Water and Wastewater Modeling and CIP Report

City of Celina, Texas

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Garver Project No.: 16088050

Engineer's Certification:

I hereby certify that this Water and Wastewater Modeling and CIP Report was prepared by Garver under my direct supervision for the City of Celina.

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Table of Contents

Engineer's Certification: 2
Table of Contents 3
List of Figures 8
List of Tables 9
List of Exhibits 11
List of Appendices 11
Glossary 12
1.0 Executive Summary 13
1.1 Population and Flow Projections 13
1.1.1 Population Projections 13
1.1.2 Flow Projections 13
1.2 Existing Facilities 14
1.2.1 Water Facilities 14
1.2.2 Sewer Facilities 14
1.3 Wastewater Flow Monitoring 15
1.4 Models 15
1.5 Water System CIP 15
1.6 Wastewater System CIP 18
2.0 Introduction 20
2.1 City Summary 20
2.2 Objectives 20
2.3 Acknowledgements 20
3.0 Population and Flow Projections 21
3.1 Population Trends 21
3.1.1 Historical Population Trends 21
3.1.2 Five Year Population Estimate 21
3.1.3 Buildout Population Projections 23
3.1.4 Population Projection Summary 26
3.2 Water Flow Projections 26
3.2.1 Current Demands 27
3.2.2 Flow Projection Design Criteria 28

3.2.3 Five Year Water Demand Projections 29
3.2.4 Ultimate Buildout Water Demand Projections 31
3.2.5 Conclusions 31
3.3 Wastewater Flow Projections 32
3.3.1 Current Flow 32
3.3.2 Flow Projection Design Criteria 33
3.3.3 Five Year Wastewater Flow Projections 33
3.3.4 Future Demand Projections 34
3.3.5 Conclusions 34
4.0 Existing Water System 35
4.1 Overview 35
4.2 Distribution System 35
4.3 Pump Stations 36
4.3.1 Celina Road Pump Station 36
4.3.2 Downtown Pump Station 37
4.3.3 Morgan Lake Pump Station 37
4.4 Storage Tanks 37
4.5 Groundwater Wells 38
4.6 Facility Assessment 38
5.0 Water Design Criteria 39
5.1 Site Security, Maintenance and Housekeeping 39
5.2 Flow, Pressure and Storage 39
5.2.1 Storage Evaluation 41
6.0 Water Model Development 43
6.1 Pipe Network 43
6.2 Elevated Storage Tanks 43
6.3 UTRWD Meter Station Connections 43
6.4 Ground Storage Tanks 43
6.5 Junction Elevations 44
6.6 Downtown PS 44
6.7 Celina Road PS 44
6.8 Morgan Lake PS 44
6.9 Pressure Zone Isolation Valves 44

6.10 Demands 45
6.10.1 Spatial Variability of Demand 45
6.10.2 Diurnal Demand Curves 45
6.10.3 Future Demand Allocation 46
6.11 Model Calibration 47
7.0 Water Model Results 48
7.1 Current Water Model Results 48
7.1.1 Average Day Analysis 48
7.1.2 Maximum Day Analysis 48
7.2 Methodology for Near-Term Evaluations 49
7.3 2017 Water Model Results 49
7.3.1 Average Day Analysis 49
7.3.2 Maximum Day Analysis 50
7.4 2022 Water Model Results 50
7.4.1 Average Day Analysis 50
7.4.2 Maximum Day Analysis 51
7.5 Future Water Improvements 51
8.0 Recommended Water Improvements 52
8.1 Project Identification and Ranking 52
8.1.1 Project Subgroupings 53
8.2 Water Restrictions 53
8.2.1 General 53
8.2.2 Existing Restrictions 53
8.2.3 Recommendations 54
8.3 Operations and Energy Efficiency Recommendations 56
8.3.1 Tank Mixing and Cycling 56
8.3.2 Water Age Versus Residual 56
8.4 Water Infrastructure Improvements 57
9.0 Existing Wastewater System 60
9.1 Overview 60
9.2 Downtown Wastewater Treatment Plant 60
9.3 Sanitary Sewer 61
9.4 Lift Stations 62

9.5 Flow Monitoring 64
9.5.1 Dry Weather Events, ... 66
9.5.2 Wet Weather Events 67
9.5.3 Conclusion 69
10.0 Wastewater Design Criteria 71
10.1 Site Security, Maintenance, and Housekeeping 71
10.2 Wastewater Lift Stations 71
10.2.1 TCEQ Requirements 71
10.3 Line Requirements 72
10.3.1 Line Sizing and Grades 72
10.4 Flow Projections 73
11.0 Wastewater Model Development 74
11.1 Manholes 74
11.2 Sewer Pipelines 74
11.3 Lift Stations 74
11.4 Connections to Downtown WWTP and UTRWD 74
11.5 Spatial Delineation of Flows 74
11.6 Dry Weather (Base) Flows 75
11.7 Wet Weather (RDII) Flows 75
11.7.1 Return Period Estimates for Flow Monitoring Period 75
11.7.2 Design Wet Weather Event and Flows 77
11.7.3 RDII Allocation 77
11.8 Future Load Allocation 77
12.0 Wastewater Model Results 78
12.1 Existing Pipe Slopes 78
12.2 2017 Wastewater Model Results 78
12.2.1 Dry Weather Analysis 78
12.2.2 Wet Weather Analysis 79
12.3 2018 Wastewater Model Results 79
12.3.1 Dry Weather Analysis 79
12.3.2 Wet Weather Analysis 79
12.4 2019 Wastewater Model Results 79
12.4.1 Dry Weather Analysis 79

12.4.2 Wet Weather Analysis 79
12.5 2020 Wastewater Model Results 80
12.5.1 Dry Weather Analysis 80
12.5.2 Wet Weather Analysis 80
12.6 2021 Wastewater Model Results 80
12.6.1 Dry Weather Analysis 80
12.6.2 Wet Weather Analysis 80
12.7 2022 Wastewater Model Results 80
12.7.1 Dry Weather Analysis 80
12.7.2 Wet Weather Analysis 80
12.8 Future Wastewater Improvements 80
12.8.1 Ultimate Buildout 80
12.8.2 WWTP Interceptor 81
12.9 Lift Station Gravity Bypass 81
12.9.1 Introduction 81
12.9.2 Old Celina Park LS 82
12.9.3 Parkside LS 82
12.9.4 Lucy's LS 82
12.9.5 Winn Road LS 82
12.9.6 Business 289 82
12.9.7 Shawnee Trail No. 1 83
12.9.8 Shawnee Trail No. 2 83
12.9.9 High Point 83
12.9.10 Carter Ranch Phase II 83
12.9.11 Willock Hils 83
13.0 Wastewater Treatment Expansion Evaluation Results 85
13.1 Overview 85
14.0 Recommended Wastewater Improvements 86
14.1 Project Identification and Ranking 86
14.1.1 Project Subgroupings 86
14.2 Wastewater Infrastructure Improvements 86
15.0 Conclusion 89
15.1 Recommendations 89

List of Figures

Figure 3-1: Population Growth 22
Figure 3-2: 2015 Master Plan and Revised CCN Boundaries for the City of Celina 24
Figure 3-3: Celina Future Land Use Map 25
Figure 3-4: Historic Water Demand 27
Figure 3-5: Historic Water Production 28
Figure 3-6: Historical and Future Average Water Demand 31
Figure 3-7: Monthly Operating Report Data 32
Figure 4-1: Pump Stations 36
Figure 4-2: Storage Tanks 37
Figure 6-1: Existing (2016) Diurnal Curves 46
Figure 8-1: Existing Maximum Day Diurnal Curve 55
Figure 9-1: Downtown WWTP 61
Figure 9-2: Flow Meter Schematic Diagram 65
Figure 9-3: Wet Weather Flow at Meter Site 006 67
Figure 9-4: RDII Priority Ranking of Meter Basins 68
Figure 9-5: Peak Flow Rates-Dry Weather vs Wet Weather Comparison 69

List of Tables

Table 1-1: Projection of Population Growth 13
Table 1-2: Average Demand Projections 13
Table 1-3: Water Facilities 14
Table 1-4: Sewer Facilities 14
Table 1-5: Summary of Proposed Water CIP 16
Table 1-6: Water CIP – Project Subgroupings 17
Table 1-7: Summary of Proposed Wastewater Capital Improvements 18
Table 1-8: Wastewater CIP – Project Subgroupings 19
Table 3-1: Historical Population and Growth Rate 21
Table 3-2: City-Identified Short Term Population Growth 22
Table 3-3: 2015 Water and Wastewater Master Plan Population Projections 23
Table 3-4: City of Celina Population Growth Based on Land Use Classification 26
Table 3-5: Population Projection 26
Table 3-6: Summary of Historical Demands 28
Table 3-7: Ultimate Buildout Projections by Source 29
Table 3-8: Five Year Water Demand Projections 30
Table 3-9: Ultimate Buildout Water Demand Projections 31
Table 3-10: Summary of Water Demand Projections 32
Table 3-11: Sewer Flow Projections by Source 33
Table 3-12: Five Year Wastewater Demand Projections 33
Table 3-13: Ultimate Buildout Wastewater Demand Projections 34
Table 3-14: Summary of Wastewater Demand Projections 34
Table 4-1: Distribution System Pipeline Inventory 35
Table 4-2: Summary of Storage Tanks 38
Table 5-1: Water System Design Criteria Summary 40
Table 5-2: Water System Design Criteria Summary (Continued) 41
Table 5-3: Existing Connections by Pressure Plane 41
Table 5-4: Updated Connections by Pressure Plane 42
Table 5-5: Summary of Storage Requirements for Pressure Planes 42
Table 6-1: Elevated Tank Elevations 43
Table 6-2: Ground Storage Tank Elevations 44

Table 8-1: UTRWD Stage Restrictions 54
Table 8-2: Water Capital Improvements Summary 58
Table 8-3: Water CIP – Project Subgroupings 59
Table 9-1: Wastewater System Sewer Inventory 61
Table 9-2: Wastewater System Lift Stations 62
Table 9-3: Summary of Recommendations 63
Table 9-4: Summary of Recommendations (Continued) 64
Table 9-5: Temporary Flow Meter Location Summary 65
Table 9-6: Dry Weather Summary 66
Table 10-1: Texas Administrative Code (TAC) 71
Table 10-2: Minimum and Maximum Grades for Wastewater Mains 73
Table 11-1: Flow Meter Dry Weather Flow Data 75
Table 11-2: Rainfall Depths (inches) for Different Durations and Frequencies 76
Table 11-3: Rainfall Event Summary Results 76
Table 12-1: Current System Pipes with Inadequate Slopes 78
Table 12-2: Lift Station Bypass Feasibility 84
Table 14-1: Wastewater Capital Improvements Summary 87
Table 14-2: Wastewater CIP – Project Subgroupings 88

List of Exhibits

Exhibit 1: Existing Water System
Exhibit 2: Current (2016) Water Model Average Day Demand Minimum Pressure
Exhibit 3: Current (2016) Water Model Average Day Demand Maximum Water Age
Exhibit 4: Current (2016) Water Model Average Day Demand Available Fire Flow
Exhibit 5: Current (2016) Water Model Maximum Day Demand Minimum Pressure
Exhibit 6: Current (2016) Water Model Maximum Day Demand Maximum Water Age
Exhibit 7: Current (2016) Water Model Maximum Day Available Fire Flow
Exhibit 8: 2017 Water Model Average Day Demand Minimum Pressure
Exhibit 9: 2017 Water Model Average Day Demand Maximum Water Age
Exhibit 10: 2017 Water Model Average Day Demand Available Fire Flow
Exhibit 11: 2017 Water Model Maximum Day Demand Minimum Pressure
Exhibit 12: 2017 Water Model Maximum Day Demand Maximum Water Age
Exhibit 13: 2017 Water Model Maximum Day Demand Available Fire Flow
Exhibit 14: 2022 Water Model Average Day Demand Minimum Pressure
Exhibit 15: 2022 Water Model Average Day Demand Maximum Water Age
Exhibit 16: 2022 Water Model Average Day Demand Available Fire Flow
Exhibit 17: 2022 Water Model Maximum Day Demand Minimum Pressure
Exhibit 18: 2022 Water Model Maximum Day Demand Maximum Water Age
Exhibit 19: 2022 Water Model Maximum Day Demand Available Fire Flow
Exhibit 20: Existing Wastewater System
Exhibit 21: Current System Pipes with Inadequate Slopes
Exhibit 22: 2017 Wastewater System Dry Weather Flow Pipe Capacity
Exhibit 23: 2017 Wastewater System Wet Weather Flow Pipe Capacity
Exhibit 24: 2022 Wastewater System Dry Weather Flow Pipe Capacity
Exhibit 25: 2022 Wastewater System Wet Weather Flow Pipe Capacity
Exhibit 26: 2022 Wet Weather with 2021 Improvements
Exhibit 27: 2022 Wet Weather with 2022 Improvements
Exhibit 28: Water CIP
Exhibit 29: Wastewater CIP
Exhibit 30: Buildout Water
Exhibit 31: Buildout Wastewater

List of Appendices

Appendix A Water Facilities Evaluation Technical Memorandum
Appendix B Lift Stations Evaluation Technical Memorandum
Appendix C Water Capital Improvements Plan
Appendix D Wastewater Capital Improvements Plan

Glossary

Terms and Abbreviations used in this report are as follows:

AWWA	American Water Works Association
BEP	Best Efficiency Point
CER	Conceptual Engineering Report
CIP	Capital Improvements Plan
EST	Elevated Storage Tank
ETJ	Extraterritorial Jurisdiction
ft.	Feet
GIS	Graphical Information System
GST	Ground Storage Tank
gpcd	Gallons per capita day
gpd	Gallons per day
gpm	Gallons per minute
GST	Ground Storage Tank
HP	Horsepower
I/I	Infiltration/Inflow
LF	Linear Feet
MG	Million gallons
MGD	Million gallons per day
NA	Not Available
NCTCOG	North Central Texas Council of Governance
No.	Number
OPCC	Opinion of Probable Construction Cost
PDR	Preliminary Design Report
PS	Pump Station
psi	Pounds per square inch
RDII	Rainfall-derived infiltration and inflow
SCADA	Supervisory Control and Data Acquisition
Sewer Basin	Sanitary sewer drainage basin
SSO	Sanitary Sewer Overflows
TWDB	Texas Water Development Board
DWU	Dallas Water Utilities

1.0 Executive Summary

This report accomplished the following objectives:

- Projected population growth and water/sewer flow projections
- Developed a water system model, utilizing meter data for both current and buildout
- Developed a wastewater system model, utilizing flow monitoring and temporary rain gauge data for both current and buildout
- Prepared a capital improvements plan (CIP) for identified improvements in the distribution and collection systems

1.1 Population and Flow Projections

1.1.1 Population Projections

The City of Celina served approximately 11,000 residents in 2015. An ultimate buildout projection of population growth based on City development data is shown in Table 1-1. The water and wastewater models were simulated using the ultimate buildout projection of 363,100 people.

Table 1-1: Projection of Population Growth

Year	Population
2015	11,000
5-year (2022)	43,729
Buildout	363,100

1.1.2 Flow Projections

The water demand projections were based on the City of Celina design standards and City of Frisco design criteria for gallons per capita day, along with a component for commercial usage. The demand projection at buildout is expected to be 100 million gallons per day (MGD) on an average day. A peaking factor of 2.0 was estimated to find a ultimate buildout max day demand of 200 MGD. The wastewater system design standard of 102 gpcd is expected to be maintained throughout the planning horizon and to ultimate buildout. The demand projection at buildout is expected to be 45.1 MGD on an average day.

Table 1-2: Average Demand Projections

Year	Water Demand (MGD)	Wastewater Flow (MGD)
2017	3.03	1.22
5-year (2022)	10.20	3.68
Buildout	100	45.1

1.2 Existing Facilities

Facility assessments were conducted on existing water and wastewater facilities to evaluate the current condition of those facilities, and to recommend improvements, if warranted.

1.2.1 Water Facilities

The City's water system consists of the items summarized below in Table 1-3:

Table 1-3: Water Facilities

Items	Number
Connections	3,644
Pessure Planes	2 (high and low)
Pump Stations	3 (Celina Rd, Downtown, Morgan Lake)
Ground Storage Tanks	2 (Celina Rd, Downtown)
Elevated Storage Tanks	3 (Downtown, Light Farms, Morgan Lake)
Standpipe	1 (Morgan Lake)
Wells	4 (2-active, 2-inoperable)

The water facility evaluation is presented as Appendix A of this report.

