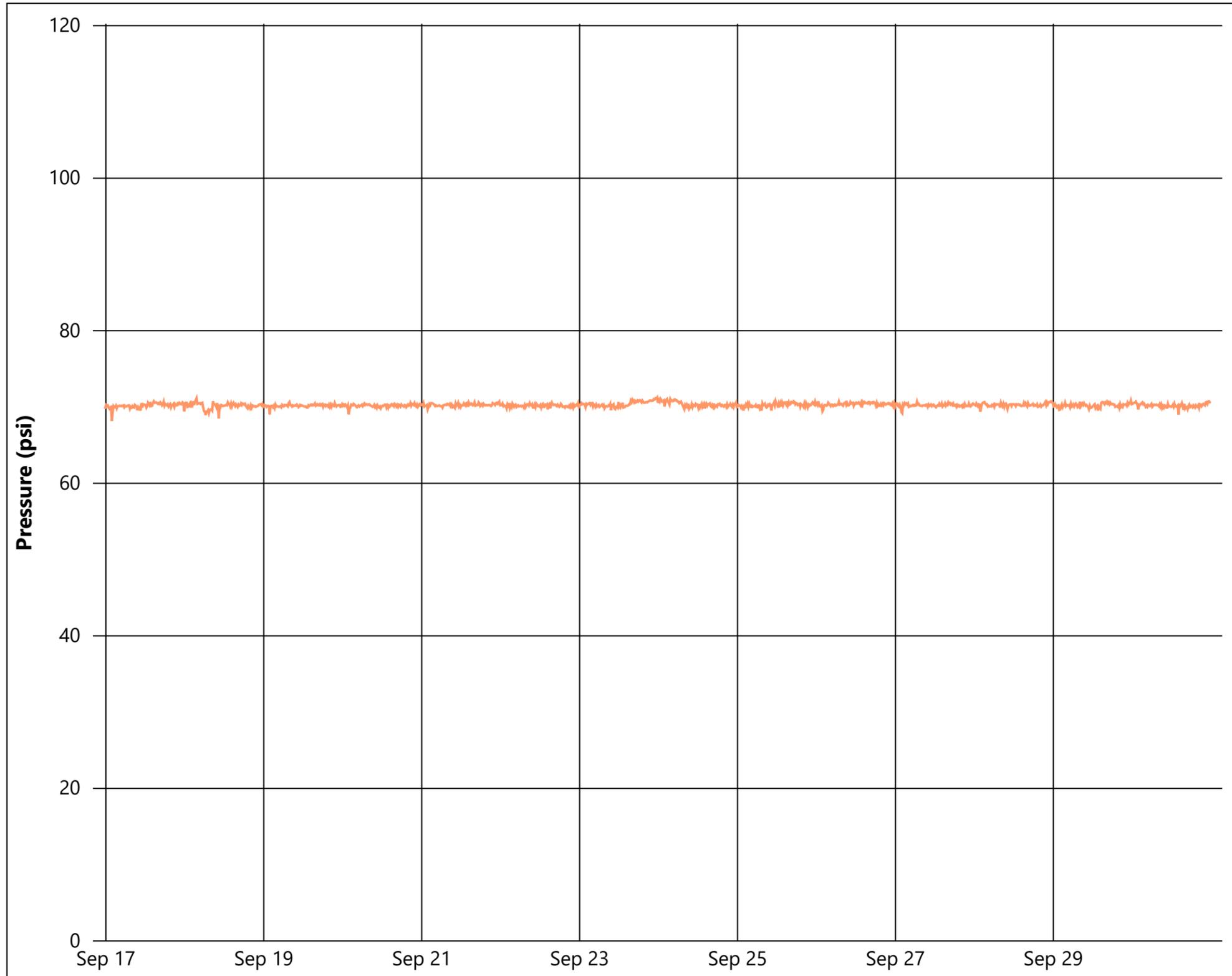
Pressure Zone
Zone 1 (535')

Statistics
Min: 66 psi
Max: 69 psi
Avg: 68 psi

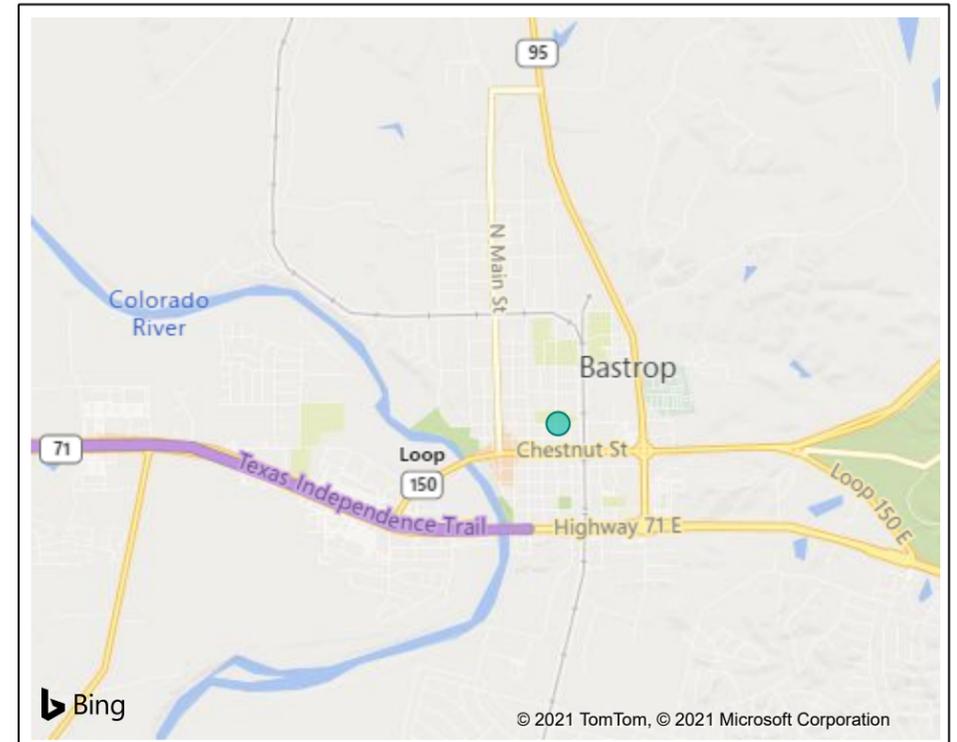
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Figure A-11
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 7



Address
Hill St and Farm St (Mina Elementary School)



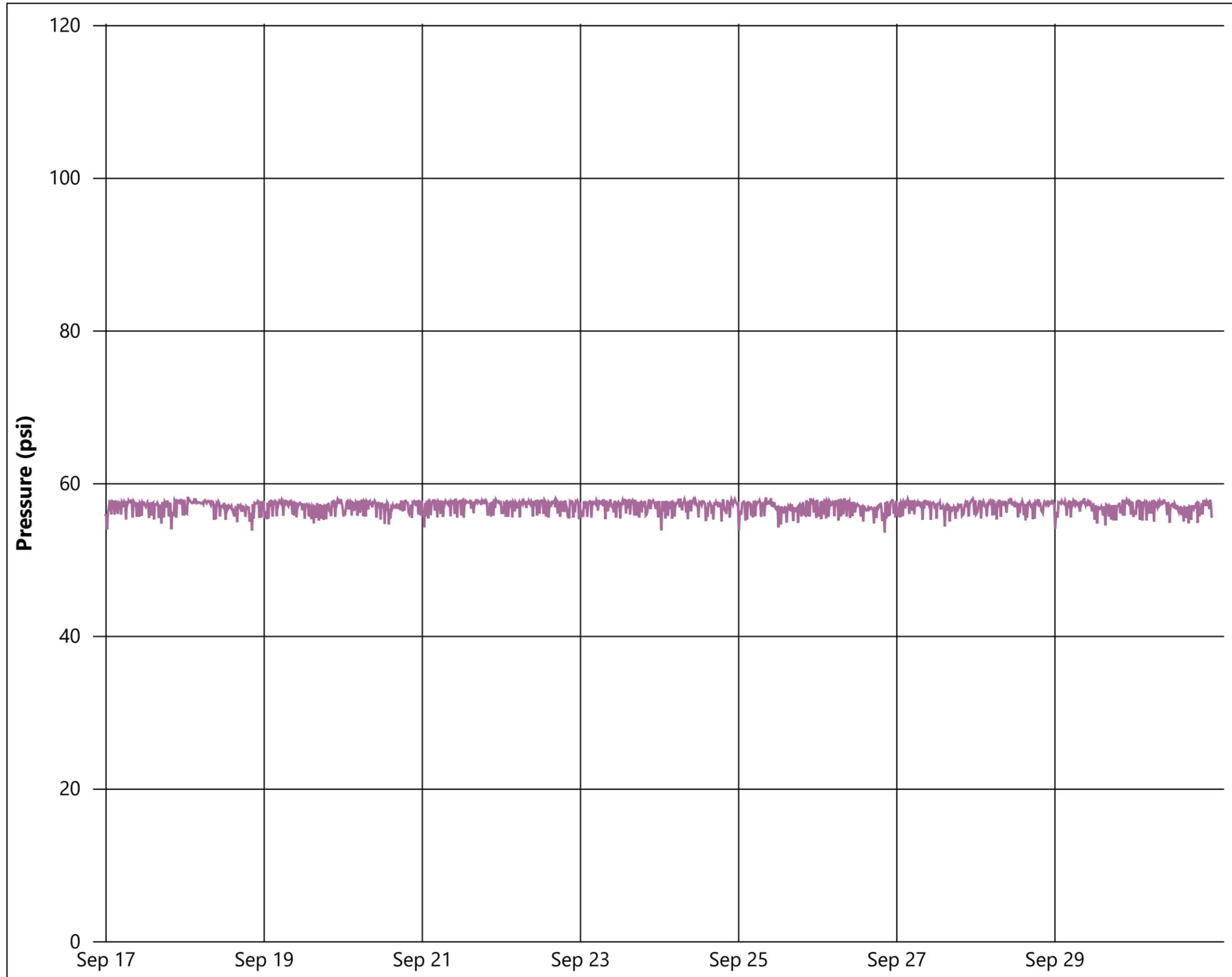
Pressure Zone
Zone 1 (535')

Statistics
Min: 68 psi
Max: 71 psi
Avg: 70 psi

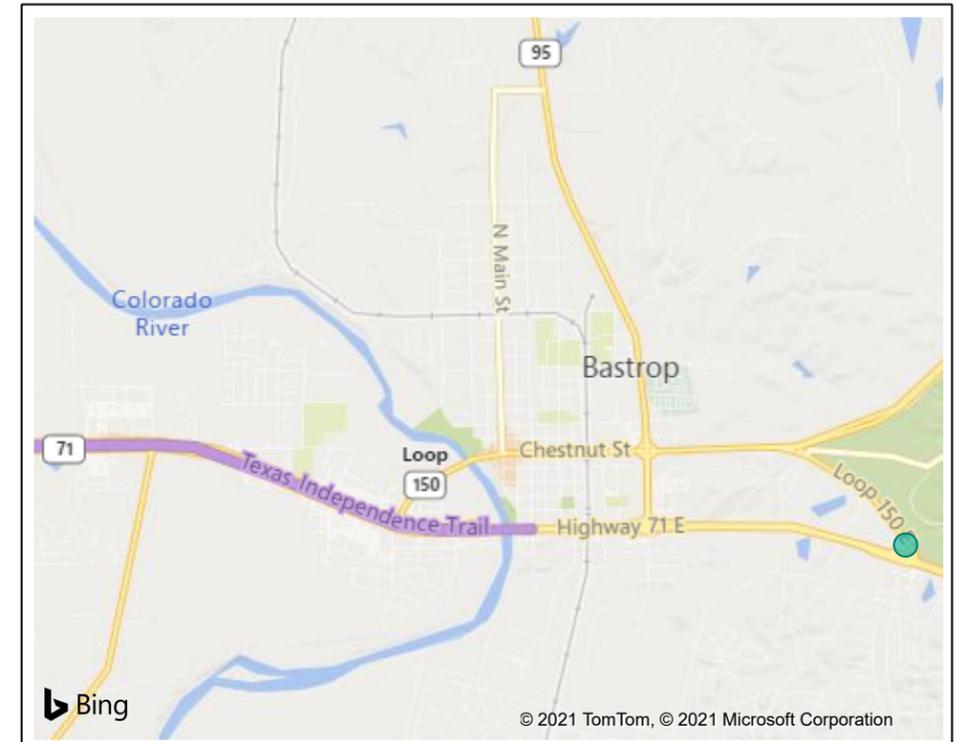
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Figure A-12
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 8



Address
Tahitian Dr and SH-150 (Exxon/Circle K)