1.2.2 Sewer Facilities

The City's wastewater system consists of the items summarized below in Table 1-4:

Table 1-4: Sewer Facilities

Items	Number
Gravity Sewer (LF)	407,600
Force Mains (LF)	23,100
Manholes	987
Lift Stations	11
WWTP	1 (Downtown WWTP)
Lines	1 (Doe Branch)

1.2.2.1 Downtown Wastewater Treatment Plant Evaluation

Garver conducted a conceptual evaluation of two alternative concepts to address the identified scope of rehabilitation, replacement, and additional treatment capacity. The capacity and feasibility of improvements to the Downtown WWTP were evaluated, and a conceptual engineering report (CER) was submitted to the City separately from this report on December 6, 2016. A preliminary design of improvements to the Downtown WWTP summarizing findings and recommendations was developed and a preliminary design report (PDR) was submitted to the City separately from this report on June 23, 2017.

1.2.2.2 Lift Station Evaluation

The lift station technical memorandum is presented as Appendix B of this report. Field assessments were undertaken on 10 lift stations and improvements are summarized in Section 11.3.

1.3 Wastewater Flow Monitoring

A wastewater flow monitoring program was conducted from April 27th, 2016 to June 30th, 2016 to evaluate existing flows from the wastewater system. A total of six temporary flow meters and three rain gauges were installed. The flow meter upstream of the Doe Branch entry point was used to compare against billing from Upper Trinity Regional Water District (UTRWD). The results are detailed in Section 9.5.

The following conclusions and recommendations were drawn from the flow monitoring program results:

- Dry weather flows are adequately transported and treated without surcharge. Velocities are adequate to keep solids from settling and debris was not noted at any of the sites during the monitoring period.
- The collected hydraulic data from six metering sites and three rainfall gauges was used for hydraulic model calibration.
- Priority ranking of basins based on RDII provided guidance for analysis of wet weather infiltration/inflow alternatives.

1.4 Models

Full models of existing and future water and wastewater demands were developed and implemented into the City's current water models. These updates are included as digital files. The models implemented usage and future buildout to identify improvement regarding flow rates, pressures, fire flows, and water age for the water system, and capacity and future growth needs for the wastewater system.

1.5 Water System CIP

A list of recommended water improvement projects by priority is identified in Appendix C: Water Capital Improvements Plan. A summary of the projects are shown in Table 1-5.

Table 1-5: Summary of Proposed Water CIP

Project Identification			Schedule	2017 Cost ($1000)[1]
Project	**Group**	**Description**	**Trigger Date**	**OPCC**
1	B	Downtown EST shutdown and SCADA switchover	Feb-17	$0
2	A	Capacity upgrades to CRPS and installation of 4 new pumps	Feb-17	$6,305
3	H	Capacity upgrades to DTPS and installation of 3 new pumps	Feb-17	$5,173
4	E	12" line and valves to switch LPP to HPP	Oct-17	$171
5	F	18", 30" and 36" line along Celina Road from CRPS	Oct-17	$7,939
6	G	24" and 30" lines to Downtown GST	Oct-17	$5,588
7	J	24" and 30" discharge lines from DTPS	Oct-17	$3,490
8	D	18" and 24" line to Morgan Lake area	Oct-18	$4,730
9	C	18" line along Cypress Creek Way	Oct-18	$312
10	L	Additional capacity upgrades to CRPS	Oct-18	$536
11	Z	New 6 MG GST at CRPS	Oct-18	$7,619
12	R	Additional capacity upgrades to DTPS	Oct-18	$556
13	K	Decommision Morgan Lake facilities	Mar-19	$145
14	AB	SCADA improvements	Oct-19	$312
15	AA	8" line upgrades in Downtown area	Oct-19	$22,390
16	M	12" line along Settlers Ridge	Oct-19	$3,308
17	Q	Additional capacity upgrades to CRPS	Oct-19	$556
18	AC	2020 5-year Master Plan	Oct-20	$200
19	P	8", 12", and 18" line from Morgan Lake to DC Ranch	Oct-19	$5,119
20	O	24" line to increase capacity in the Low Pressure Plane	Oct-20	$5,340
21	T	18" and 24" lines along Hwy. 455	Oct-20	$2,387
22	S	18" and 24" lines along Legacy Drive	Oct-21	$3,353
23	X	8" and 24" lines to connect Preston Lakes to Preston Road Corridor	Oct-21	$4,175
24	W	8" and 12" line along E. Malone St. and Preston Road	Oct-20	$612
25	V	8" lines in the Low Pressure Plane	Oct-20	$547
26	Y	18" line from the Parks at Wilson Creek to Lakes at Mustang Ranch	Oct-21	$2,939
27	U	12" line from Preston Road to Morgan Lake Estates	Oct-21	$342
		Total 2017 OPCC:		**$94,141,277**

In addition to the recommended water capital improvements, operational recommendations such as water restrictions, tank mixing, and reduction of water age are included in Sections 8.2 and 8.3. Table 1-6 divides up the projects by their subgroupings as described in Section 8.1.1.

Table 1-6: Water CIP – Project Subgroupings

Project Identification			Schedule	2017 Cost ($1000)[1]
Project	**Grouping**	**Description**	**Trigger Date**	**OPCC**
Development Driven				
1	B	Downtown EST shutdown and SCADA switchover	Feb-17	$0
2	A	Capacity upgrades to CRPS and installation of 4 new pumps	Feb-17	$6,305
3	H	Capacity upgrades to DTPS and installation of 3 new pumps	Feb-17	$5,173
4	E	12" line and valves to switch LPP to HPP	Oct-17	$171
5	F	18", 30" and 36" line along Celina Road from CRPS	Oct-17	$7,939
6	G	24" and 30" lines to Downtown GST	Oct-17	$5,588
7	J	24" and 30" discharge lines from DTPS	Oct-17	$3,490
8	D	18" and 24" line to Morgan Lake area	Oct-18	$4,730
9	C	18" line east of Light Farm EST along Cypress Creek Way	Oct-18	$312
10	L	Additional capacity upgrades to CRPS	Oct-18	$536
11	Z	New 6 MG GST at CRPS	Oct-18	$7,619
12	R	Additional capacity upgrades to DTPS	Oct-18	$556
16	M	12" line along Settlers Ridge	Oct-19	$3,308
17	Q	Additional capacity upgrades to CRPS	Oct-19	$556
18	AC	2020 5-year Master Plan	Oct-20	$200
19	P	8", 12", and 18" line from Morgan Lake to DC Ranch	Oct-19	$5,119
20	O	24" line to increase capacity in the Low Pressure Plane	Oct-20	$5,340
		Development Subtotal =		**$56,940,272**
Operational				
13	K	Decommision Morgan Lake facilities	Mar-19	$145
14	AB	SCADA improvements	Oct-19	$312
15	AA	8" line upgrades in Downtown area	Oct-19	$22,390
22	S	18" and 24" lines along Legacy Drive	Oct-21	$3,353
		Operational Subtotal =		**$26,199,874**
Fire Flow				
21	T	18" and 24" lines along Hwy. 455	Oct-20	$2,387
23	X	8" and 24" lines to connect Preston Lakes to Preston Road Corridor	Oct-21	$4,175
24	W	8" and 12" line along E. Malone St. and Preston Road	Oct-20	$612
25	V	8" lines in the Low Pressure Plane	Oct-20	$547
26	Y	18" line from the Parks at Wilson Creek to Lakes at Mustang Ranch	Oct-21	$2,939
27	U	12" line from Preston Road to Morgan Lake Estates	Oct-21	$342
		Fire Flow Subtotal =		**$11,001,131**
		Total 2017 OPCC =		**$94,141,277**

1.6 Wastewater System CIP

A list of recommended wastewater projects by priority is identified in Appendix D, and summarized in the following Table 1-7.

Table 1-7: Summary of Proposed Wastewater Capital Improvements

Project Identification			Schedule	2017 Cost ($1000)[1]
Project	**Grouping**	**Description**	**Trigger Date**	**OPCC**
1	AC	WWTP expansion to 0.75 MGD	Oct-17	$8,300
2	B	12" line to replace Carter Ranch LS	Oct-17	$1,502
3	P	6" line to replace Lucy's LS	Oct-17	$120
4	Q	8" and 10" line to replace Shawnee Trail No. 1 LS	Oct-17	$1,172
5	C	8" line to replace Winn Road LS	Oct-17	$486
6	R	10" and 12" line to provide additional capacity for the addition of the Chalk Hill LS	Oct-17	$915
7	AA	Manhole rehabilitation from PK I/I study	Oct-17	$422
8	AB	Pipeline rehabilitation from PK I/I study	Oct-17	$761
9	O	12" line replacement to increase capacity to Heritage	Oct-17	$1,244
10	A	24" line replacement to increase capacity along Light Farms	Oct-17	$1,362
11	AD	WWTP expansion to 0.95 MGD	Oct-18	$3,000
12	N	New 30", 36", 42", and 60" interceptor from Downtown WWTP to future WWTP; 8" interceptor to replace Willock Hills LS	Oct-19	$43,144
13	T	18" line replacement to increase capacity Downtown	Oct-19	$3,066
14	U	15" line along FM 455 across Preston Rd	Oct-19	$734
		Total 2017 OPCC:		**$66,227,007**

Table 1-8 divides up the projects by their subgroupings as described in Section 14.1.1.

Table 1-8: Wastewater CIP – Project Subgroupings

Project Identification			Schedule	2017 Cost ($1000)[1]
Project	**Grouping**	**Description**	**Trigger Date**	**OPCC**
Development Driven				
1	AC	WWTP expansion to 0.75 MGD	Oct-17	$8,300
6	R	10" and 12" line to provide additional capacity for the addition of the Chalk Hill LS	Oct-17	$915
10	A	24" line replacement to increase capacity along Light Farms	Oct-17	$1,362
11	AD	WWTP expansion to 0.95 MGD	Oct-18	$3,000
12	N	New 30", 36", 42", and 60" interceptor from Downtown WWTP to future WWTP; 8" interceptor to replace Willock Hills LS	Oct-19	$43,144
		Development Subtotal =		**$56,720,948**
Operational				
2	B	12" line to replace Carter Ranch LS	Oct-17	$1,502
3	P	6" line to replace Lucy's LS	Oct-17	$120
4	Q	8" and 10" line to replace Shawnee Trail No. 1 LS	Oct-17	$1,172
5	C	8" line to replace Winn Road LS	Oct-17	$486
		Operational Subtotal =		**$3,279,312**
I/I				
7	AA	Manhole rehabilitation from PK I/I study	Oct-17	$422
8	AB	Pipeline rehabilitation from PK I/I study	Oct-17	$761
9	O	12" line replacement to increase capacity to Heritage	Oct-17	$1,244
13	T	18" line replacement to increase capacity Downtown	Oct-19	$3,066
14	U	15" line along FM 455 across Preston Rd	Oct-19	$734
		I/I Subtotal =		**$6,226,747**
		Total 2017 OPCC =		**$66,227,007**

2.0 Introduction

2.1 City Summary

The City of Celina is a community located primarily in the northwest corner of Collin County, Texas with portions of the City in northeast Denton County. The City is situated north and east to the Dallas/Fort Worth Metroplex, and comprises 22 square miles.

In 2016, the City of Celina water system served approximately 11,000 people with 3,644 connections. The City receives treated water from the Upper Trinity Regional Water District (UTRWD). This accounts for 70% of the water supply in 2016. The other 30% was produced from City owned and operated wells that is then blended with the UTRWD water at the Downtown Pump Station (DTPS) and the Morgan Lake Facility. These wells will begin to be decommissioned in the near future due to condition and maintenance costs.

The City's wastewater is treated by the City, the UTRWD, and onsite sewage systems made up primarily of septic and aerobic treatment systems. Subdivisions less than 1 acre and commercial properties use gravity lines and lift stations to transport wastewater to one of two places: the Downtown WWTP or Doe Branch Interceptor. The Doe Branch Interceptor transports collected wastewater to the UTRWD for processing. The Downtown WWTP currently collects and treats an average of 456,000 gallons of wastewater per day. The DWWTP is permitted for a maximum of 500,000 gallons per day. The larger subdivisions (>1 acre) typically utilize onsite sewage systems.

2.2 Objectives

The City commissioned this Water and Wastewater Modeling and CIP Report in order to evaluate the current condition of the existing infrastructure, and to adequately prepare for future growth and facility maintenance through a 5 year planning period. The modeling and CIP report accomplished the following:

- Developed the water model to adapt dynamically with recent developments
- Developed a wastewater system model, utilizing flow monitoring and temporary rain gauge data
- Prepared a capital improvements plan for identified improvements in the distribution and collection systems

2.3 Acknowledgements

Staff members throughout the City, including the Public Works, Engineering, and Planning and Development departments, were integral to the development of this Water and Wastewater Modeling and CIP Report. Garver and our consultant team is sincerely grateful for their dedication to this effort.

3.0 Population and Flow Projections

This section documents the current, five year, and ultimate buildout planning horizon population and flow projections for the City of Celina.

3.1 Population Trends

The following population projections utilize historical, current, and planned population projections to identify anticipated growth rates and ultimate buildout population. These projections should be reviewed with every Master Plan update to confirm the anticipated growth rates are being met.

3.1.1 Historical Population Trends

Historical population trends and growth rates for the City of Celina, shown in Table 3-1, are based on the U.S. Decennial Census. The City of Celina has historically been a rural community with growth rates near 1%. However, recent development expansion from the Dallas-Fort Worth metroplex has resulted in exponential residential growth over the past fifteen years. As such, the City's current growth rate of 13% is anticipated to increase for the foreseeable future.

Table 3-1: Historical Population and Growth Rate

Year	Population[1]	Growth Rate
1970	1,272	1%
1980	1,520	2%
1990	1,737	1%
2000	1,861	1%
2010	6,028	12%
2015	11,000	13%
[1] U.S. Decennial Census (1970-2010)		

In addition to the growth within the City's existing boundaries, annexation of surrounding areas is expected to increase the City's population. The following sections document the previous projection methods and describe the approach used as the basis for the current water and wastewater system modeling.

3.1.2 Five Year Population Estimate

Five year population projections were based on the City of Celina's July 2015 Development Takedown Schedule, which contains a record of all current and anticipated development. The overall population density (8.4 persons/acre) and the expected area of land developed was used to calculate the estimated populations shown in Table 3-2.

Table 3-2: City-Identified Short Term Population Growth

Year	Total
2015	10,875
2016	12,985
2017	15,585
2018	21,360
2019	27,401
2020	33,138
2021	38,741
2022	43,729

Table 3-2 shows the 5-year population to be approximately 43,729. The City-identified short term growth rate exceeds the current 13% for years 2016-2021, and will be incorporated into model development. Figure 3-1 displays the historical and projected five year growth pattern.

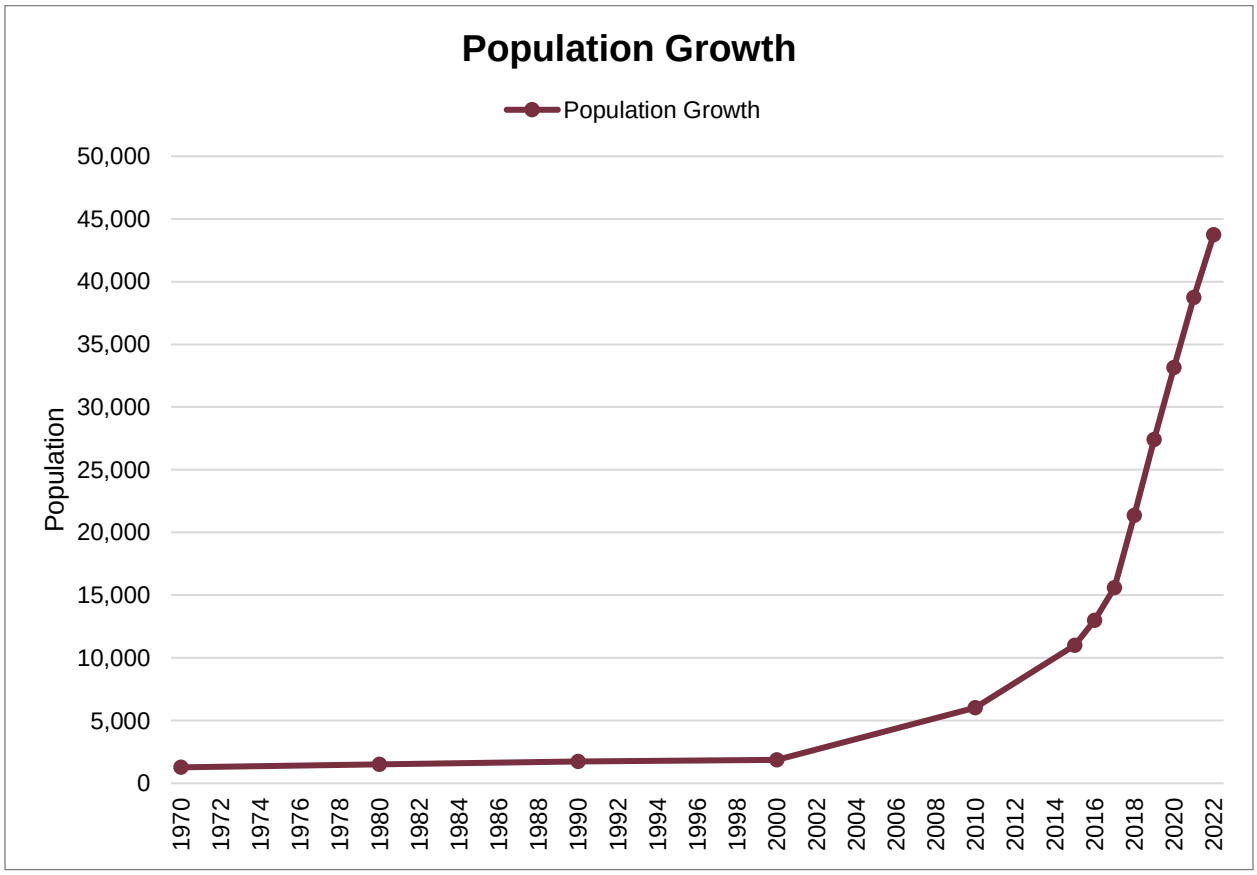


Figure 3-1: Population Growth

3.1.3 Buildout Population Projections

3.1.3.1 Previous Buildout Population Projections

The 2015 Master Plan buildout projections were generated using the 2013 Comprehensive Plan and the 2003 Master Plan for the City to estimate future buildout populations. The calculated populations for the water and wastewater plans are presented in Table 3-3. These projections were based on an ultimate planning area of 77 square miles, which aligned with City zoning and annexation plans. The 2015 Water and Wastewater Master Plan projections assumed that there would be 6.2 and 8 connections per acre for residential and commercial areas, respectively.