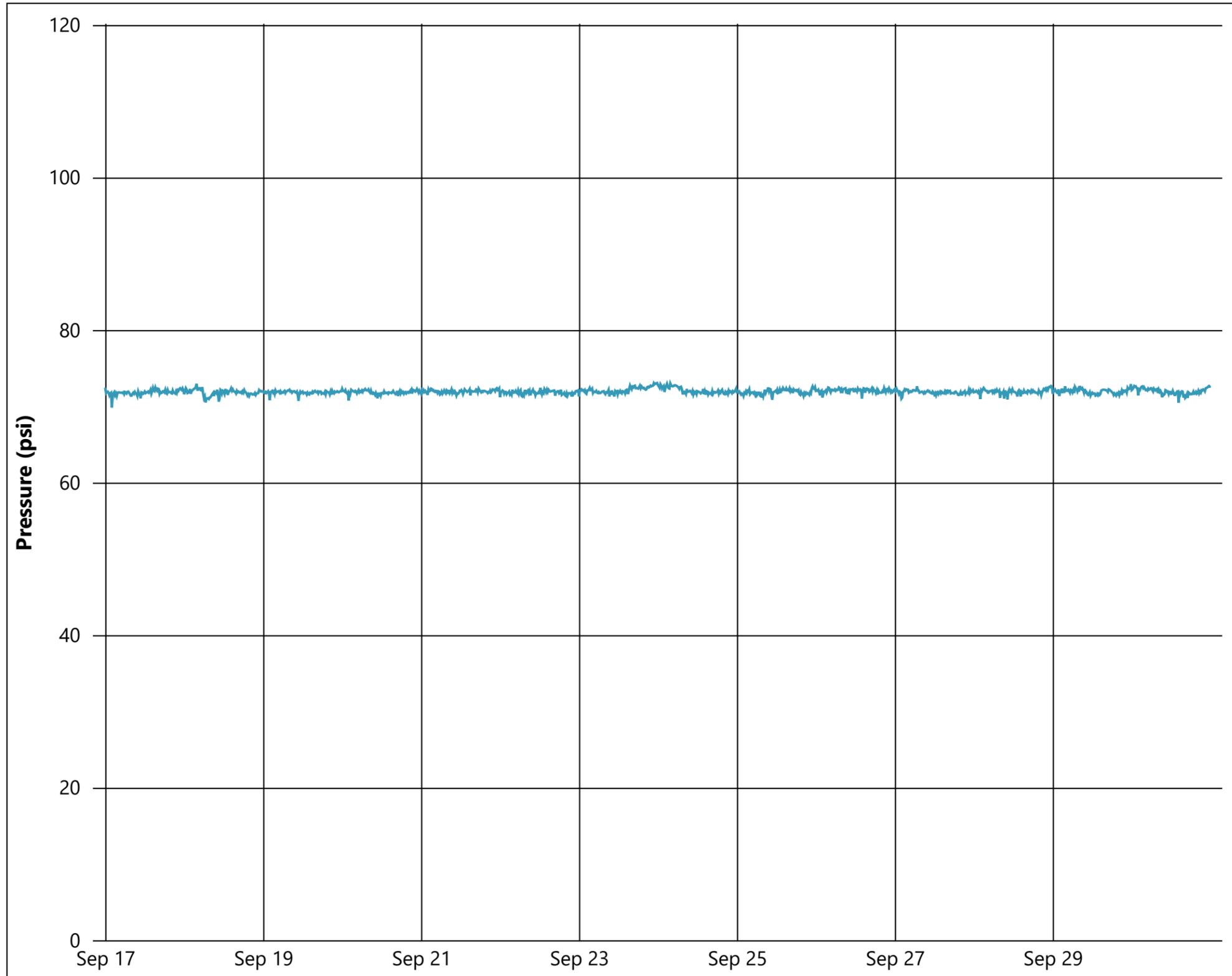
Pressure Zone
Zone 2 (655')

Statistics
Min: 54 psi
Max: 58 psi
Avg: 57 psi

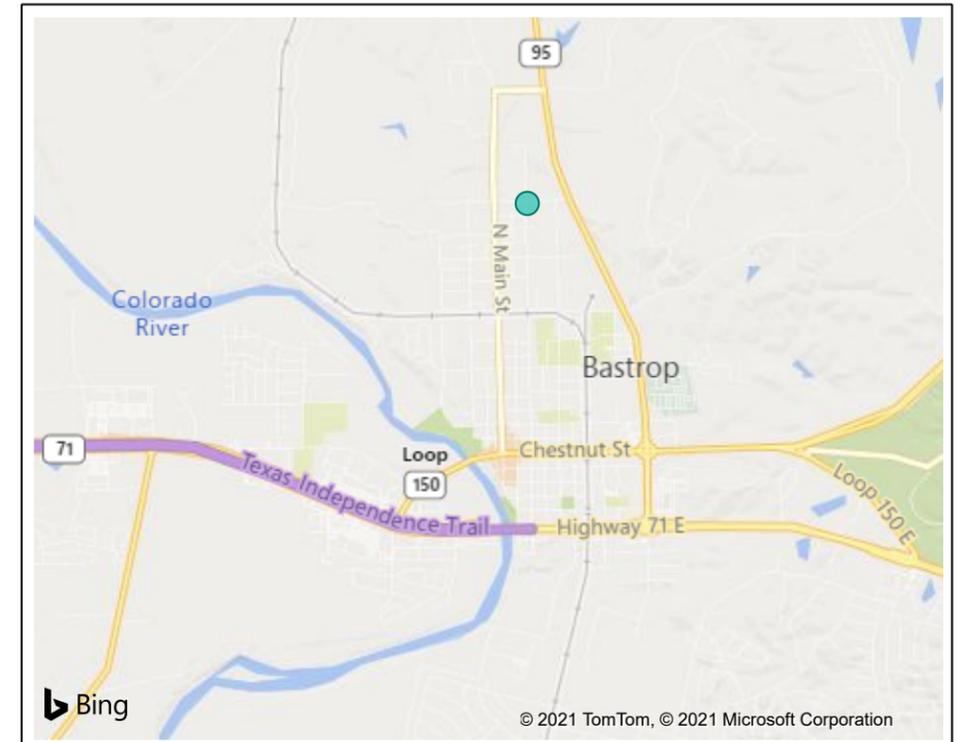
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Figure A-13
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 9



Address
Mesquite St and Pecan St



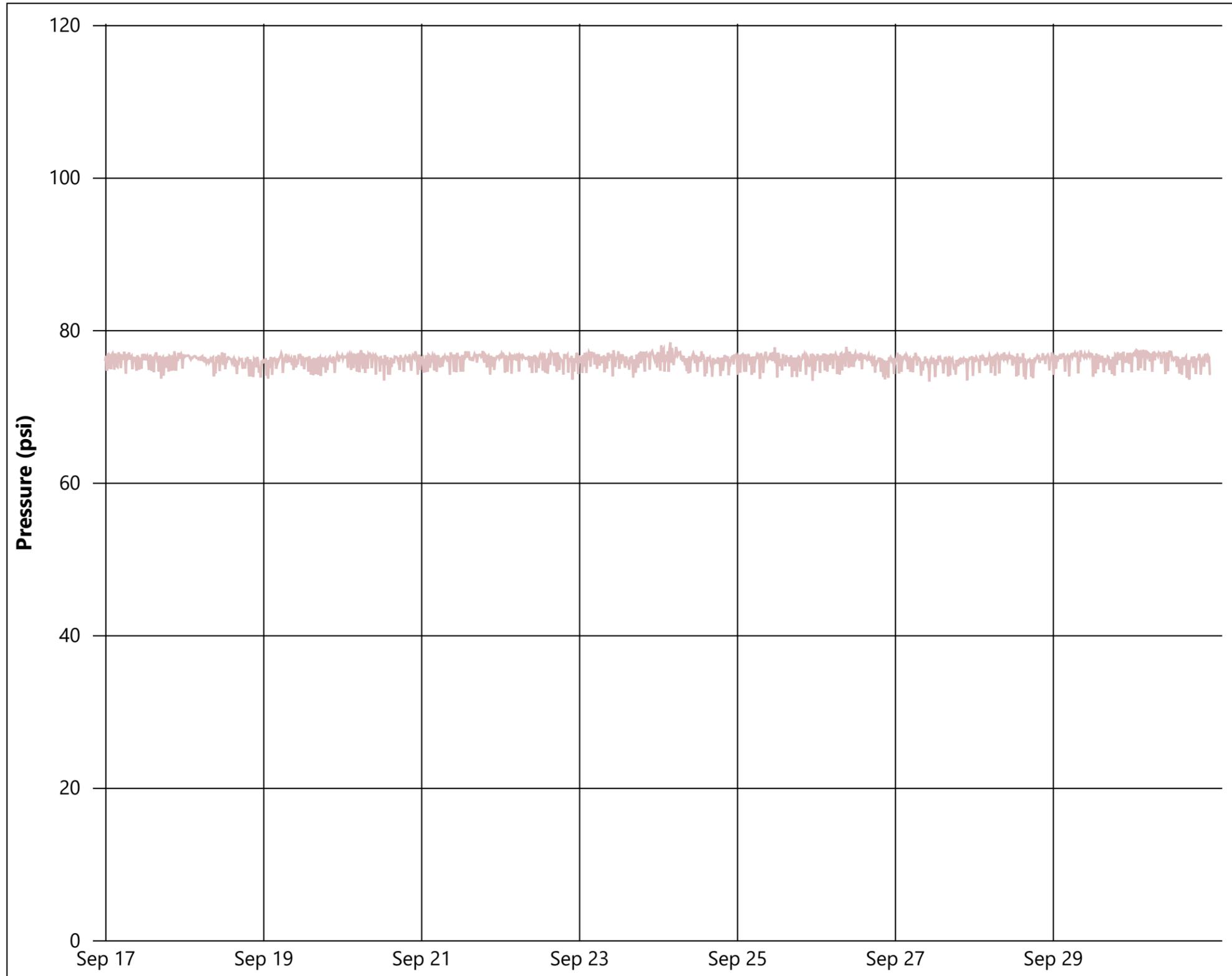
Pressure Zone
Zone 1 (535')

Statistics
Min: 70 psi
Max: 73 psi
Avg: 72 psi

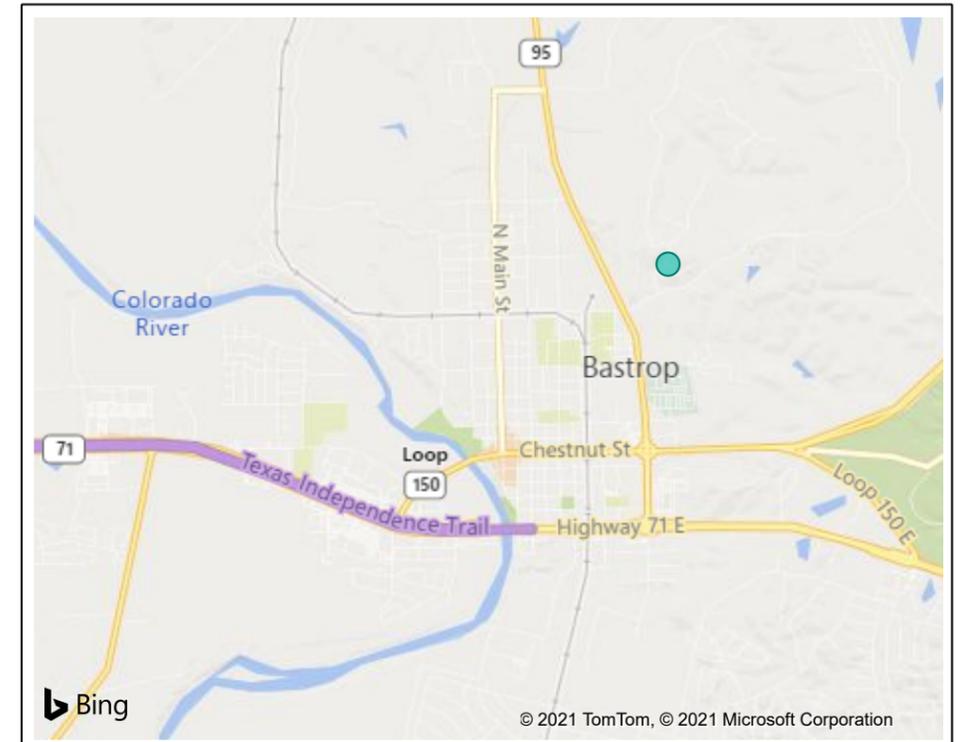
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Figure A-14
City of Bastrop
Field Pressure Testing Results
Pressure Recorder: 10



Address
Post Oak Rim and Piney Ridge Dr



Pressure Zone
Zone 2 (655')

Statistics
Min: 73 psi
Max: 78 psi
Avg: 76 psi

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APPENDIX B:
CIP Cost Estimate Project Sheets

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 1 Phase: Short-term

Project Name: 1.25 MG Willow Zone 1 Ground Storage Tank

Project Description:

This project includes construction of a new 1.25 MG GST at the Willow site.

Project Driver:

This project is triggered by the poor condition of the existing ground storage tank.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.25 MG Ground Storage Tank	1	LS	\$ 2,200,000	\$ 2,200,000
				SUBTOTAL:	\$ 2,200,000
MOBILIZATION				5%	\$ 110,000
				SUBTOTAL:	\$ 2,310,000
CONTINGENCY				30%	\$ 693,000
				SUBTOTAL:	\$ 3,003,000
ENG/SURVEY				18%	\$ 540,600
				SUBTOTAL:	\$ 3,543,600
Estimated Project Total:					\$ 3,543,600

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: **2** Phase: **Short-term**

Project Name: **Decommission Willow Zone 1 Ground Storage Tank**

Project Description:

This project decommissions the existing 0.5 MG GST due to poor condition.