Table 3-3: 2015 Water and Wastewater Master Plan Population Projections

Year	2015 Master Plan	
	Water	Wastewater
2015	11,000	11,000
Buildout	339,000	343,267

The difference between the Water and Wastewater Master Plan projections results from the Wastewater Master Plan including drainage basins which extend into nearby jurisdictions (which added approximately 6,143 acres).

However, the City's Certificate of Convenience and Necessity (CCN) boundary has been modified since the 2015 Master Plan, with the new boundary supplied by the City encompassing approximately 67 square miles. The 2015 Master Plan and revised CCN boundaries are shown in Figure 3-2.

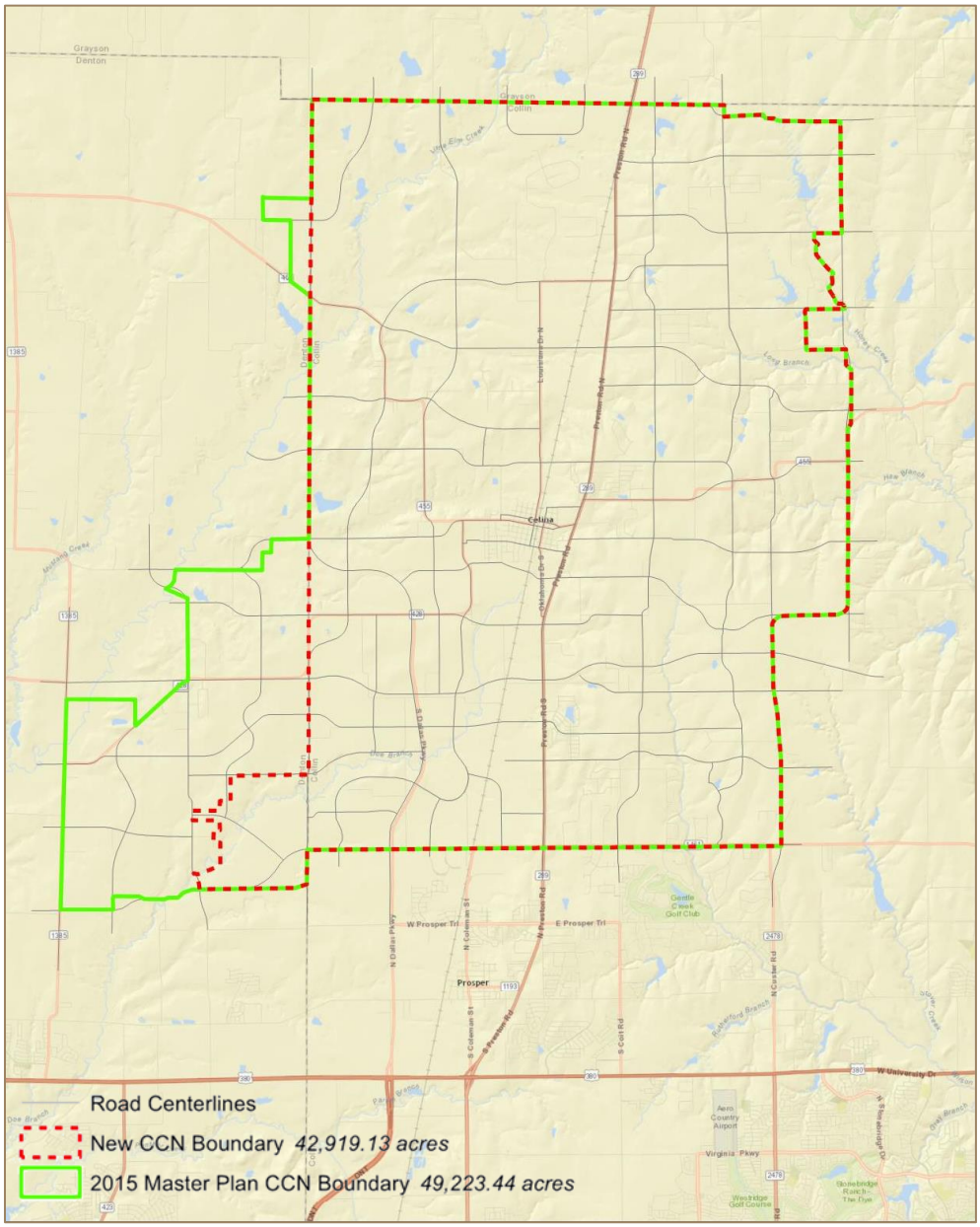


Figure 3-2: 2015 Master Plan and Revised CCN Boundaries for the City of Celina

The City also produces a future land use plan to allocate areas of Celina to specific land use classifications. The land use classifications may be used to predict population projections. The Plan produced by the City is included as Figure 3-3.

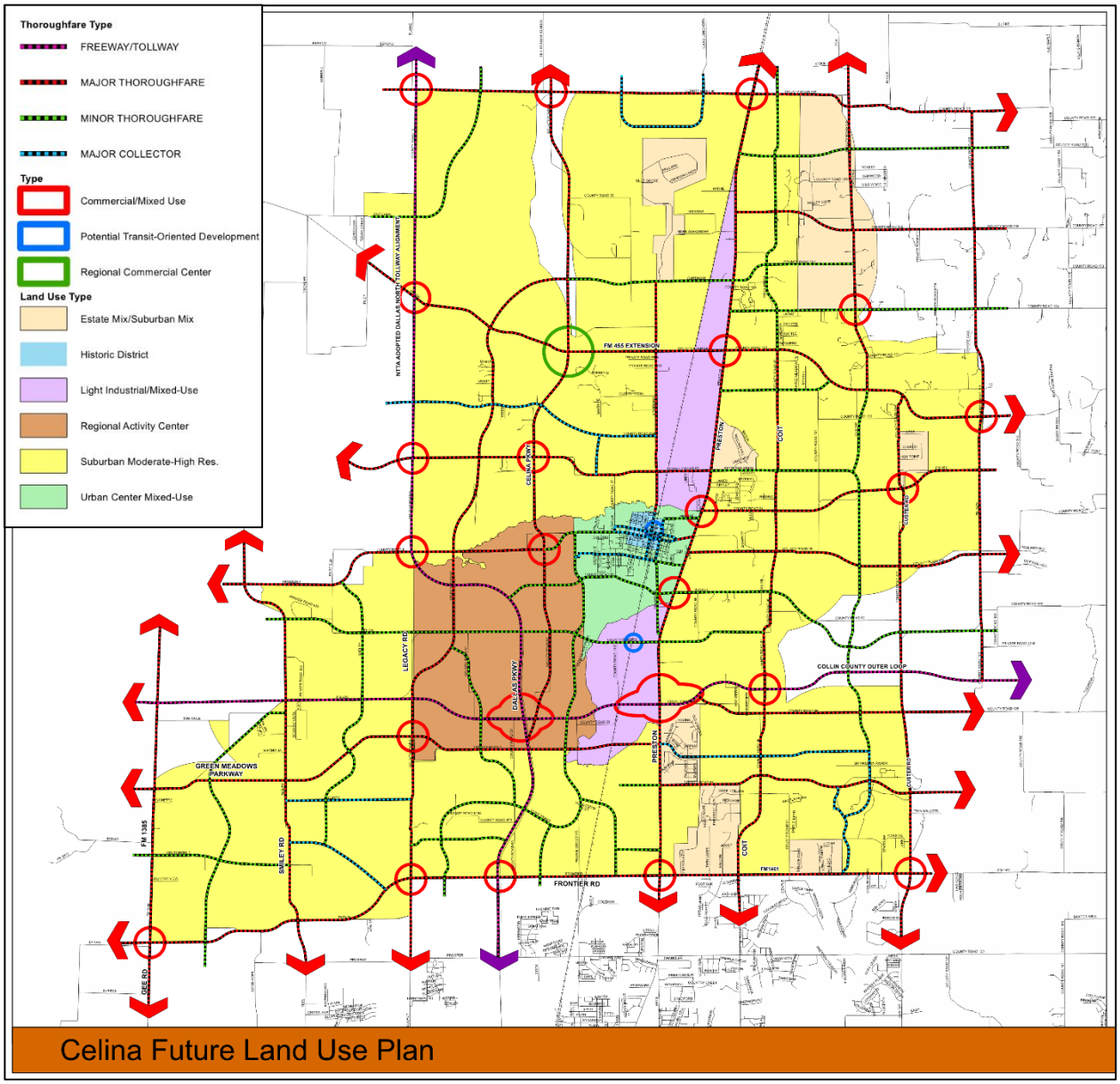


Figure 3-3: Celina Future Land Use Map

Land use within the City's revised CCN is expected to fall into six categories, ranging from residential to light industrial/mixed use. As such, the ultimate buildout population projections were developed using the existing population plus projected growth based on future land use classifications for currently undeveloped areas within the CCN.

Table 3-4: City of Celina Population Growth Based on Land Use Classification

Classification	Acres	Dwellings/ acre	People per Dwelling	Population Growth
Estate Mix/Suburban Mix	4,014	1	3	12,042
Historic District	13	4	3	156
Light Industrial/Mixed Use	2,113	0	0	0
Regional Activity Center	3,533	4	2	28,260
Suburban Moderate-High Residential	29,040	3.5	3	304,917
Urban Center Mixed Use	633	3	2.5	4,748
Total additional population				350,123

Including this future growth, the buildout population was estimated at 363,100, with an overall density of 8.46 persons per acre. The City of Celina has expressed interest in following a similar growth pattern to that of the City of Frisco, and this predicted density is comparable to the planned population density in the City of Frisco (8.34 persons per acre).

3.1.4 Population Projection Summary

Table 3-5 summarizes the population projections utilized for the basis of this report.

Table 3-5: Population Projection

Year	Total
2016	12,985
2017	15,585
2018	21,360
2019	27,401
2020	33,138
2021	38,741
2022	43,729
Buildout	363,100

3.2 Water Flow Projections

Flow demands and projections were developed for current demands, the 5-year CIP planning horizon, and ultimate buildout. The demand analysis and projections utilized a combination of historical water usage data and per unit projected demands. Near-term projections include City-identified growth, and the ultimate buildout considers a population of 363,100, as identified in Section 3.1.3.

3.2.1 Current Demands

Monthly operating reports for the period of January 2013 through June 2016 were provided by the City. The reports documented daily maximums, averages, and minimums for each month during that time period. Figure 3-4 displays this data graphically.

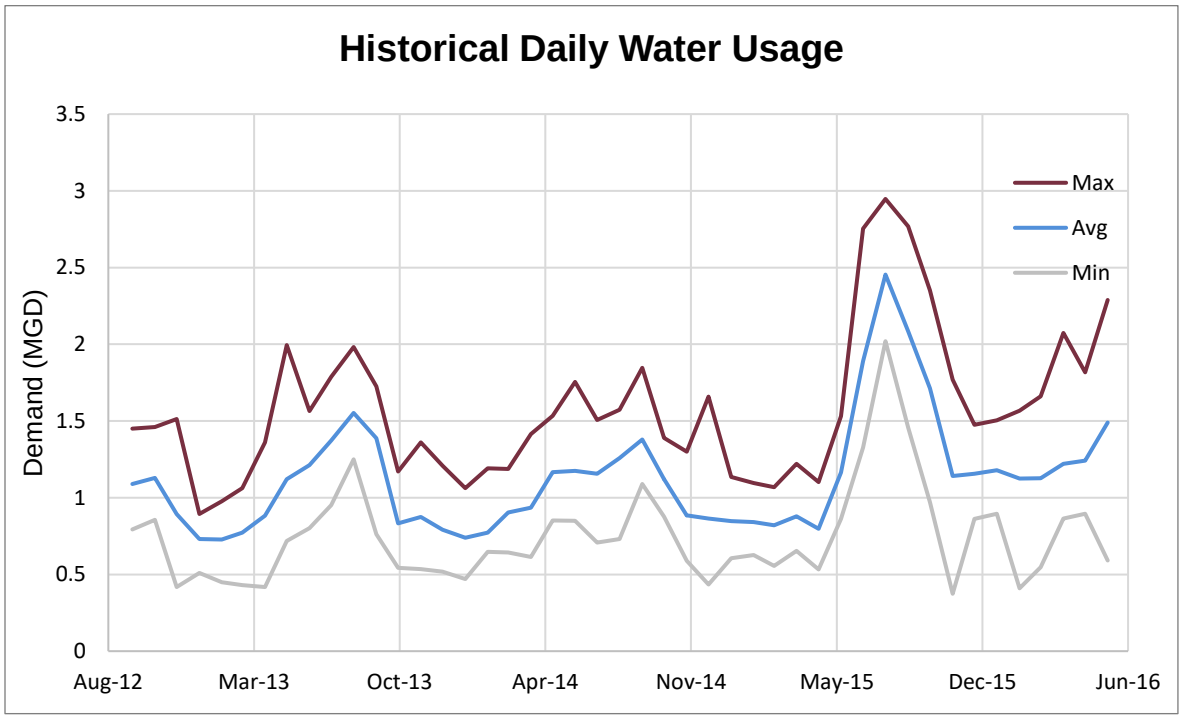


Figure 3-4: Historic Water Demand

Figure 3-5 shows the daily demand over the same time period as production originating from wells in the City of Celina and purchased water from UTRWD.

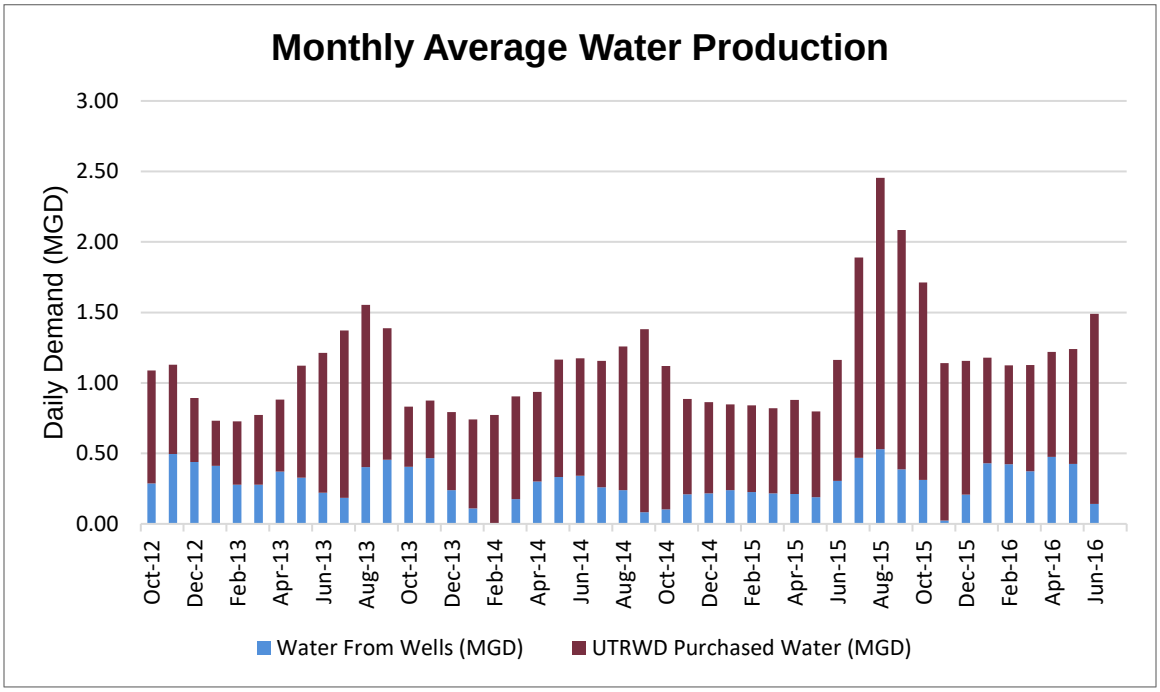


Figure 3-5: Historic Water Production

A summary of the annual average and 2016 planning numbers is shown in Table 3-6. This data indicated that the average number of people per connection was 2.9, and the annual average per capita demand was 141 gpcd. The maximum day per capita demand occurred in August 2015. The 2016 average and maximum day demand values were estimated based on the per capita demand values, average number of people per connection, and the number of connections (3,644 in 2016).