Project Driver:

This project is triggered by the poor condition of the existing ground storage tank.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Decommission Ground Storage Tank	1	LS	\$ 275,000	\$ 275,000
				SUBTOTAL:	\$ 275,000
MOBILIZATION				5%	\$ 13,800
				SUBTOTAL:	\$ 288,800
CONTINGENCY				30%	\$ 86,700
				SUBTOTAL:	\$ 375,500
ENG/SURVEY				18%	\$ 67,600
				SUBTOTAL:	\$ 443,100
Estimated Project Total:					\$ 443,100

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: **3** Phase: **Short-term**

Project Name: **1.25 MG Willow Zone 2 Ground Storage Tank**

Project Description:

This project includes construction of a new 1.25 MG GST at the Willow site.

Project Driver:

This project is triggered by the poor condition of the existing ground storage tank.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.25 MG Ground Storage Tank	1	LS	\$ 2,200,000	\$ 2,200,000
				SUBTOTAL:	\$ 2,200,000
		MOBILIZATION		5%	\$ 110,000
				SUBTOTAL:	\$ 2,310,000
		CONTINGENCY		30%	\$ 693,000
				SUBTOTAL:	\$ 3,003,000
		ENG/SURVEY		18%	\$ 540,600
				SUBTOTAL:	\$ 3,543,600
Estimated Project Total:					\$ 3,543,600

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 4 Phase: Short-term

Project Name: Decommission Willow Zone 2 Ground Storage Tank

Project Description:

This project decommissions the existing 0.5 MG GST due to poor condition.

Project Driver:

This project is triggered by the poor condition of the existing ground storage tank.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Decommission Ground Storage Tank	1	LS	\$ 275,000	\$ 275,000
				SUBTOTAL:	\$ 275,000
		MOBILIZATION		5%	\$ 13,800
				SUBTOTAL:	\$ 288,800
		CONTINGENCY		30%	\$ 86,700
				SUBTOTAL:	\$ 375,500
		ENG/SURVEY		18%	\$ 67,600
				SUBTOTAL:	\$ 443,100
Estimated Project Total:					\$ 443,100

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 5 Phase: Short-term

Project Name: Willow Zone 1 Pump Station Expansion

Project Description:

This project involves an expansion of the Willow Zone 1 Pump Station firm capacity to 4.2 MGD by replacing the three existing pumps.

Project Driver:

This project is proposed to provide additional pumping capacity to meet recommended pumping criteria in Pressure Zone 1.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Pump Station - Expans 2.3 MGD (Willow)	1	LS	\$ 3,000,000	\$ 3,000,000
				SUBTOTAL:	\$ 3,000,000
		MOBILIZATION		5%	\$ 150,000
				SUBTOTAL:	\$ 3,150,000
		CONTINGENCY		30%	\$ 945,000
				SUBTOTAL:	\$ 4,095,000
		ENG/SURVEY		18%	\$ 737,100
				SUBTOTAL:	\$ 4,832,100
Estimated Project Total:					\$ 4,832,100

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 6 Phase: Short-term

Project Name: 16/12-inch Blakey Lane Water Line

Project Description:

This project involves the construction of a new 16-inch water line, connecting to the existing 12-inch water line along Blakey Lane and the existing 16-inch water line along SH 71. It also involves the construction of a new 12-inch water line, connecting to the existing 12-inch water lines along Blair Avenue and Blakey Lane.

Project Driver:

This project is proposed to serve customers in the western portion of Pressure Zone 1, connect to the proposed Zone 1 Elevated Storage Tank, and to increase system efficiency and reliability.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16" WL & Appurtenances - by Open Cut	4,600	LF	\$ 240	\$ 1,104,000
2	16" WL - by Bore with Steel Casing	500	LF	\$ 640	\$ 320,000
3	12" WL & Appurtenances - by Open Cut	2,900	LF	\$ 180	\$ 522,000
4	Pavement Repair	7,500	LF	\$ 75	\$ 562,500
				SUBTOTAL:	\$ 2,508,500
				MOBILIZATION	5%
					\$ 125,500
				SUBTOTAL:	\$ 2,634,000
				CONTINGENCY	30%
					\$ 790,200
				SUBTOTAL:	\$ 3,424,200
				ENG/SURVEY	18%
					\$ 616,400
				SUBTOTAL:	\$ 4,040,600
Estimated Project Total:					\$ 4,040,600

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 7 Phase: Short-term

Project Name: 1.0 MG Blakey Elevated Storage Tank

Project Description:

This project includes construction of a new 1.0 MG elevated storage tank and 20-inch water line to connect to the existing water system. The new tank will be constructed at the southeast corner of Blakey Lane and FM 969 with an overflow elevation of 530 feet. The tank will serve customers in Pressure Zone 1, once the proposed Pressure Zone 1 boundary change has taken place.

Project Driver:

This project is proposed to provide elevated storage for customers in Pressure Zone 1.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.0 MG Elevated Storage Tank	1	LS	\$ 5,000,000	\$ 5,000,000
2	20" WL & Appurtenances - by Open Cut	300	LF	\$ 300	\$ 90,000
3	Pavement Repair	300	LF	\$ 75	\$ 22,500
				SUBTOTAL:	\$ 5,112,500
MOBILIZATION				5%	\$ 255,700
				SUBTOTAL:	\$ 5,368,200
CONTINGENCY				30%	\$ 1,610,500
				SUBTOTAL:	\$ 6,978,700
ENG/SURVEY				18%	\$ 1,256,200
				SUBTOTAL:	\$ 8,234,900
Estimated Project Total:					\$ 8,234,900

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 8 **Phase:** Intermediate-term

Project Name: 24/20/16-inch Bob Bryant Transmission Lines

Project Description:

This project involves the construction of a 24-inch line connecting the Bob Bryant Pump station to the 24-inch transmission line from the Simsboro Aquifer WTP. It also involves the construction of 20/16-inch water lines downstream of the Bob Bryant Pump Station and along Charles Boulevard and Schaefer Boulevard.

Project Driver:

This project is proposed to increase the transmission capacity of the Bob Bryant Pump Station to serve growth.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24" WL & Appurtenances - by Open Cut	4,100	LF	\$ 360	\$ 1,476,000
2	24" WL - by Bore with Steel Casing	500	LF	\$ 960	\$ 480,000
3	20" WL & Appurtenances - by Open Cut	2,500	LF	\$ 300	\$ 750,000
4	16" WL & Appurtenances - by Open Cut	2,300	LF	\$ 240	\$ 552,000
5	Pavement Repair	4,800	LF	\$ 75	\$ 360,000
SUBTOTAL:					\$ 3,618,000
MOBILIZATION				5%	\$ 180,900
SUBTOTAL:					\$ 3,798,900
CONTINGENCY				30%	\$ 1,139,700
SUBTOTAL:					\$ 4,938,600
ENG/SURVEY				18%	\$ 889,000
SUBTOTAL:					\$ 5,827,600
Estimated Project Total:					\$ 5,827,600

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 9 **Phase:** Intermediate-term

Project Name: Move Pressure Zone 1 Boundary

Project Description:

This project involves moving the boundary of Pressure Zone 1 to the west by opening the valves along Old Austin Highway, Eskew Street, and SH 71. Pressure Zone 1 would then include downtown and all of the area currently served by Pressure Zone 3 with the exception of the areas west of FM 969.