Table 3-6: Summary of Historical Demands

Classification	Average per Capita (gpcd)	Demand (MGD)
Annual Average	141	-
Annual Max Day	323	-
2016 Average Day	-	1.49
2016 Max Day	-	3.40

3.2.2 Flow Projection Design Criteria

Design criteria from five sources, including historical demands, Texas Water Development Board water demand projections, the 2015 Master Plan, City of Celina Engineering Standards, and the 2008 City of Frisco Master Plan, were used in determining per unit projected demands. These design criteria are summarized in Table 3-7.

The Texas Water Development Board (TWDB) estimates future average daily demand based on population projections and historical county water usage. The resulting future average daily demand estimates are 185 gpcd through 2020, and 183 gpcd through 2070 as more efficient household fixtures are anticipated. This may be underestimating the future City demand for multiple reasons. First, these projections only consider the City's current limits and do not account for the projected additional 45 square miles at ultimate buildout. Secondly, these sources distribute projected growth at the county level among cities by comparing historical growth in each city to its county's overall growth. The record growth of surrounding cities has limited the development potential for those respective cities, so their growth rates would be expected to decrease relative to that of the City of Celina. Lastly, new construction is anticipated to use more water per capita due to larger house sizes, automatic irrigation systems, and less use of private wells.

The City of Celina Engineering Standards require that an average daily demand of 230 gpcd be used for future City water planning. This value matches the residential average daily demand documented in the 2008 City of Frisco Master Plan. The City of Frisco also specifies a peaking factor of 2.0 (i.e., 460 gpcd) for calculating peak day demands. Because the City of Celina desires to follow a similar growth pattern to the City of Frisco, and their design criteria are conservative relative to both historical data and TWDB estimates, values of 230 gpcd for average daily demands and 460 gpcd for peak daily demand will be used in the future demand projections.

Table 3-7: Ultimate Buildout Projections by Source

Source	Average Daily Demand (gpcd)	Peak Daily Demand (gpcd)
Historical Data	141	323
TWDB	183	NA
2015 Master Plan	NA	42
Celina Standards	230	NA
Frisco Master Plan	230	460

3.2.3 Five Year Water Demand Projections

Water demand projections for the 5-year planning period were conducted based on the calculated 5-year population projection estimate detailed in Section 3.1.2. Future demand was assigned utilizing the City's July 2015 Development Takedown Schedule and previously detailed population projections.

Average day residential demand projections were based on an average of 230 gpcd and the anticipated population growth. The per acre loading rate for residential areas was estimated by dividing the residential demand by the land area associated with residential growth. This resulted in an average value of approximately 2,336 gpd/ac. The constant 2,336 gpd/ac allows a higher per capita value to be applied in areas with large lots (where irrigation use is typically greater) than in areas with small lots (where population density is greater). The percentage of lots (i.e., land) developed in that subdivision each year was also applied to calculate the total flow based on developed land area. The added maximum day demand for each subdivision was calculated using a 2.0 peaking factor over average day.

Non-residential demands for the planning period were estimated based on assumed development of areas from the Land Use Plan along Preston Road on either side (north and south) of downtown Celina. Specifically, it was assumed that 20% (182 acres) of the 911-acre area south of downtown would be developed, whereas 8% (98 acres) of the 1,225-acre area north of downtown would be developed over the planning period. For each area, it was assumed that the development would be divided equally over the 6-year period from 2016 to 2022. This calculation accounts for a 0.14 MGD/year increase in demand.

Average day non-residential demands were estimated using a value of 3,000 gal/ac for areas classified as light industrial/mixed use, regional activity center, and urban center mixed use. This approximation is preferable to distributing demands based solely on anticipated population growth because there are not currently people in those areas to base demands on.

To summarize, the existing demands associated with the existing population and development were held at the existing demand values and utilized as a baseline. The average day 230 gpcd was not applied to the existing population. The average day residential demand projections were developed as a population growth per year in addition to the current population, and then added to the existing baseline demand. Non-residential demands were estimated utilizing land classifications on a per acre basis, then equally divided over six years. The peak day demand projections were developed in a similar manner utilizing the existing peak demand as a baseline and the 2.0 peaking factor.

Total 5-year demand projections are summarized in Table 3-8, with a historical comparison of past and projected future demands in Figure 3-6.

Table 3-8: Five Year Water Demand Projections

Year	Average Daily Demand (MGD)	Peak Daily Demand (MGD)
2017	3.03	6.48
2018	4.51	9.44
2019	6.06	12.55
2020	7.54	15.50
2021	8.97	18.35
2022	10.20	20.81

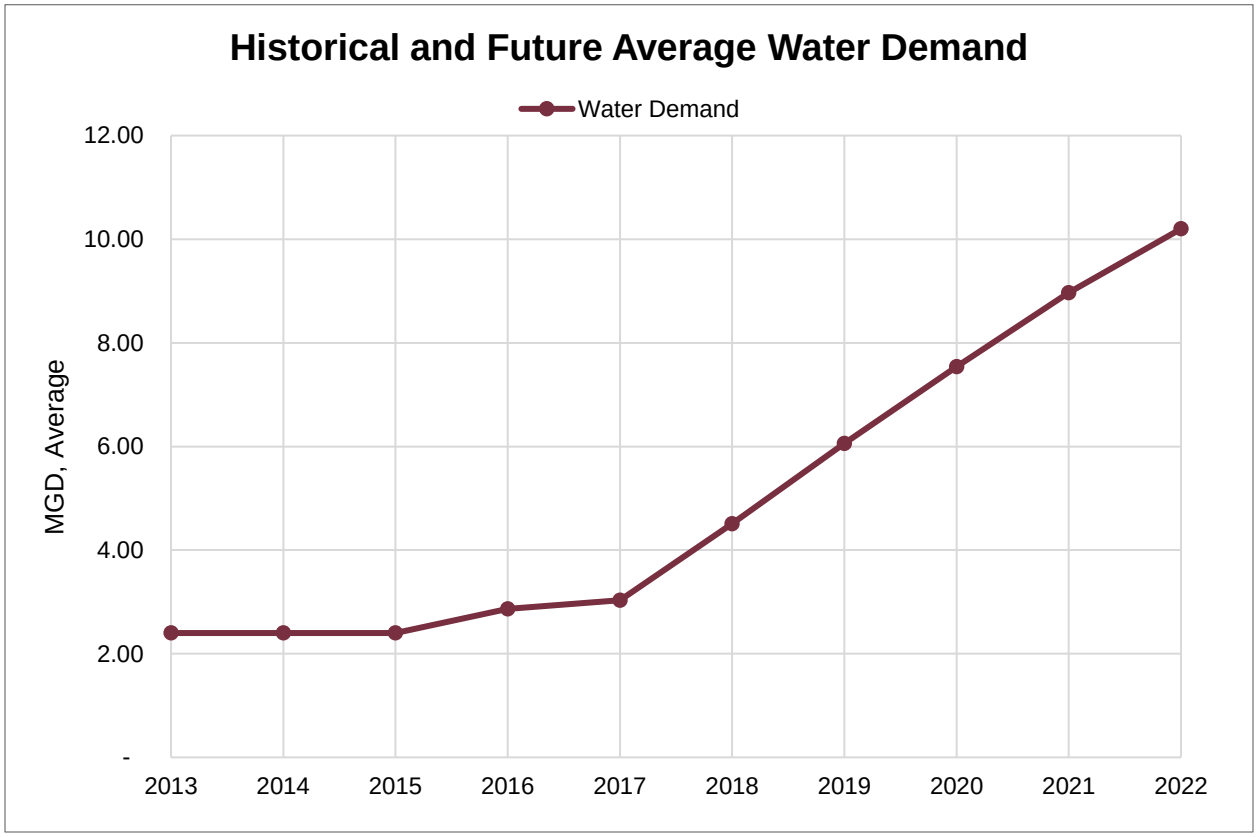


Figure 3-6: Historical and Future Average Water Demand

3.2.4 Ultimate Buildout Water Demand Projections

Ultimate buildout demand projections are summarized in Table 3-9.These demands were calculated based on the land use distribution utilized previously and the City's current Futue Land Use Plan.

Table 3-9: Ultimate Buildout Water Demand Projections

Average Daily Demand (MGD)	Peak Daily Demand (MGD)
100	200

3.2.5 Conclusions

Garver proposes the use of an average daily residential demand of 230 gpcd as identified in the City of Celina Engineering Standards and 2008 City of Frisco Master Plan coupled with a 3,000 gpd/ac average daily commericial demand. A peaking factor of 2.0 per industry standard and the 2008 City of Frisco Master Plan is proposed to determine peak daily demand. The average and peak daily demands are summarized for the five-year and buildout planning periods in Table 3-10.

Table 3-10: Summary of Water Demand Projections

Year	Average Daily Demand (MGD)	Peak Daily Demand (MGD)
2017	3.03	6.48
5-year (2022)	10.20	20.81
Buildout	100	200

3.3 Wastewater Flow Projections

Flow demands and projections were developed for current demands, the 5-year CIP planning horizon, and ultimate buildout. The demand analysis and projections utilized a combination of historical flow data, information gathered from field measurements conducted during the flow testing study, design criteria, and per unit projected demands. Near-term projections include City-identified growth, and the ultimate buildout considers a population of 363,100, as identified in Section 3.1.3.

3.3.1 Current Flow

Monthly operating reports for the period of January 2013 through June 2016 were provided by the City for the Downtown WWTP. The reports documented average daily flows and maximums for each month during that time period. In addition, monthly billing data was provided from UTRWD for the period of January 2016 through April 2016. Figure 3-7 displays this data graphically for the 2015 – 2016 timeframe.

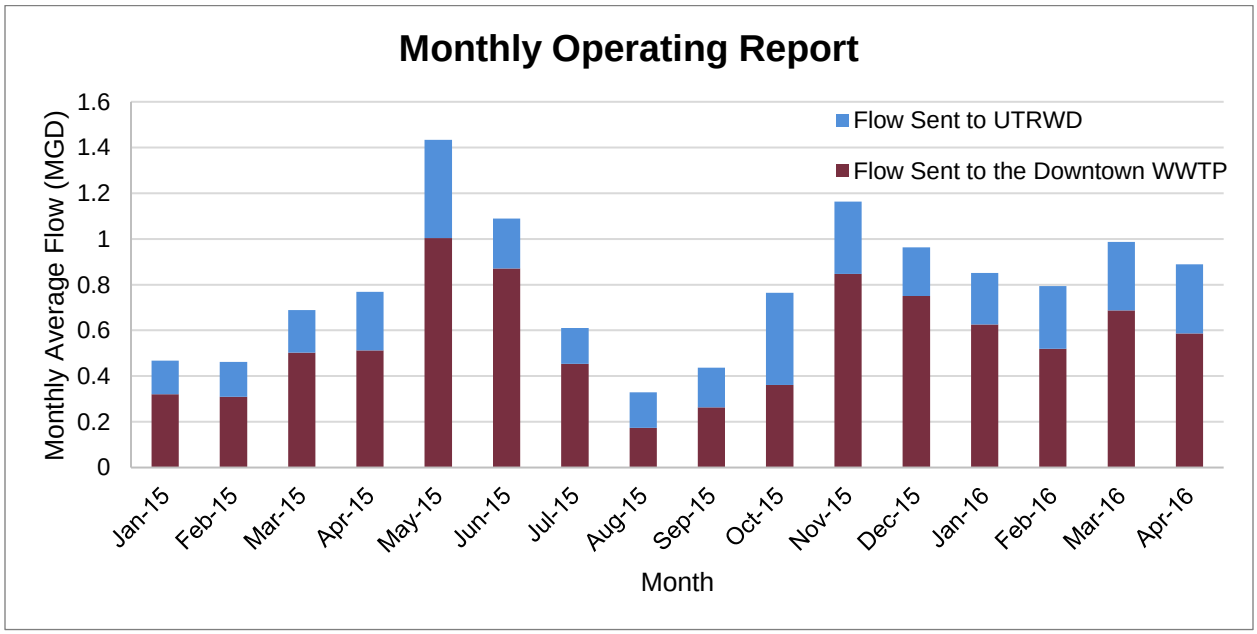


Figure 3-7: Monthly Operating Report Data

Monthly billing data from the City indicates that 84% of the existing water connections are also served by wastewater. This discrepancy is largely due to the use of septic systems on the larger, more rural lots. Assuming the previously detailed connections and current per capita rates, this equates to an average flow of 77.5 gpcd. The existing sewer flows were also compared to the results of flow monitoring conducted by Pipeline Anaylsis, which estimated an average flow of 0.78 MGD, or approximately 71 gpcd.

3.3.2 Flow Projection Design Criteria

A summary of historical, flow test data, the 2015 Master Plan, and Celina Standards are presented in Table 3-11. Due to the variability and fluctuations of the historical and flow testing data, the Celina design standards are recommended for planning purposes.

Table 3-11: Sewer Flow Projections by Source

Source	Average Daily Flow (gpcd)	Max Daily Flow (gpcd)
Historical Data	77.5	NA
Flow Testing	71	196
2015 Master Plan	102	306-408, depending on line size
Celina Standards	102	408

3.3.3 Five Year Wastewater Flow Projections

Wastewater load projections for the 5-year planning period were conducted based on the City's July 2015 Development Takedown Schedule, which lists the anticipated number of connections per subdivision for each year through 2022. Average day demand additions were estimated for each subdivision based on the population based residential demand of 102 gpcd. The added maximum day demand for each subdivision was calculated using a 4.0 peaking factor over average day. Non-residential demands were not explicitly accounted for due to uncertainty regarding the anticipated locations of these loadings. Non-residential loads should be evaluated on a case-by-case basis to determine if adequate capacity exists.

Table 3-12: Five Year Wastewater Demand Projections

Year	Average Daily Flow (MGD)	Peak Daily Flow (MGD)
2017	1.22	11.47
2018	1.72	13.49
2019	2.25	15.60
2020	2.75	17.61
2021	3.24	19.57
2022	3.68	21.31

3.3.4 Future Demand Projections

Average day residential demand projections were based on an average of 102 gpcd and the anticipated population growth. Future land use classifications for currently undeveloped areas within the CCN, as shown in Figure 3-3, were used to develop per acre demands. Average day non-residential demands were estimated using a value of 1,500 gal/ac for areas classified as light industrial/mixed use, regional activity center, and urban center mixed use. Maximum day demands were calculated by using a 4.0 peaking factor to convert average day to maximum day values. Ultimate buildout flow projections are summarized in Table 3-13.

Table 3-13: Ultimate Buildout Wastewater Demand Projections

Average Daily Demand (MGD)	Peak Daily Demand (MGD)
45.1	180.5

3.3.5 Conclusions

2016 flows were based on the flow monitoring results conducted by Pipeline Analysis. Garver proposes the use of an average daily residential demand of 102 gpcd as identified in the City of Celina Engineering Standards plus 1,500 gpd/ac average daily commericial demand for ultimate buildout. The average and peak flows are summarized for the 2016, five-year, and buildout planning periods in Table 3-14.

Table 3-14: Summary of Wastewater Demand Projections

Year	Average Daily Demand (MGD)	Peak Daily Demand (MGD)
2016	0.94	0.9412
5-year (2022)	3.68	21.31
Buildout	45.1	180.5

4.0 Existing Water System

4.1 Overview

The City's water system consists of the items summarized below:

- 3,644 connections;
- Two pressure planes, high and low;
- Three pump stations: Celina Road PS, Downtown PS and Morgan Lake PS;
- Two ground storage tanks, located at the Celina Road Pump Station and Downtown Pump Station; and
- Three elevated storage tanks: Light Farms Elevated Storage Tank, Morgan Lake Elevated Storage Tank, and Downtown Elevated Storage Tank
- One standpipe at Morgan Lake
- Four wells (two active, two inoperable)

The City of Celina purchases wholesale treated water from UTRWD. As of 2016, the water purchased from the UTRWD constituted 70% of the water supply with the remaining 30% of the City's water supply comes from City owned wells located at the Downtown PS and Morgan Lake PS. A facility summary and condition assessment was conducted by Garver in a separate Technical Memorandum. This summary documents all available information at these facilities. It is included in this report as Appendix A.

4.2 Distribution System

The water distribution system consists of 591,463 total feet of pipeline, as shown in Table 4-1.

Table 4-1: Distribution System Pipeline Inventory

Size (in.)	Total Length (ft)	Portion of System (%)
1	6,160	1.0
2	35,130	6.0
3	1,451	0.2
4	519	0.09
6	128,124	21.7
8	212,187	35.9
10	6,621	1.1
12	138,951	23.5
16	72	0.01
18	58,223	9.8
24	3,700	0.6
30	325	0.1
Total	**591,463**	**100%**

The pipelines range in age, material, and condition. A formal condition assessment of the pipelines was not conducted as a part of this study.

4.3 Pump Stations

The City of Celina owns and operates three water pump stations: Downtown Pump Station, Celina Road Pump Station, and Morgan Lake Pump Station. A field investigation of the pump stations was conducted and recommended improvements are located in Appendix A, and summarized in Section 4.6.

Figure 4-1: Pump Stations

4.3.1 Celina Road Pump Station

The Celina Road Pump Station is located at 17099 Celina Road. The pump station operates three pumps. The facility has a firm pumping capacity of 3.86 MGD and a total capacity of 5.79 MGD while operating at the best efficiency point (BEP). The station receives water from UTRWD. All water enters the pump station via the ground storage tank and the water is then pumped through the City's water distribution system. The operational controls at the Celina Road Pump Station are based on operating water levels at the Downtown Elevated Storage Tank.

4.3.2 Downtown Pump Station

The Downtown Pump Station is located at 107 E Elm Street. The station contains four pumps. When operated at the BEP, the pumps have a firm capacity of 2.40 MGD and a total capacity of 4.13 MGD. The remaining facility components currently consist of one elevated storage tank, one pump building, one ground storage tank, and three groundwater wells. The elevated storage tank helps provide the pressure and supply of water for the lower pressure plane distribution system, while the pump station services the upper pressure plane water distribution system. The facility pumps water approximately 3.5 miles north to the Morgan Lake elevated storage tank.

4.3.3 Morgan Lake Pump Station

The Morgan Lake Pump Station is located immediately north of the Morgan Lake development. The pump station receives water via the Downtown Pump Station. The station consists of two pumps, with a firm capacity of 420 gpm and a total capacity of 920 gpm. The pump station serves the upper pressure plane, but can be redirected to support the lower plane based on system demand using the elevated storage tank.

4.4 Storage Tanks

This City of Celina maintains two ground storage tanks and three elevated storage tanks.

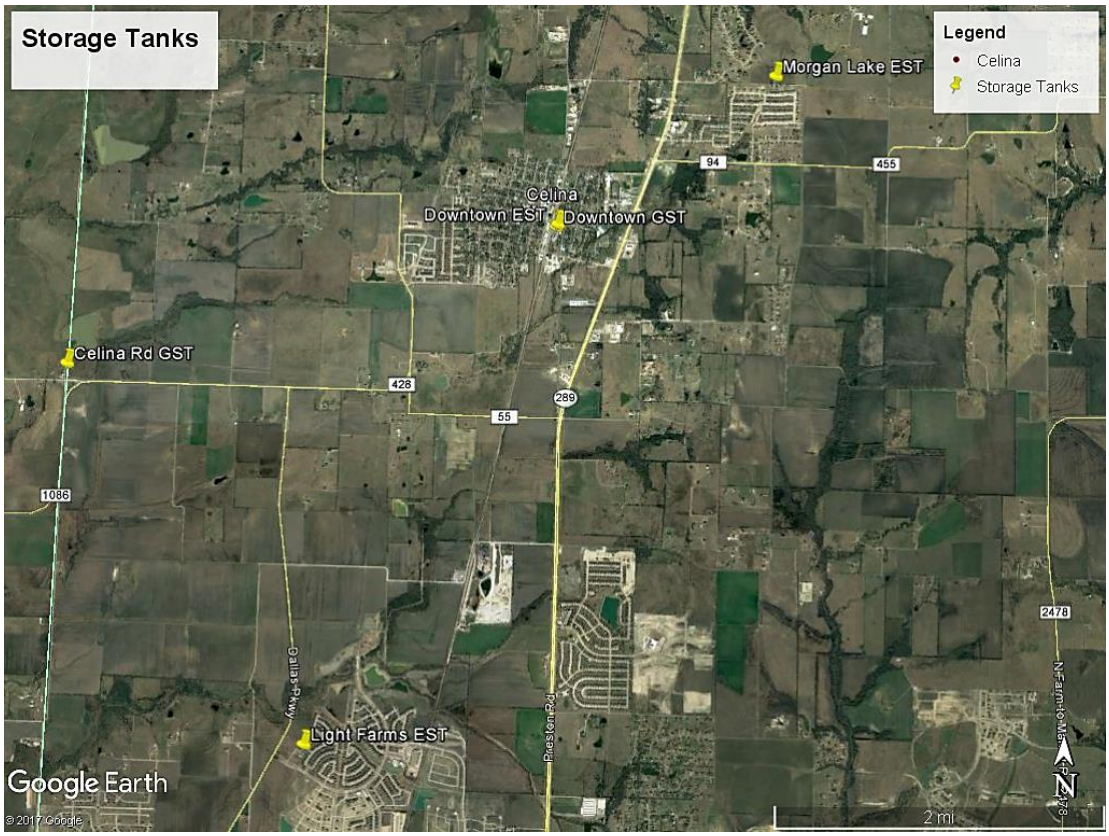


Figure 4-2: Storage Tanks

A summary of the type and storage volume is shown in Table 4-2.

Table 4-2: Summary of Storage Tanks

Name	Type	Storage (MG)
Downtown	Ground	0.15
Celina Road	Ground	1.0
Downtown	Elevated	0.075
Morgan Lake	Elevated	0.54
Light Farms	Elevated	1.0

4.5 Groundwater Wells

The City owns and operates four groundwater wells that are located at the Downtown Facility (three) and Morgan Lake Facility (one). As of 2016, two of the wells located at the Downtown Pump Station were operable and produced an estimated 30% of the City's potable water supply. However, well production has steadily declined due to the condition of the wells and operational challenges associated with the well water quality. Therefore, future water supply planning will not consider the wells as viable sources of potable water.

4.6 Facility Assessment

A facility assessment of all storage and pumping facilities described in Sections 4.3 and 4.4 was provided by the City. The purpose of the field evaluation study was to:

- Compare TCEQ requirements to the existing installations
- Identify any regulatory upgrades needed
- Evaluate the overall condition of those facilities
- Identify any conditional improvements needed
- Include any major capital expenditures within the CIP

A technical memorandum presenting the findings of those field evaluations is included in this report as Appendix A.

5.0 Water Design Criteria

5.1 Site Security, Maintenance and Housekeeping

The Texas Commission on Environmental Quality (TCEQ) provides requirements to ensure that public water systems supply safe drinking water to their customers. The recommendations identified within this report and in Appendix A for facility improvements were founded on the requirements set forth by TCEQ:

§290.43. Water Storage
(e) Facility security. All potable water storage tanks and pressure maintenance facilities must be installed in a lockable building that is designed to prevent intruder access or enclosed by an intruder-resistant fence with lockable gates. Pedestal-type elevated storage tanks with lockable doors and without external ladders are exempt from this requirement. The gates and doors must be kept locked whenever the facility is unattended.

§290.46. Minimum Acceptable Operating Practices for Public Drinking Water Systems
(m) Maintenance and housekeeping. The maintenance and housekeeping practices used by a public water system shall ensure the good working condition and general appearance of the system's facilities and equipment. The grounds and facilities shall be maintained in a manner so as to minimize the possibility of the harboring of rodents, insects, and other disease vectors, and in such a way as to prevent other conditions that might cause the contamination of the water.

5.2 Flow, Pressure and Storage

In addition to site improvements, TCEQ also regulates water system design requirements. The following Table 5-1 compares TCEQ requirements to those adopted by previous Celina CIPs and industry standards. Design criteria were selected for this water model based on a combination of industry standards, International Fire Code recommendations, City preference, and TCEQ requirements.

Table 5-1: Water System Design Criteria Summary

System Element	TCEQ	Industry Design Standards	Water Model
Water Supply (gpm/connection) @ Max Day	0.6 gpm/connection min.	1.62 gpm/connection (Max Day)	1.62 gpm/connection (Max Day)
Min. Normal Operating Pressure	35 psi min.	40 psi	35 psi (minimum)
Min. Residual Pressure Under Combined Fire and Drinking Water Demands	20 psi	20 psi	20 psi
Min. Static Pressure		40-60 psi	40-60 psi
Elevated Storage	100 gal/connection 200 gal/connection if no ground storage Must be at least 80 feet above highest service connection in the pressure plane served.	NA	15% of Maximum day Demand
Ground Storage		NA	130 gal/capita
Total Storage	200 gal/connection	Sum of elevated and ground storage requirements.	Sum of elevated and ground storage requirements.
Fire Flows	250 gpm min for at least 2 hrs 20 psi minimum sufficient water pressure	Residential = 1,000 gpm Lt Mercantile = 1,500 gpm Industrial and Principal Mercantile = 3,000 gpm	Residential = 1,000 gpm Lt Mercantile = 1,500 gpm Industrial and Principal Mercantile = 3,000 gpm
High Service Pumping	If elevated storage is at least 200 gal/connection, each pressure plane or pump station must provide 0.6 gpm/connection All pump stations must have two or more pumps per pressure plane.	Max Day demand plus fire flows	Max Day demand plus fire flows

(Continued on following page)

Table 5-2: Water System Design Criteria Summary (Continued)

System Element	TCEQ	Industry Design Standards	Celina Design Standard
Water Mains	Number of Conn. / Min Line Size (in) 10 / 2 25 / 2.5 50 / 3 100 / 4 150 / 5 250 / 6 >250 / 8 and larger No new lines under 2" in diameter are allowed.	Minimum main providing fire protection: 8" Minimum line size serving Single Family Residential: 8" Minimum line size serving other than Single Family Residential: 8" Maximum looped line length: 3,000 feet Maximum dead end length: 1,200 feet	Minimum main providing fire protection: 8" Minimum line size serving Single Family Residential: 8" Minimum line size serving other than Single Family Residential: 8" Minimum line size for residential mains >600ft or serving more than one fire hydrant or fire lane: 12" Otherwise: 8" Minimum line size for commercial, schools, manufacturing mains <1000ft: 12"
Maximum Pipe Velocities	Water: No direction	Water: <10 ft/s	Water: 2-8 ft/s

Section 3 of this report detailed the current and future flow rates that will be applied to the model.

5.2.1 Storage Evaluation

The Celina water distribution system is divided into high and low pressure planes. A summary of the number of connections is in Table 5-3.

Table 5-3: Existing Connections by Pressure Plane

Pressure Plane	Connections
High Plane (Existing)	1794
Low Plane (Existing)	1850

However, there are 75 existing connections on the north side of the system that will be moved to the low pressure plane in a near-term CIP project with a trigger date in October 2017. These considerations are taken into account in the updated Table 5-4.

Table 5-4: Updated Connections by Pressure Plane

Pressure Plane	Connections	Connections: After CIP Project 4 - E
High Plane (Expected - 2017)	2555	2480
Low Plane (Expected - 2017)	3008	3083

The City is also in design of a new 2.0 MG elevated storage tank which will would replace the Downtown GST and Morgan Lake during proposed CIP projects. Using the TCEQ Design Criteria from Table 5-1, the required total storage was determined for current, 2022, and buildout conditions. A summary of the current, required, and additional storage volume that will be needed in the future is summarized for both the low and high pressure planes in Table 5-5.

Table 5-5: Summary of Storage Requirements for Pressure Planes

	Storage (MG)					
	Required		Available		Additional Needed	
	Total	Elevated	Total	Elevated	Total	Elevated
High Plane						
Current	0.39	0.20	0.69	0.54	None	None
2022	1.56	0.78	2.0	2.0	None	None
Ultimate Buildout	12.16	6.08	2.0	2.0	10.16	4.08
Low Plane						
Current	0.43	0.21	2.0	1.0	None	None
2022	1.54	0.77	2.0	1.0	None	None
Ultimate Buildout	19.5	9.75	2.0	1.0	17.5	8.75

6.0 Water Model Development

The modeled distribution system for the City of Celina consists of the pipe network, UTRWD supply connection, groundwater well infrastructure, elevated and ground storage, and pumping infrastructure that allow the City to supply potable water to its customers. A hydraulic model representation of the physical system has been created using Bentley WaterGEMS V8i (WaterGEMS). The following sections detail components of the hydraulic model development process.

6.1 Pipe Network

The pipe network was developed based on the City's GIS database. The existing GIS pipe database was imported into WaterGEMS using the ModelBuilder tool, which allowed the pipe locations, lengths, and sizes listed in the GIS database to be directly converted to pipe attributes within the hydraulic model. The connectivity of the pipe network was refined through discussions with City personnel, cross-referencing with the previous hydraulic model, and engineering judgment to determine the most reasonable assumptions where data gaps existed.

6.2 Elevated Storage Tanks

The base, minimum, and maximum (overflow) levels for each elevated tank were specified in the model based on annual inspection reports, GIS data, and previous model values. These values are listed in Table 6-1. Storage versus level relationships were based off approximate representative diameters for each of the elevated storage tanks.

Table 6-1: Elevated Tank Elevations

Facility	Base Elevation	Minimum Elevation	Maximum Elevation
High Plane			
Morgan Lake EST	797	880	917
Low Plane			
Downtown EST	696	789	813
Light Farms EST	639	795	835

6.3 UTRWD Meter Station Connections

UTRWD provides water to the City at the Celina Road Pump Station. This connection was modeled as an infinite supply reservoir with a hydraulic grade line sufficient to provide flow to the Celina Road GST.

6.4 Ground Storage Tanks

Ground storage is provided at the Celina Road PS, Downtown PS, and Morgan Lake PS. At each of these facilities, pump stations draw suction off the GSTs and boost the pressure. The Celina Road PS conveys water to the low pressure plane. The Downtown and Morgan Lake PS convey water to the high pressure plane. The base, minimum, and maximum levels for each ground storage tank were specified in the model based on annual inspection reports, GIS data, and previous model values. These values are listed in Table 6-2.

Table 6-2: Ground Storage Tank Elevations

Facility	Base Elevation	Minimum Elevation	Maximum Elevation
High Plane			
Morgan Lake GST	795	795	895
Downtown GST	692.5	692.5	716.5
Low Plane			
Celina Road GST	623	663	663

6.5 Junction Elevations

Junction elevations were assigned based on contour data for the area using the automated Trex (Terrain Extractor) tool within WaterGEMS. For the majority of the CCN, 2-foot contour data was available. This level of precision is suitable for distribution system modeling, as an elevation error of 2 feet will result in a pressure error of approximately 0.9 psi.

6.6 Downtown PS

The Downtown PS takes suction off the Downtown GST and pumps water to the high pressure plane. The Downtown GST is fed by the low pressure plane, so the Downtown PS acts as a booster pump station to convey water from the low pressure plane to the high pressure plane. The Downtown wells also supply water to the Downtown GST, which is subsequently pumped to the high pressure plane via the Downtown PS.

There are four pumps at the Downtown PS. The pump curves for each set of pumps were defined in the model using multiple point curves based on values in the previous hydraulic model.

6.7 Celina Road PS

The Celina Road PS takes suction off the Celina Road GST and pumps water to the low pressure plane. The Celina Road GST is fed by the UTRWD connection. The Celina Road PS provides all the flow to the system aside from that which is produced by the City's wells. The three identical pumps were defined in the model using multiple point curves based on values in the previous hydraulic model.

6.8 Morgan Lake PS

The Morgan Lake PS takes suction off the Morgan Lake GST and pumps water to the high pressure plane. The Morgan Lake GST is fed by the Morgan Lake Well, so the Morgan Lake PS acts as a booster pump station for that well. There are two pumps at the Morgan Lake PS, and these two pumps were defined in the model based on a single design point obtained from the previous hydraulic model.