Project Driver:

This project is proposed to improve system efficiency and to serve growth in Pressure Zones 1 and 3 while continuing to meet recommended system design criteria.

Itemized Cost Estimate

This project will be carried out by City Staff. A cost estimate was not prepared.

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: **10** Phase: **Short-term**

Project Name: **20/16/12-inch Downtown Water Lines**

Project Description:

This project involves the construction of 20/16/12-inch water lines in the downtown area of Pressure Zone 1. The proposed 20-inch water line will replace the existing 10-inch water line connecting the Willow Zone 1 Pump Station to the existing 8-inch water line along Willow Street. The proposed 16-inch water line will replace the existing 12-inch water line crossing the Colorado River, with the exception of the existing 16-inch section. The proposed 12-inch water line will replace the existing 8/6-inch water lines along Willow and Cedar Streets. It will continue south along Chambers Street to Chestnut Street, replacing the existing 8-inch water lines. It will then replace the existing 6-inch water line along Martin Luther King Drive and connect to the existing 16-inch water line on the north side of SH 71.

Project Driver:

This project is proposed to increase transmission and distribution capacity in the downtown area of Pressure Zone 1.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	20" WL & Appurtenances - by Open Cut	100	LF	\$ 300	\$ 30,000
2	16" WL & Appurtenances - by Open Cut	3,700	LF	\$ 240	\$ 888,000
3	12" WL & Appurtenances - by Open Cut	10,600	LF	\$ 180	\$ 1,908,000
4	Pavement Repair	14,300	LF	\$ 75	\$ 1,072,500
				SUBTOTAL:	\$ 3,898,500
				MOBILIZATION	5%
					\$ 195,000
				SUBTOTAL:	\$ 4,093,500
				CONTINGENCY	30%
					\$ 1,228,100
				SUBTOTAL:	\$ 5,321,600
				ENG/SURVEY	18%
					\$ 957,900
				SUBTOTAL:	\$ 6,279,500
Estimated Project Total:					\$ 6,279,500

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 11 Phase: Short-term

Project Name: 12/8-inch Chestnut Street Water Lines

Project Description:

This project involves the construction of a 12-inch water line along Chestnut Street that replaces the existing 10-inch water line along Chestnut Street and an 8-inch water line along Farm and Pitt Streets that replaces a 2-inch water line.

Project Driver:

This project is proposed to increase transmission capacity to and from the FM 150 Ground Storage Tank.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	4,100	LF	\$ 180	\$ 738,000
2	8" WL & Appurtenances - by Open Cut	2,400	LF	\$ 120	\$ 288,000
3	Pavement Repair	6,500	LF	\$ 75	\$ 487,500
				SUBTOTAL:	\$ 1,513,500
MOBILIZATION				5%	\$ 75,700
				SUBTOTAL:	\$ 1,589,200
CONTINGENCY				30%	\$ 476,800
				SUBTOTAL:	\$ 2,066,000
ENG/SURVEY				18%	\$ 371,900
				SUBTOTAL:	\$ 2,437,900
Estimated Project Total:					\$ 2,437,900

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 12 Phase: Short-term

Project Name: 12-inch Chambers Street Water Line

Project Description:

This project involves the construction of a 12-inch water line that replaces the existing 10-inch water line along Chambers Street.

Project Driver:

This project is proposed to increase transmission capacity to Pressure Zone 2 from the Willow Zone 2 Pump Station.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	4,000	LF	\$ 180	\$ 720,000
2	Pavement Repair	4,000	LF	\$ 75	\$ 300,000
				SUBTOTAL:	\$ 1,020,000
MOBILIZATION				5%	\$ 51,000
				SUBTOTAL:	\$ 1,071,000
CONTINGENCY				30%	\$ 321,300
				SUBTOTAL:	\$ 1,392,300
ENG/SURVEY				18%	\$ 250,700
				SUBTOTAL:	\$ 1,643,000
Estimated Project Total:					\$ 1,643,000

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 13 Phase: Short-term

Project Name: 12-inch Driftwood Lane Water Line

Project Description:

This project involves the construction of a new 12-inch water line along Driftwood Lane, connecting to the existing 12-inch water lines along Hasler Boulevard and South Eskew.

Project Driver:

This project is proposed to increase reliability for the water system and provide redundancy for water customers in the event of an emergency.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	5,300	LF	\$ 180	\$ 954,000
2	Pavement Repair	5,300	LF	\$ 75	\$ 397,500
				SUBTOTAL:	\$ 1,351,500
MOBILIZATION				5%	\$ 67,600
				SUBTOTAL:	\$ 1,419,100
CONTINGENCY				30%	\$ 425,800
				SUBTOTAL:	\$ 1,844,900
ENG/SURVEY				18%	\$ 332,100
				SUBTOTAL:	\$ 2,177,000
Estimated Project Total:					\$ 2,177,000

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 14 Phase: Short-term

Project Name: 12/8-inch Lost Pines Ave Water Lines

Project Description:

This project involves the construction of 12/8-inch water lines connecting to the existing 12-inch water lines along SH 71 and the existing 6-inch water line along Lost Pines Ave.

Project Driver:

This project is proposed to to increase system efficiency and reliability in Pressure Zone 2.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	3,100	LF	\$ 180	\$ 558,000
2	8" WL & Appurtenances - by Open Cut	900	LF	\$ 120	\$ 108,000
				SUBTOTAL:	\$ 666,000
MOBILIZATION				5%	\$ 33,300
				SUBTOTAL:	\$ 699,300
CONTINGENCY				30%	\$ 209,800
				SUBTOTAL:	\$ 909,100
ENG/SURVEY				18%	\$ 163,700
				SUBTOTAL:	\$ 1,072,800
Estimated Project Total:					\$ 1,072,800

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 15 **Phase:** Short-term

Project Name: 16-inch Valverde Water Line

Project Description:

This project involves construction of a new 16-inch water line, connecting to the existing 16-inch water line along SH 71 and continuing north and west through the proposed Valverde development.