6.9 Pressure Zone Isolation Valves

The distribution system is divided into two pressure planes. In general, the low pressure plane (lower elevations, lower hydraulic grade line) encompasses the western portion of the system and the high pressure plane (higher elevations, higher hydraulic grade line) encompases the eastern portion of the

system. The pressure planes are divided by the Downtown GST and PS, as discussed previously. Additionally, there is a 10-inch line across Preston Road north of Pecan Street, near Celina Middle School. This line is typically closed to isolate the low pressure plane (on the west side of the line) from the high pressure plane (on the east side of the line).

6.10 Demands

The overall model demands (or projected water usages) outlined in Section 3 were used to create model demand alternatives in the hydraulic model. Average and maximum day demand alternatives were created for the following scenarios:

- Existing (2016)
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- Ultimate Buildout

The existing demands were used as a baseline for development of the other demand alternatives.

The procedure for spatial distribution of the existing demand across the City's network is described in Section 6.10.1, and procedures for developing the existing diurnal curves utilized to develop the temporal variation in demands are described in Section 6.10.2.

6.10.1 Spatial Variability of Demand

Billing records and geocoded meter locations were provided by the City. The billing records were utilized to determine the usage for individual accounts during average and peak demand periods. The usage values were adjusted to account for non-revenue water in the system, and the demands were allocated spatially using the LoadBuilder tool within WaterGEMS.

6.10.2 Diurnal Demand Curves

Diurnal curves are used to capture the temporal variation in demands throughout a daily period. There are two general approaches for developing diurnal curves, top-down and bottom-up. Top-down approaches utilize flow and storage level data for all the main system components (i.e., system connections, pump stations, GSTs, ESTs, etc.) to perform mass balance calculations. Specifically, top-down approaches solve for the the usage in the system throughout the day by utilizing the equation *[Inflow] – [Outflow] = [Change in Storage]*. Typically, these calculations are performed on a pressure plane scale. The City did not have adequate historical flow and level data to complete a top-down analysis during this project.

The other general approach is a bottom-up analysis. This approach utilizes diurnal curves for each customer, and the overall diurnal curve is aggregated as a function of the individual diurnal curves and demands. A bottom-up approach was utilized in the current project consisting of the following steps:

1. Accounts were categorized based on type of account (e.g., single family residential, multi-family residential, commercial, school) and, for some types, water usage (e.g., low, medium, high).
2. Accounts were identified within each subset, and smart meter data was provided by the City for the accounts.
3. Representative average and maximum day diurnal curves were assembled for each of the account subsets.
4. The representative diurnal curves were applied to the associated demands during the load allocation through the WaterGEMS LoadBuilder tool.
5. Overall resultant diurnal curves were generated and reviewed to ensure they were within the expected range of variation.

6.10.3 Future Demand Allocation

Demand allocation for the Ultimate Buildout demand alternatives was completed using parcel shapefiles with associated future land use classifications and areas, with the Existing (2016) demand alternatives serving as the base alternatives. The composite average and maximum day diurnal curves developed for the existing system were applied to all the added demands. Figure 6-1 shows the diurnal curves for both the average day and maximum day demands.

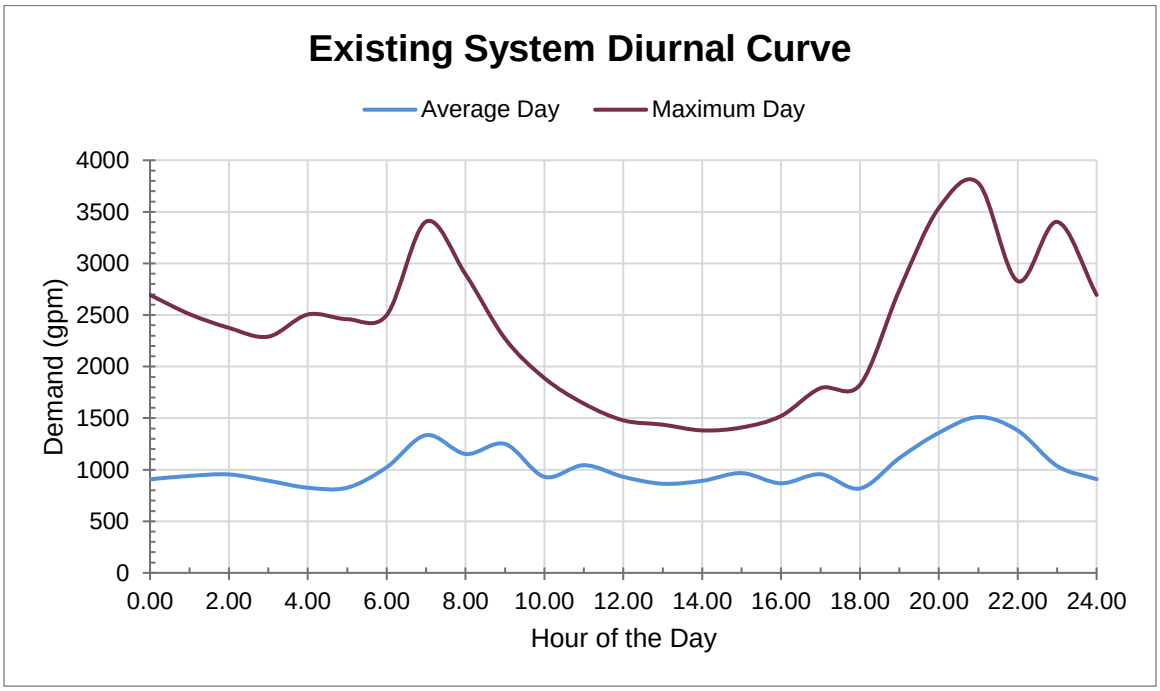


Figure 6-1: Existing (2016) Diurnal Curves

Demand allocation for the 2017 to 2022 demand alternatives was completed using subdivision shapefiles, takedown schedules, and per area demands as discussed previously in the demand projection development section. Again, the Existing (2016) demand alternatives served as the base alternatives to develop the 2017 to 2022 demand alternatives. And, as for the Ultimate Buildout, the composite average and maximum day diurnal curves developed for the existing system were applied to all the added demands.

6.10.3.1 Future Water Supply

The City is currently subscribed to the UTRWD for a maximum usage rate of 2.5 MGD, indicating the immediate need for additional water allocation. Preliminary water allocation discussions with the City indicate that potential options for future water include additional allocation from UTRWD, addition of new groundwater wells, the potential for regionalization to the north with the Greater Texoma Utility Authority (GTUA), and becoming a customer member of NTMWD.

Initial discussions with the GTUA indicate that regional partnership is only in the initial stages and many years out.

Discussions with the NTMWD indicate that the potential to become a water customer would likely occur prior than the opportunity to become a sewer customer, and are dependent upon the successful completion of the proposed Lower Bois D'arc reservoir. This completion date is currently outside the 2023 timeframe.

Therefore, the five year build-out assumes that all future water is being provided by the UTRWD. Ultimate buildout projections assume the City will be served from the low plane by UTRWD, and NTMWD to the high plane. These projections should be updated as further regionalization talks occur.

6.11 Model Calibration

Model calibration is an important step in the modeling process as it provides an opportunity to evaluate the ability of the model to accurately reflect the actual system. Field data collection plans were created by Garver and executed by the City. The field data collection plan consisted of hydrant flow tests throughout the system. City staff recorded hydrant flows and pressures (static and residuals) in the field, and SCADA data (e.g., storage tank levels, pump status, etc.) were recorded for known system elements.

The field data results were used to refine the model. Specifically, pump speeds were adjusted down so that modeled static pressures more closely matched field observations. The adjustment in speed within the model was completed to reduce the head provided by the pumps for a given flow rate, which often occurs as pumps age. This is a model representation of a change in the performance of the pump. The calibration process identified areas where additional coordination was needed between Garver and the City to resolve connectivity issues, verify/update line sizes, etc. These updates were made, and the model was adjusted accordingly.

7.0 Water Model Results

Model scenarios were created for current and future system conditions. The current model included existing system elements, as well as improvements which are already included in the City's existing capital plans. Current model simulations are performed under both average and maximum day demand scenarios using 2016 demand values.

Infrastructure improvements were identified through discussions with City staff, evaluation of facilities, and analysis of model results. Improvements to address issues for the Current model scenarios were incorporated into the hydraulic model to assess the utility of the proposed projects.

Infrastructure needs were assessed using both short- and long-term development projections. Due to the rapid growth experienced by Celina in recent years and projected into the future, the short-term system evaluations were conducted on an annual basis for the years 2017 through 2022. This provided the City with anticipated needs for a 5-year window. Additionally, the ultimate buildout scenario was modeled in order to provide a long-term roadmap and ensure compatibility of short-term infrastructure improvements with anticipated long-term needs.

7.1 Current Water Model Results

7.1.1 Average Day Analysis

In general, distribution systems have adequate capacity during average day demand conditions. System-wide results for the current average day demand scenario are shown in Exhibits 2 through 4. Within the Celina distribution system, there are a few noteworthy areas during average day demand conditions:

- Pressures in the low plane vary from highs in the southwest (Creeks of Legacy) to lows in the downtown area. Specifically, pressures are low in the area east of the railroad tracks.
- Pressures in the high plane are sufficient; minimum pressures in the North Preston Lake Estates area approach 100 psi. Based on elevation, this area would be better served off the low plane. However, infrastructure does not exist to make that conversion from the high plane to the low plane immediately.
- Due to the locations of the Light Farms and Morgan Lake ESTs, there is potential for limited turnover in the tanks if adequate tank cycling is not achieved.
- Water age generally increases outward from the source. Therefore, areas of high water age include Creeks of Legacy, the Lakes of Mustang Ranch, and North Preston Lake Estates.
- Available fire flows of at least 1,000 gpm are available at most hydrants during average day conditions. In general, the low fire flow values are associated with small diameter lines, the area of the low plane east of the railroad tracks, and North Preston Lake Estates.

7.1.2 Maximum Day Analysis

Distribution systems are designed to provide adequate capacity for maximum day and peak hour demand conditions, including high-service pumping, elevated storage, and pipe transmission and distribution hydraulic capacity. System-wide results for the 2016 maximum day demand scenario are shown in Exhibits 5 through 7. Within the Celina distribution system, there are a few noteworthy areas during 2016 maximum day demand conditions:

- Pressures are generally good. As anticipated, they follow the same trends as for average day, but are lower. There are some areas of low pressure associated with higher elevation areas in each pressure plane.
- The higher demands (as compared to average day) reduce the system water age. In general, the water age is relatively low during the scenario. However, some elevated water age values are still seen at the edges of the system and in areas of relatively low demand.
- Similar to pressures, available fire flows follow the same trends as for average day with regard to spatial variation, but are lower in magnitude. For example, during maximum day, there are areas of the Lakes of Mustang Ranch with available fire flows of less than 1,000 gpm, which is a decrease of more than 500 gpm for some hydrants (as compared to average day).

7.2 Methodology for Near-Term Evaluations

Typically, modeling results during master planning studies will be presented that show results for a given demand condition with a baseline system and a proposed system. For example, the baseline system for the 2017 analysis would be the existing system conditions, which are the basis for the 2016 evaluation presented previously. Then, the proposed system would include any improvements necessary to rectify any issues identified due to the increase in demands. While that approach is typical, the rapid growth projected for Celina made the traditional approach problematic, as the rapid growth would make immediate improvements obsolete if not compared to the planning horizon.

The methodology employed for the near-term (through 2022) improvements was to assess the system with 2022 demands and determine the infrastructure improvements necessary to achieve the target level of service under those demands. Then, once all the infrastructure improvements had been identified and cross-referenced with anticipated needs for the ultimate buildout scenario, evaluations were completed in one-year increments starting with 2017. The 2017 demands were modeled, and the infrastructure improvements needed to supply those demands were identified and implemented. Subsequently, the 2018 demands were modeled and the additional improvements needed to meet those demands were identified and implemented in the model. This methodology was continued through 2022.

7.3 2017 Water Model Results

The results presented in this section are for scenarios with 2017 demands and the capital improvements necessary to provide adequate levels of service in the distribution system.

7.3.1 Average Day Analysis

System-wide results for the 2017 average day demand scenario are shown in Exhibits 8 through 10. Noteworthy results from the 2017 average day analysis include the following:

- Pressures generally follow the same trends as for the 2016 evaluation. However, the pressures in the downtown area are increased for two reasons. First, the Downtown EST was decommissioned. This allowed the hydraulic grade line of the low plane to increase, by maintaining higher levels in the Light Farms EST. Additionally, the downtown area east of the railroad tracks was transitioned from the low plane to the high plane. This allowed the area to be served off a higher hydraulic grade line, which increases the pressures. Pressure increases in

this area should be gradual and controlled via pressure reducing valves in order to minimize potential issues with line breaks due to the increased service pressure.

- Compared to the 2016 scenario, the increased overall demand generally improves water age. However, developing areas continue to suffer from high water age due to the relatively low initial demands and, generally, the remote location relative to the main supply and transmission infrastructure. For example, water age is high in the Chalk Hill addition, although that will reduce over time as that area is built out.
- Fire flows are generally good. Low values remain for a few hydrants in the downtown area and at dead end locations, such as North Preston Lake Estates.

7.3.2 Maximum Day Analysis

System-wide results for the 2017 maximum day demand scenario are shown in Exhibits 11 through 13. Noteworthy results from the 2017 maximum day analysis include the following:

- Minimum pressures are generally lower on maximum day than on average day. There are a few high elevation areas in the high plane that experience minimum pressures around 35 psi, due to levels in the Morgan Lake EST dropping during maximum day demand conditions. Proposed improvements to the Downtown PS will increase the supply to the high plane and reduce potential for storage depletion that can result in low pressures at high elevation locations within the system.
- Cambridge Crossing experiences higher minimum pressures during maximum day conditions than during average day conditions. This result is related to pump station operations at the Celina Road PS. During average day, that pump station cycles off, and during those times, the Light Farms EST sets the hydraulic grade line for the low plane. However, during maximum day, the Celina Road PS operates continuously, so the hydraulic grade line in the low plane is always a maximum at the Celina Road PS. Due to the proximity of Cambridge Crossing to the Celina Road PS, Cambridge Crossing also sees consistently elevated hydraulic grade line values and, subsequently, relatively high pressures.
- In general, water age is relatively low. The high water age areas are associated with additions that are starting the process of being built out.
- Fire flow results for maximum day are consistent with the results for average day, although the magnitude is generally reduced due to the additional system demands.

7.4 2022 Water Model Results

The results presented in this section are for scenarios with 2022 demands and capital improvements necessary to provide adequate levels of service in the distribution system.

7.4.1 Average Day Analysis

System-wide results for the 2022 average day demand scenario are shown in Exhibits 14 through 16. Noteworthy results from the 2022 average day analysis include the following:

- Minimum pressures are generally at least 50 psi on average day. There is one area with minimum pressures less than 50 psi, which is along Louisiana Drive near Preston Estates Drive and Old Preston Trail. This is an area of high elevation in the low pressure plane, which results in relatively low pressures compared to the rest of the system.

- In the low plane, the area around the Light Farms EST is a potential area of concern for water quality. It will be important to provide adequate cycling of the Light Farms EST to minimize potential issues associated with system water quality.
- In the high plane, the North Preston Lake Estates remains a location with high water age. Additionally, the area downstream of the new SE Sector EST has potential for high water age and associated reduced water quality. Similar to the discussion for the low plane, it will be important to achieve adequate cycling of the SE Sector EST to minimize potential issues associated with system water quality.
- Fire flows are generally very good. The fire flows for North Preston Lake Estates have been improved by looping with a new line from the east.

7.4.2 Maximum Day Analysis

System-wide results for the 2022 maximum day demand scenario are shown in Exhibits 17 through 19. Noteworthy results from the 2022 maximum day analysis include the following:

- The downtown area of the low plane experiences lower pressures during maximum day conditions than during average day conditions; a significant portion of the downtown area experiences minimum pressures less than 50 psi on maximum day.
- System water age is significantly improved for maximum day, as compared to average day. The North Preston Lake Estates area remains an area of concern, due to the remote location and limited demands. Cycling of the elevated storage tanks is improved, as well, which results in lower water age associated with those tanks and the areas downstream of the tanks.
- Available fire flows remain good during maximum day demand conditions, due to the system-wide improvements.

7.5 Future Water Improvements

As discussed previously in Section 3.0, the population and flow projections form the basis of design for water and wastewater system modeling. Future water improvements were designed based on water model results for the ultimate buildout. The City of Celina Population and Flow Projection Tech Memo summarizing the current and ultimate buildout projections was submitted to the City separately from this report on July 8, 2017. The buildout water improvements can be seen graphically in Exhibit 30.

8.0 Recommended Water Improvements

8.1 Project Identification and Ranking

In order to accurately define the need for an improvement to the system, several key factors were identified as a trigger for a project. These triggers were developed in conjunction with the previously established design criteria. One identified area of need may have several triggers which necessitate a need for one set of improvements to address all issues (i.e., one area of low pressure may not meet TCEQ requirements or recommended fire flows).

The identified triggers are as follows (in order of priority, from greatest to least):

1) Regulatory
   The regulatory requirements which would qualify in this category include TCEQ regulations identified in the design criteria section. For example, failing to meet a minimum residual pressure of 20 psi in the model under combined drinking water and fire flow demands would activate this trigger, or failure to meet minimum TCEQ storage capacity. Additionally, TCEQ design and facility requirements such as site security would activate this trigger.

2) Capacity
   This trigger is activated if a section or area of the system is not able to provide the modeled flow during peak demand or elevated storage to all meters within that portion of the system.

3) Fire flow
   This trigger is activated during the fire flow modeling scenario, if that portion of the system is not able to meet the minimum required flow rates.

4) Condition
   Condition triggers are activated based upon deteriorating conditions of existing infrastructure. This trigger is activated if the field investigations of the water storage and pumping facilities determine rehabilitation is needed, and/or the asset is reaching the end of its useful life. City staff input was utilized to identify known pipe condition issues in the distribution system.

5) City-Identified
   City-identified triggers include areas of pipeline City staff have identified that are anticipated to be replaced (such as replacing 4-inch pipe with a larger size transmission). Policies that impact an improvement, such as requiring new 10-inch pipe for any improvements along Preston Road or the defined looping and dead end criteria, can also activate this trigger.

6) Operational
   Operational triggers are activated when an improvement will provide increased operational benefit, such as decommissioning aged infrastructure. Looping and dead end requirements would also be captured in this trigger (as those types of improvements would improve water quality and minimize flushing requirements).

Once these triggers were identified, any area within the existing system that activated one of these criteria was identified to be addressed through improvements. A modeling analysis was conducted to determine the most cost-effective improvements to implement, while providing the maximum impact with minimal infrastructure for current and future system growth.

Improvements that shared the same triggers were then categorized into alphabetical groupings based on proximity and need being addressed. For example, a low fire flow in one portion of town may be addressed by multiple new pipelines. These pipelines would share the same trigger, and the same geographic area. Therefore, they would be grouped into one alphabetized category (i.e., Group C).

The most critical, immediate needs were given highest priority, and consideration was also given to the greatest service area impacts for each improvement. The resultant project identification and rankings list, located in Appendix C, provides the City with a directory of the most critical needs addressed.

8.1.1 Project Subgroupings

Following initial project identification and priority ranking, Garver and the City identified the main drivers necessitating each project. Three primary drivers were identified and consisted of: 1) development driven projects, which are driven by the system expansion due to development, 2) operational projects, which aimed to improve current operations and reduce operations and maintenance costs, and 3) fire flow projects which will improve the fire flow level of service in identified areas.

8.2 Water Restrictions

8.2.1 General

Water restrictions are conservation plans that limit outdoor watering based on time, type, and location. Typically, during various stages of drought, different levels of water restrictions are applied. The most common forms of drought staging include four stages with increasing limitations on outdoor water use with the most serious stage prohibiting the use of watering outdoors. Water restrictions typically limit outdoor watering to specific days and in between certain times during the day. Other types of water restrictions may limit outdoor water use based on a locational zone or address number. Exceptions to water restrictions may also be applied based on the type of irrigation or watering system being used.

8.2.2 Existing Restrictions

8.2.2.1 Celina

The City of Celina does not currently list water restrictions on its public website. The City of Celina website does identify that the City is a member of the Water IQ program and lists resources and means to conserve water. Currently, a tip is posted to water early (before 10:00 am) or late (after 6:00 pm) to reduce water loss by evaporation.

8.2.2.2 UTRWD

UTRWD recommends a water conservation plan and also incorporates a drought contingency plan as required by TCEQ during drought or emergency conditions. UTRWD uses four drought and emergency

response stages. UTRWD identifies requirements for initiation of each stage in their drought contingency plan. The stages and water use restrictions and reductions measures suggested for each stage are detailed below in Table 8-1.

Table 8-1: UTRWD Stage Restrictions

Stages	Restrictions
Stage 1: Water Wise	• UTRWD Water Conservation Plan limiting outdoor irrigation to two days per week becomes mandatory • UTRWD Water Conservation Plan limiting time of day irrigation schedule becomes mandatory • Request voluntary reductions in water use by the public and by customers
Stage 2: Water Watch	• All requirements from Stage 1 • Prohibit recreational water use • Restrict washing of motor vehicles to hand-held bucket or hand-held hose with postivie shut-off nozzle • Require reduction of water use through mandatory day-of-week watering schedule
Stage 3: Water Warning	• All requirements from Stages 1 and 2 • Irrigation of landscaped areas limitied to one day per week between the hours of 6:00 am and 10:00 am and between 6:00 pm and 12:00 am • Irrigation of landscaped areas using a hand-held bucket, hose, or drip irrigation system may be on any day limited to between the hours of 6:00 pm and 6:00 am • Vehicle washing restricted to commercial car wash facilities • Suspend issuance of permits for new swimming pools, hot tubs, spas, and ornamental ponds • Implement rate surcharge on retail usage
Stage 4: Emergency	• All requirements from Stages 1, 2, and 3 • Irrigation of landscaped areas is prohibitied, except for foundations and trees which may be watered for 2 hours per day with a hand-held bucket, hose, or drip irrigation system • Prohibit vehicle washing • Increase rate surcharge applicable to retail customers

UTRWD has recommended a watering schedule for their major members and customers as follows:

- No more than two days per week (automatic systems or hose-end sprinklers)
- No outdoor watering from 10:00 am to 6:00 PM (automatic systems or hose-end sprinklers)
- Watering with hand-held hoses, soaker hoses, or drip irrigation systems is allowed any time

8.2.3 Recommendations

As a water conservation plan, it is recommended to implement City-wide restrictions based on odd/even address watering schedules, or similar. Garver recommends the following schedule for the City:

- Monday - No watering allowed
- Tuesdays and Fridays - Non-residential sites
- Wednesdays and Saturdays - Residential addresses ending in even numbers
- Thursdays and Sundays - Residential addresses ending in odd numbers

The allowable watering time should be implemented in a way to reduce the peak impact on the system. For 2017, the maximum day diurnal curve is included below as Figure 8-1.

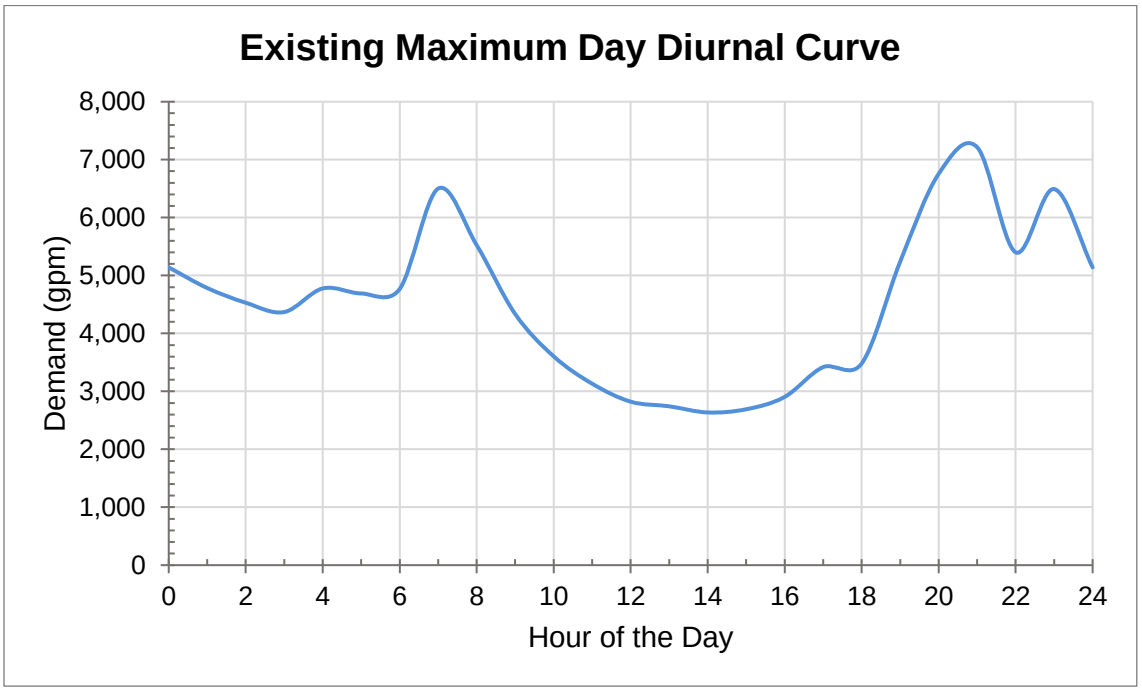


Figure 8-1: Existing Maximum Day Diurnal Curve

As shown in Figure 8-1, the peak demands occur between 6:00 AM and 8:00 am and between 7:00 PM and 12:00 AM. Therefore, Garver recommends placing water restrictions that outdoor watering with automatic irrigation systems or hose-end sprinklers should not occur during the hours of 6:00 AM to 9:00 PM. These restrictions are more stringent than those developed by UTRWD.

However, this schedule should be closely coordinated with the UTRWD to ensure that it meets the best interest of their regional usage patterns. Restrictions based on zones are not recommended because they would place a burden on specific areas of the high and low planes and would require more storage capacity. Restrictions based on odd/even addresses evenly distributes water usage across the City.

These measures should be implemented in a non-peak usage time (from October through February), to allow customers adequate time to reprogram irrigation timers and to raise public awareness of the new restrictions. Implementing new restrictions during a non-peak time will also reduce the possibility of higher demand caused by unequal customer implementation of the new restrictions.

A City-wide educational effort is recommended to gain public participation in implementing the new watering restrictions. Active community participation, such as water sprinkler programming seminars, circulars attached to water bills, and local media advertisements, will raise awareness of the new restrictions and encourage public acceptance and involvement.

During emergency and drought conditions, it is recommended the City follow the UTRWD Drought Contingency Plan as it is applied to customers of UTRWD.

8.3 Operations and Energy Efficiency Recommendations

8.3.1 Tank Mixing and Cycling

Modeling for the water age study assumed tanks in the system were completely mixed. The degree of mixing within tanks depends on a number of factors, including the size, geometry, fill/draw rates, inlet/outlet piping, and tank cycle range. Inadequate mixing can result in tank stratification, with the result being that water in the top level remaining in the tank for extended periods that lead to water quality issues.

Tank mixing is important for water quality. However, it is only one component. Adequate turnover of the tank, which limits hydraulic detention time in the tank, is also necessary. For example, in a completely mixed tank, if 25% of the water is replaced each day, the average hydraulic detention time for the water in the tank will be 4 days. However, if 50% of the water is replaced each day, the average hydraulic detention time will be only 2 days.

8.3.2 Water Age Versus Residual

Water age is typically an indicator of disinfection by-products (DBPs) for systems that utilize chlorine disinfection as their primary disinfectant. As the water ages, more DBPs are formed. These levels can approach or exceed EPA limits for those constituents, depending on total age, organic carbons in the water, and water temperature. Water ages exceeding 3 days are generally considered an area of concern.

TCEQ recommends the following steps to limiting nitrification and improving water quality within chloraminated systems:

- Optimize the chloramination process.
  This would require bench top studies to evaluate the current water supply by UTRWD, which may change seasonally, and evaluating what levels of chlorine and ammonia must be fed to maintain the proper residual.
- Reduce water age.
  This has been accomplished to the extent possible through the existing infrastructure by the proposed projects. Additional steps the City could take would include implementation of a flushing program targeting areas of concern, implementation of tank mixing apparatus (which come in solar-powered models to maintain energy efficiency) and seasonally adjusting the tower levels, depending on demand. However, care must be taken to maintain the adequate storage requirements within each tank to cover average day demand.
- Replace aging infrastructure.
  This is accomplished through the implementation of the proposed Capital Improvements Plan.

Executing these recommended steps will assist in reducing overall water age, while improving chloramine residual throughout the system.

8.4 Water Infrastructure Improvements

See Appendix C for detailed infrastructure improvements, cost estimates, and recommendations. A contingency factor of 30% has been applied to accommodate unforeseen design considerations and changes in market pricing. The water CIP projects can be seen graphically in Exhibit 28.

A summary of proposed projects, time-frame for implementation, and forecasted costs is displayed in Table 8-2.

Table 8-2: Water Capital Improvements Summary

Project Identification			Schedule	2017 Cost ($1000)[1]
Project	**Group**	**Description**	**Trigger Date**	**OPCC**
1	B	Downtown EST shutdown and SCADA switchover	Feb-17	$0
2	A	Capacity upgrades to CRPS and installation of 4 new pumps	Feb-17	$6,305
3	H	Capacity upgrades to DTPS and installation of 3 new pumps	Feb-17	$5,173
4	E	12" line and valves to switch LPP to HPP	Oct-17	$171
5	F	18", 30" and 36" line along Celina Road from CRPS	Oct-17	$7,939
6	G	24" and 30" lines to Downtown GST	Oct-17	$5,588
7	J	24" and 30" discharge lines from DTPS	Oct-17	$3,490
8	D	18" and 24" line to Morgan Lake area	Oct-18	$4,730
9	C	18" line along Cypress Creek Way	Oct-18	$312
10	L	Additional capacity upgrades to CRPS	Oct-18	$536
11	Z	New 6 MG GST at CRPS	Oct-18	$7,619
12	R	Additional capacity upgrades to DTPS	Oct-18	$556
13	K	Decommision Morgan Lake facilities	Mar-19	$145
14	AB	SCADA improvements	Oct-19	$312
15	AA	8" line upgrades in Downtown area	Oct-19	$22,390
16	M	12" line along Settlers Ridge	Oct-19	$3,308
17	Q	Additional capacity upgrades to CRPS	Oct-19	$556
18	AC	2020 5-year Master Plan	Oct-20	$200
19	P	8", 12", and 18" line from Morgan Lake to DC Ranch	Oct-19	$5,119
20	O	24" line to increase capacity in the Low Pressure Plane	Oct-20	$5,340
21	T	18" and 24" lines along Hwy. 455	Oct-20	$2,387
22	S	18" and 24" lines along Legacy Drive	Oct-21	$3,353
23	X	8" and 24" lines to connect Preston Lakes to Preston Road Corridor	Oct-21	$4,175
24	W	8" and 12" line along E. Malone St. and Preston Road	Oct-20	$612
25	V	8" lines in the Low Pressure Plane	Oct-20	$547
26	Y	18" line from the Parks at Wilson Creek to Lakes at Mustang Ranch	Oct-21	$2,939
27	U	12" line from Preston Road to Morgan Lake Estates	Oct-21	$342
		Total 2017 OPCC:		**$94,141,277**

(1) Project Costs are the Opinion of Probable Construction Costs (OPCC) based in year 2017, and include Engineering and Contingency. A three percent escalation for inflation to the Trigger Date month and year has been added for a Forecasted Cost in Appendix C.

Table 8-3 divides up the projects by their subgroupings as described in Section 8.1.1.

Table 8-3: Water CIP – Project Subgroupings

Project Identification			Schedule	2017 Cost ($1000)[1]
Project	**Grouping**	**Description**	**Trigger Date**	**OPCC**
Development Driven				
1	B	Downtown EST shutdown and SCADA switchover	Feb-17	$0
2	A	Capacity upgrades to CRPS and installation of 4 new pumps	Feb-17	$6,305
3	H	Capacity upgrades to DTPS and installation of 3 new pumps	Feb-17	$5,173
4	E	12" line and valves to switch LPP to HPP	Oct-17	$171
5	F	18", 30" and 36" line along Celina Road from CRPS	Oct-17	$7,939
6	G	24" and 30" lines to Downtown GST	Oct-17	$5,588
7	J	24" and 30" discharge lines from DTPS	Oct-17	$3,490
8	D	18" and 24" line to Morgan Lake area	Oct-18	$4,730
9	C	18" line east of Light Farm EST along Cypress Creek Way	Oct-18	$312
10	L	Additional capacity upgrades to CRPS	Oct-18	$536
11	Z	New 6 MG GST at CRPS	Oct-18	$7,619
12	R	Additional capacity upgrades to DTPS	Oct-18	$556
16	M	12" line along Settlers Ridge	Oct-19	$3,308
17	Q	Additional capacity upgrades to CRPS	Oct-19	$556
18	AC	2020 5-year Master Plan	Oct-20	$200
19	P	8", 12", and 18" line from Morgan Lake to DC Ranch	Oct-19	$5,119
20	O	24" line to increase capacity in the Low Pressure Plane	Oct-20	$5,340
		Development Subtotal =		**$56,940,272**
Operational				
13	K	Decommision Morgan Lake facilities	Mar-19	$145
14	AB	SCADA improvements	Oct-19	$312
15	AA	8" line upgrades in Downtown area	Oct-19	$22,390
22	S	18" and 24" lines along Legacy Drive	Oct-21	$3,353
		Operational Subtotal =		**$26,199,874**
Fire Flow				
21	T	18" and 24" lines along Hwy. 455	Oct-20	$2,387
23	X	8" and 24" lines to connect Preston Lakes to Preston Road Corridor	Oct-21	$4,175
24	W	8" and 12" line along E. Malone St. and Preston Road	Oct-20	$612
25	V	8" lines in the Low Pressure Plane	Oct-20	$547
26	Y	18" line from the Parks at Wilson Creek to Lakes at Mustang Ranch	Oct-21	$2,939
27	U	12" line from Preston Road to Morgan Lake Estates	Oct-21	$342
		Fire Flow Subtotal =		**$11,001,131**
		Total 2017 OPCC =		**$94,141,277**

9.0 Existing Wastewater System

9.1 Overview

The City's wastewater system consists of the items summarized below:

- 407,600 LF of gravity sewer lines and 23,100 LF of force mains
- 987 manholes
- Eleven wastewater lift stations
- Downtown Wastewater Treatment Plant
- Doe Branch Line

An overall map of the existing wastewater system is included as Exhibit 20.