Project Driver:

This project is proposed to serve customers in the Valverde development.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16" WL & Appurtenances - by Open Cut	9,200	LF	\$ 240	\$ 2,208,000
2	16" WL - by Bore with Steel Casing	500	LF	\$ 640	\$ 320,000
				SUBTOTAL:	\$ 2,528,000
MOBILIZATION				5%	\$ 126,400
				SUBTOTAL:	\$ 2,654,400
CONTINGENCY				30%	\$ 796,400
				SUBTOTAL:	\$ 3,450,800
ENG/SURVEY				18%	\$ 621,200
				SUBTOTAL:	\$ 4,072,000
Estimated Project Total:					\$ 4,072,000

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 16 **Phase:** Short-term

Project Name: 16-inch West Bastrop Village Water Line

Project Description:

This project involves construction of a new 16-inch water line, connecting to the existing 16-inch water line along FM 20 and continuing south and west through the proposed West Bastrop Village development.

Project Driver:

This project is proposed to serve customers in the West Bastrop Village development.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16" WL & Appurtenances - by Open Cut	6,800	LF	\$ 240	\$ 1,632,000
SUBTOTAL:					\$ 1,632,000
				MOBILIZATION	5%
					\$ 81,600
SUBTOTAL:					\$ 1,713,600
				CONTINGENCY	30%
					\$ 514,100
SUBTOTAL:					\$ 2,227,700
				ENG/SURVEY	18%
					\$ 401,000
SUBTOTAL:					\$ 2,628,700
Estimated Project Total:					\$ 2,628,700

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 17 Phase: Short-term

Project Name: 16-inch SH 71 Water Line

Project Description:

This project involves the construction of a new 16-inch water line that connects proposed 16-inch water lines in the Valverde and West Bastrop Village developments. It also connects to the existing 16-inch water line along SH 71.

Project Driver:

This project is proposed to improve system connectivity and reliability.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16" WL & Appurtenances - by Open Cut	8,200	LF	\$ 240	\$ 1,968,000
2	16" WL - by Bore with Steel Casing	500	LF	\$ 640	\$ 320,000
3	Pavement Repair	3,800	LF	\$ 75	\$ 285,000
				SUBTOTAL:	\$ 2,573,000
MOBILIZATION				5%	\$ 128,700
				SUBTOTAL:	\$ 2,701,700
CONTINGENCY				30%	\$ 810,600
				SUBTOTAL:	\$ 3,512,300
ENG/SURVEY				18%	\$ 632,300
				SUBTOTAL:	\$ 4,144,600
Estimated Project Total:					\$ 4,144,600

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 18 **Phase:** Short-term

Project Name: 12-inch Lovers Lane Water Line

Project Description:

This project involves the construction of a new 12-inch water line, connecting to the existing 8-inch water line along Lovers Lane.

Project Driver:

This project is proposed to serve customers in the southern portion of the City.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL	
1	12" WL & Appurtenances - by Open Cut	14,800	LF	\$ 180	\$ 2,664,000	
SUBTOTAL:					\$ 2,664,000	
				MOBILIZATION	5%	\$ 133,200
SUBTOTAL:					\$ 2,797,200	
				CONTINGENCY	30%	\$ 839,200
SUBTOTAL:					\$ 3,636,400	
				ENG/SURVEY	18%	\$ 654,600
SUBTOTAL:					\$ 4,291,000	
Estimated Project Total:					\$ 4,291,000	

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 19 Phase: Short-term

Project Name: 16/12-inch SH 304 Water Lines

Project Description:

This project involves the construction of new 16/12-inch water lines, connecting to the existing 12-inch water line along SH 304. The new 12-inch water line is connecting two existing sections of 12-inch line.

Project Driver:

This project is proposed to serve customers in the southern portion of the City and to increase system efficiency and reliability.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	16" WL & Appurtenances - by Open Cut	8,400	LF	\$ 240	\$ 2,016,000
2	12" WL & Appurtenances - by Open Cut	500	LF	\$ 180	\$ 90,000
3	Pavement Repair	1,100	LF	\$ 75	\$ 82,500
				SUBTOTAL:	\$ 2,188,500
MOBILIZATION				5%	\$ 109,500
				SUBTOTAL:	\$ 2,298,000
CONTINGENCY				30%	\$ 689,400
				SUBTOTAL:	\$ 2,987,400
ENG/SURVEY				18%	\$ 537,800
				SUBTOTAL:	\$ 3,525,200
Estimated Project Total:					\$ 3,525,200

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 20 Phase: Short-term

Project Name: 12-inch Movie Studio Water Line

Project Description:

This project involves the construction of a new 12-inch water line that connects proposed 16-inch water lines.

Project Driver:

This project is proposed to improve system connectivity and reliability.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	7,100	LF	\$ 180	\$ 1,278,000
2	12" WL - by Bore with Steel Casing	500	LF	\$ 480	\$ 240,000
				SUBTOTAL:	\$ 1,518,000
MOBILIZATION				5%	\$ 75,900
				SUBTOTAL:	\$ 1,593,900
CONTINGENCY				30%	\$ 478,200
				SUBTOTAL:	\$ 2,072,100
ENG/SURVEY				18%	\$ 373,000
				SUBTOTAL:	\$ 2,445,100
Estimated Project Total:					\$ 2,445,100

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 21 **Phase:** Short-term

Project Name: 12-inch Mauna Loa Lane Water Line

Project Description:

This project involves the construction of a new 12-inch water line along Mauna Loa Lane, connecting to the existing 12-inch water line along Jackson Street and the existing 8-inch water line along Tahitian Drive.

Project Driver:

This project is proposed to serve customers in the southern portion of Pressure Zone 2 and to increase system efficiency and reliability.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	12" WL & Appurtenances - by Open Cut	10,600	LF	\$ 180	\$ 1,908,000
2	Pavement Repair	1,600	LF	\$ 75	\$ 120,000
3	Pressure Reducing Valve	1	LS	\$ 150,000	\$ 150,000
				SUBTOTAL:	\$ 2,178,000
MOBILIZATION				5%	\$ 108,900
				SUBTOTAL:	\$ 2,286,900
CONTINGENCY				30%	\$ 686,100
				SUBTOTAL:	\$ 2,973,000
ENG/SURVEY				18%	\$ 535,200
				SUBTOTAL:	\$ 3,508,200
Estimated Project Total:					\$ 3,508,200

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: **22** Phase: **Intermediate**

Project Name: **4.0 MGD Simsboro Water Treatment Plant Expansion**

Project Description:

This project involves expanding the production capacity of the Simsboro Aquifer WTP to 10.0 MGD.

Project Driver:

This project is proposed to meet recommended production capacity requirements and provide additional capacity to serve growth.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	4.0 MGD WTP Expansion	1	LS	\$ 5,000,000	\$ 5,000,000
				SUBTOTAL:	\$ 5,000,000
	MOBILIZATION			5%	\$ 250,000
				SUBTOTAL:	\$ 5,250,000
	CONTINGENCY			30%	\$ 1,575,000
				SUBTOTAL:	\$ 6,825,000
	ENG/SURVEY			18%	\$ 1,228,500
				SUBTOTAL:	\$ 8,053,500
Estimated Project Total:					\$ 8,053,500

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 23 **Phase:** Intermediate

Project Name: 24-inch WTP Secondary Transmission Line

Project Description:

This project involves the construction of a 24-inch water line from the Simsboro Aquifer Water Treatment Plant, connecting to a 24-inch water line along Carter Street that is currently under design.

Project Driver:

This project is proposed to provide redundancy for water customers in the event of an emergency.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	24" WL & Appurtenances - by Open Cut	11,300	LF	\$ 360	\$ 4,068,000
2	Pavement Repair	1,100	LF	\$ 75	\$ 82,500
				SUBTOTAL:	\$ 4,150,500
MOBILIZATION				5%	\$ 207,600
				SUBTOTAL:	\$ 4,358,100
CONTINGENCY				30%	\$ 1,307,500
				SUBTOTAL:	\$ 5,665,600
ENG/SURVEY				18%	\$ 1,019,900
				SUBTOTAL:	\$ 6,685,500
Estimated Project Total:					\$ 6,685,500

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: **24** Phase: **Intermediate**

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

Project Description:

This project includes construction of a new 1.0 MG elevated storage tank and 20-inch water line to connect to the existing water system. The new tank will be constructed at the northwest corner of the Valverde development with an overflow elevation of 655 feet. The tank will serve customers in Pressure Zone 3.

Project Driver:

This project is proposed to provide elevated storage for customers in Pressure Zone 3.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	1.0 MG Elevated Storage Tank	1	LS	\$ 5,000,000	\$ 5,000,000
2	20" WL & Appurtenances - by Open Cut	900	LF	\$ 300	\$ 270,000
				SUBTOTAL:	\$ 5,270,000
MOBILIZATION				5%	\$ 263,500
				SUBTOTAL:	\$ 5,533,500
CONTINGENCY				30%	\$ 1,660,100
				SUBTOTAL:	\$ 7,193,600
ENG/SURVEY				18%	\$ 1,294,900
				SUBTOTAL:	\$ 8,488,500
Estimated Project Total:					\$ 8,488,500

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 25 Phase: Intermediate

Project Name: Decommission FM 20 Elevated Storage Tank

Project Description:

This project involves the decommissioning of the 0.25 MG FM 20 Elevated Storage Tank.

Project Driver:

This project is proposed to optimize system operations once the new Zone 3 Elevated Storage Tank is online.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Decommission Elevated Storage Tank	1	LS	\$ 275,000	\$ 275,000
				SUBTOTAL:	\$ 275,000
				MOBILIZATION	5%
					\$ 13,800
				SUBTOTAL:	\$ 288,800
				CONTINGENCY	30%
					\$ 86,700
				SUBTOTAL:	\$ 375,500
				ENG/SURVEY	18%
					\$ 67,600
				SUBTOTAL:	\$ 443,100
Estimated Project Total:					\$ 443,100

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 26 Phase: Intermediate

Project Name: 0.5 MG FM 150 Ground Storage Tank

Project Description:

This project involves the construction of a new 0.5 MG ground storage tank at the FM 150 Pump Station.

Project Driver:

This project is proposed to meet ground storage requirements at the FM 150 Pump Station once the existing standpipe has been decommissioned.

Itemized Cost Estimate					
ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	0.5 MG Ground Storage Tank	1	LS	\$ 1,500,000	\$ 1,500,000
				SUBTOTAL:	\$ 1,500,000
		MOBILIZATION		5%	\$ 75,000
				SUBTOTAL:	\$ 1,575,000
		CONTINGENCY		30%	\$ 472,500
				SUBTOTAL:	\$ 2,047,500
		ENG/SURVEY		18%	\$ 368,600
				SUBTOTAL:	\$ 2,416,100
Estimated Project Total:					\$ 2,416,100

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 27 **Phase:** Intermediate

Project Name: Decommission FM 150 Standpipe

Project Description:

This project involves the decommissioning of the 1.0 MG FM 150 standpipe.

Project Driver:

This project is proposed to improve water quality in the water system and increase operational efficiency once the standpipe has reached the end of its expected service life.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Decommission Standpipe	1	LS	\$ 275,000	\$ 275,000
				SUBTOTAL:	\$ 275,000
		MOBILIZATION		5%	\$ 13,800
				SUBTOTAL:	\$ 288,800
		CONTINGENCY		30%	\$ 86,700
				SUBTOTAL:	\$ 375,500
		ENG/SURVEY		18%	\$ 67,600
				SUBTOTAL:	\$ 443,100
Estimated Project Total:					\$ 443,100

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 28 Phase: Long-Term

Project Name: Bob Bryant Pump Station Expansion to 4.2 MGD

Project Description:

This project involves an expansion of the Bob Bryant Pump Station firm capacity to 4.2 MGD by adding a third pump. This project also includes the construction of a new 0.50 MG GST.

Project Driver:

This project is proposed to provide additional pumping capacity to serve growth in Pressure Zone 1.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Pump Station - Expans 2.2 MGD	1	LS	\$ 250,000	\$ 250,000
2	0.5 MG Ground Storage Tank	1	LS	\$ 1,500,000	\$ 1,500,000
				SUBTOTAL:	\$ 1,750,000
MOBILIZATION				5%	\$ 87,500
				SUBTOTAL:	\$ 1,837,500
CONTINGENCY				30%	\$ 551,300
				SUBTOTAL:	\$ 2,388,800
ENG/SURVEY				18%	\$ 430,000
				SUBTOTAL:	\$ 2,818,800
Estimated Project Total:					\$ 2,818,800

Bastrop Water Master Plan

DRAFT Capital Improvement Plan Cost Estimate

May 2022

Project Number: 29 Phase: Long-Term

Project Name: FM 20 Pump Station Expansion to 4.5 MGD

Project Description:

This project involves an expansion of the FM 20 Pump Station firm capacity to 4.5 MGD by adding a third pump. This project also includes the construction of a new 0.50 MG GST.

Project Driver:

This project is proposed to provide additional pumping capacity to serve growth in Pressure Zone 3.

Itemized Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Pump Station - Expans 2.3 MGD (FM 20)	1	LS	\$ 250,000	\$ 250,000
2	0.5 MG Ground Storage Tank	1	LS	\$ 1,500,000	\$ 1,500,000
				SUBTOTAL:	\$ 1,750,000
MOBILIZATION				5%	\$ 87,500
				SUBTOTAL:	\$ 1,837,500
CONTINGENCY				30%	\$ 551,300
				SUBTOTAL:	\$ 2,388,800
ENG/SURVEY				18%	\$ 430,000
				SUBTOTAL:	\$ 2,818,800
Estimated Project Total:					\$ 2,818,800