The City of Celina has an agreement in place to discharge wastewater to Upper Trinity Regional Water District via the Doe Branch Line. This contract allows 0.665 MGD to be received from the City.

Several studies were conducted as a part of this report to evaluate the condition of the existing infrastructure and evaluate current flow rates. Those items include:

- Lift station evaluation and condition assessment (included as Appendix B)
- Sewer basin temporary flow monitoring for a period of 60 days (separate report)
- WWTP process evaluation (separate report)

Descriptions of those efforts and the resultant findings are summarized in the following subsections.

9.2 Downtown Wastewater Treatment Plant

The City owns and operates a two-train wastewater treatment plant. One train includes an extended aeration oxidation ditch treating approximately half of the influent flow. The remaining flow is treated through the second train, which includes a flow-through sequencing batch reactor (SBR). The plant is currently permitted for an annual average daily flow of 0.5 MGD, and features mechanical bar screens, influent pumps, oxidation ditch, final clarifiers, SBR and chlorine contact basins. Solids processing is completed through a sludge holding tank, rotary fan sludge press, and disposal. The location of the WWTP is illustrated in Figure 9-1.

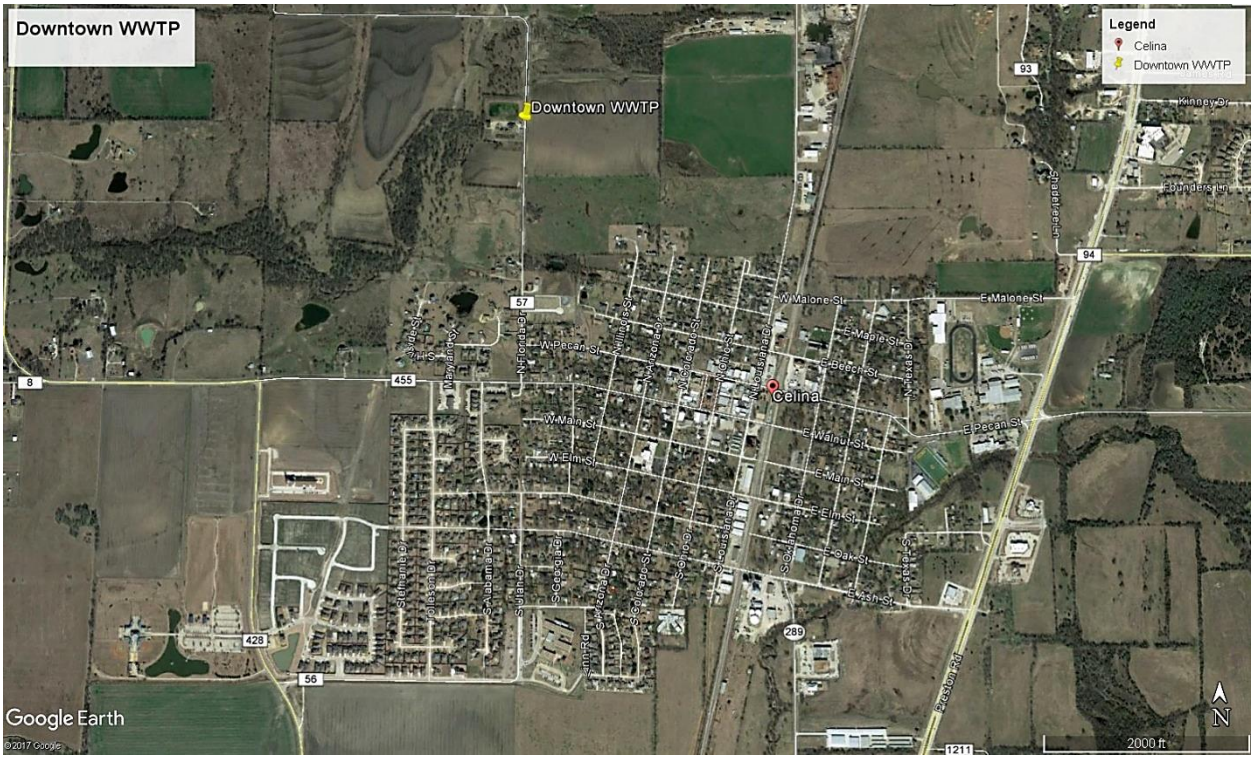


Figure 9-1: Downtown WWTP

9.3 Sanitary Sewer

Table 9-1: Wastewater System Sewer Inventory

Size (in.)	Total Length (ft)	Portion of System (%)
Unknown (4 or 6)	411	0.10
4	595	0.15
6	46,081	11.31
8	220,425	54.08
10	12,273	3.01
12	22,332	5.48
15	25,871	6.35
18	12,543	3.08
21	33,995	8.34
24	646	0.16
27	7,033	1.73
30	18,478	4.53
36	6,878	1.69
Total	**407,561**	**100**
*Includes only gravity pipes		

9.4 Lift Stations

The City of Celina owns and operates eleven lift stations which are used for the City's wastewater collection system. Most of the lift stations are within the Celina City East zone (northern portion of the City of Celina CCN service area), with the exception of Carter Ranch Phase II and High Point Lift Stations located south and east of the main cluster respectively. The eleven lift stations are listed in Table 9-2.

Table 9-2: Wastewater System Lift Stations

Facility	Pump Description and Size	Overall Condition
Winn Road	Flygt (two) MP 3068 with 3.8 HP motors	Fair
Parkside	Flygt (two) MP 3068 with 10 HP motors	Good
Old Celina Park	Hydromatic (two) HPG-200 with 2 HP motors	Good
Lucy's	Hydromatic (two) HPG-200 with 2 HP motors	Poor
Business 298 #1	Hydromatic (two) HPGH-750 PC with 7.5 HP motors	Fair
Shawnee Trail #1	Dayton (two) with 2 HP motors	Fair
Shawnee Trail #2	Hydromatic (two) with 2 HP motors	Fair
High Point	Hydromatic (two) with 7.5 HP motors	Poor
Carter Ranch Phase II	Flygt Pumps (three) with 7.5 (two) and 10 (one) HP motors	Good
Willock Hills	Flygt Pump (two) with 7.5 HP motors	Fair
Tolleson	NA (Tolleson was not inspected)	NA
General Physical Condition Rating Guidelines: *Good: no immediate attention required.* *Fair: requires some initial repair to remain in adequate working condition.* *Poor: requires replacement or reconstruction in the immediate future.*		

Garver conducted a site assessment of ten lift stations on April 2, 2016. The assessment included evaluation of service areas, staff interviews, record documents, O&M maintenance records, equipment cut sheets, surveys, and associated code requirements. The findings from that assessment were then compared to TCEQ regulations, and a list of proposed recommendations was developed.

A technical memorandum presenting the detailed evalutions and the findings of the assessment is included in this report as Appendix B.

9.4.1.1 Recommendations

A summary of the recommendations and estimated associated costs are included in Table 9-3 and Table 9-4. These recommendations and associated costs are anticipated to be implemented through the City's operational budget as funding allows. Therefore, these recommendations were not included in the Wastewater CIP as part of the main improvements recommendations.

Table 9-3: Summary of Recommendations

Lift Station	Recommendations	Cost
Winn Road	• Install SCADA interface • Install perimeter fencing with barbed wire and signage • Install ventilation pipe • Install gravity flow bypass and upon completion of future CIP project, decommission lift station	$45,500
Parkside	• Install SCADA interface • Equip site with back-up power capabilities • Install barbed wire and signage on perimeter wall • Widen driveway • Install chain to pull pumps	$54,600
Old Celina Park	• Install SCADA interface • Equip site with back-up generator capabilities • Install ventilation pipe • Install signage • Trim back overhanging tree limbs away from control panel	$42,600
Lucy's	• Install SCADA interface • Upgrade control panel • Equip site with back-up power capabilities • Install perimeter fence with barbed wire and signage • Improve roadway accessibility • Replace existing manhole cover with wet well access hatch • Install ventilation pipe • Consider abandoning lift station due to the condition of the site area and location of the lift station • Install gravity flow bypass and upon completion of future CIP project, decommission lift station	$82,100
Business 298 #1	• Install SCADA interface • Upgrade control panel • Equip site with back-up generator capability • Construct access roadway • Rehabilitate concrete slab and general landscaping • Install signage • Install ventilation pipe	$75,300
Shawnee Trail #1	• Install SCADA interface • Equip site with back-up generator capabilities • Install barbed wire on perimeter fence • Install ventilation pipe	$39,500
Shawnee Trail #2	• Install SCADA interface • Equip site with back-up power capability • Rehabilitate concrete pad and install slab supports • Extend access roadway • Add hinges to wet well access hatch • Install barbed wire on perimeter fence • Install ventilation pipe • Landscaping to clean up area	$46,400

(Continued on following page)

Table 9-4: Summary of Recommendations (Continued)

Lift Station	Recommendations	Cost
High Point	• Install SCADA interface • Equip site with back-up power capability • Construct access roadway • Install perimeter fencing with barbed wire and signage • Install ventilation pipe • Landscaping to improve site area	$56,900
Carter Ranch Phase 2	• Install gravity flow bypass and upon completion of future CIP project, decommission lift station • Demolish lift station	$25,000
Willock Hills	• Install SCADA interface • Construct access roadway • Rehabilitate wet well access hatch • Install ventilation pipe • Landscaping • Install gravity flow bypass and upon completion of future interceptor, decommission lift station	$53,000
Tolleson	• Demolish lift station	$25,000
Total OPCC		**$545,900**

9.5 Flow Monitoring

The purpose of the flow monitoring study is to establish current dry and wet weather flows at key locations and major drainage basins within the City. This data is then used to calibrate the hydraulic model and identify areas with the greatest I/I for future investigation.

Pipeline Analysis, LLC conducted the sanitary sewer flow and rainfall monitoring from April 27th to June 30th, 2016. Data and key findings were presented in a report, Sanitary Sewer Flow Monitoring and Lift Station Pump Performance Tests, dated August 2016, that accompanies this report as a separate document in an electronic format. The report presents wastewater flow data and rainfall totals, along with RDII and drainage basin rankings.

Wastewater flow data was obtained at user defined sampling intervals, typically 15 minutes, from six temporary flow meters installed inside manholes. Manholes were selected based on the amount of coverage area for each individual basin. Detailed area piping maps are within the report, and a summary of each location is displayed in Table 9-5.

Table 9-5: Temporary Flow Meter Location Summary

Flow Meter	Location	Pipe Size
Celina 001	1130 N Louisana Dr	21
Celina 002	7700 Blk N Florida Dr	15
Celina 003	302 N Florida Dr	21
Celina 004	13039 W FM 455	12
Celina 005	4667 Preston Rd	15
Celina 006	3328 Smiley Dr	36

Figure 9-2 presents a wastewater schematic diagram that graphically represents the association between each flow meter placed in the collection system. The flow meter sites determine the boundary of each monitored area. To determine the individual flow from Basin 002 (known as discrete flow), one must take the data recorded by Meter 002 (known as cumulative flow) and subtract the data from Meter 004. Discrete flow is used to determine the ranking of each metered basin and the individual wastewater contribution by area.

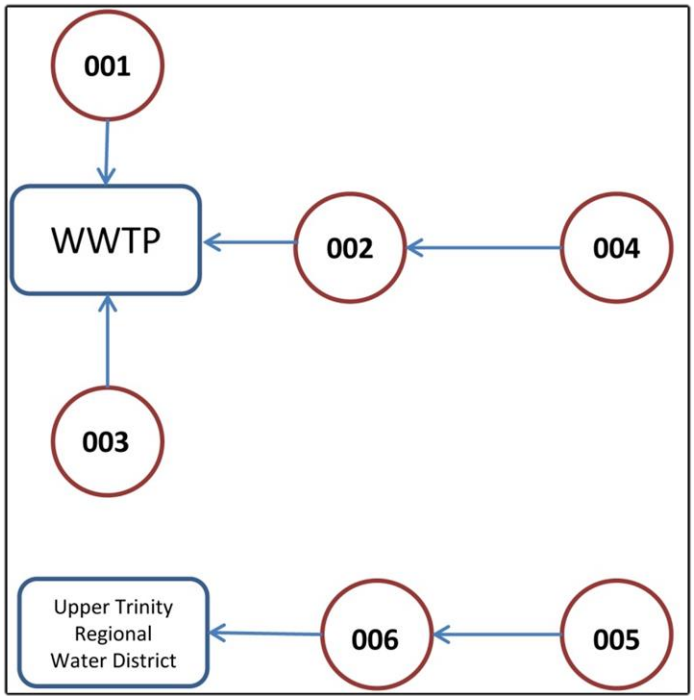


Figure 9-2: Flow Meter Schematic Diagram

Rainfall totals were also gathered from three temporary rainfall gauges installed throughout the City during the duration of the monitoring period.

9.5.1 Dry Weather Events,

Total daily wastewater volume during dry weather was determined from analysis of the dry weather period which occurred May 17th to 23rd, 2016. These days were representative of dry weather flow conditions with low groundwater infiltration potential. Dry weather data for each metering site is summarized in Table 9-6. Meter site 001 experienced very low flows throughout the monitoring period and while the peaking ratio was calculated, it compares a measurable peak flow rate to an unmeasurable average flow. As a result, the peaking ratio is of little value and shown as not applicable. Silt was not present at any of the meter locations during the monitoring period and dry weather surcharge was not observed.

The ratio of peak recorded liquid depth to the pipeline diameter (d/D) provides a method to gauge the capacity of the pipeline being utilized during dry weather. When the d/D ratio exceeds 50%, then the pipeline is over half full. Meter site 002 was observed to exceed a d/D of 50% during peak dry weather conditions.

Table 9-6: Dry Weather Summary

Descritption/Site	Meter 001	Meter 002	Meter 003	Meter 004	Meter 005	Meter 006
Dry Weather Period	5/17 - 5/23	5/17 - 5/23	5/17 - 5/23	5/17 - 5/23	5/17 - 5/23	5/17 - 5/23
Daily Average Flow (MGD)	0.00	0.37	0.15	0.21	0.14	0.26
Discrete Daily Average Flow (MGD)	0.00	0.16	0.15	0.21	0.14	0.12
Minimum Flow (MGD)	0.00	0.22	0.02	0.10	0.02	0.09
Maximum Flow (MGD)	0.02	0.62	0.59	0.43	0.40	0.51
Peaking Ratio	NA	1.68	4.03	2.07	2.94	2.00
Pipe Diameter (in)	21	15	21	12	15	36
Daily Average Level (in)	0.69	7.06	2.16	3.94	2.10	3.13
Minimum Level (in)	0.53	5.66	1.48	3.32	1.09	2.09
Maximum Level (in)	1.17	8.93	3.15	4.81	4.09	4.22
Peak Flow Depth/Diameter	6%	60%	15%	40%	27%	12%
Average Silt Level (in)	0	0	0	0	0	0
Daily Average Velocity (fps)	0.07	1.00	1.52	1.41	1.73	1.27

9.5.2 Wet Weather Events

Rainfall was recorded at three gauging sites with six significant storm events analyzed. The events averaged 0.62 inches, 0.86 inches, 0.80 inches, 0.72 inches, 3.00 inches and 2.77 inches. Figure 9-3 presents data from meter site 006. On June 11th and 12th of 2016, the storm event produces a dramatic peak in flow due to rainfall dependent inflow. Flows return to normal fairly quickly and little slow-response infiltration was observed.

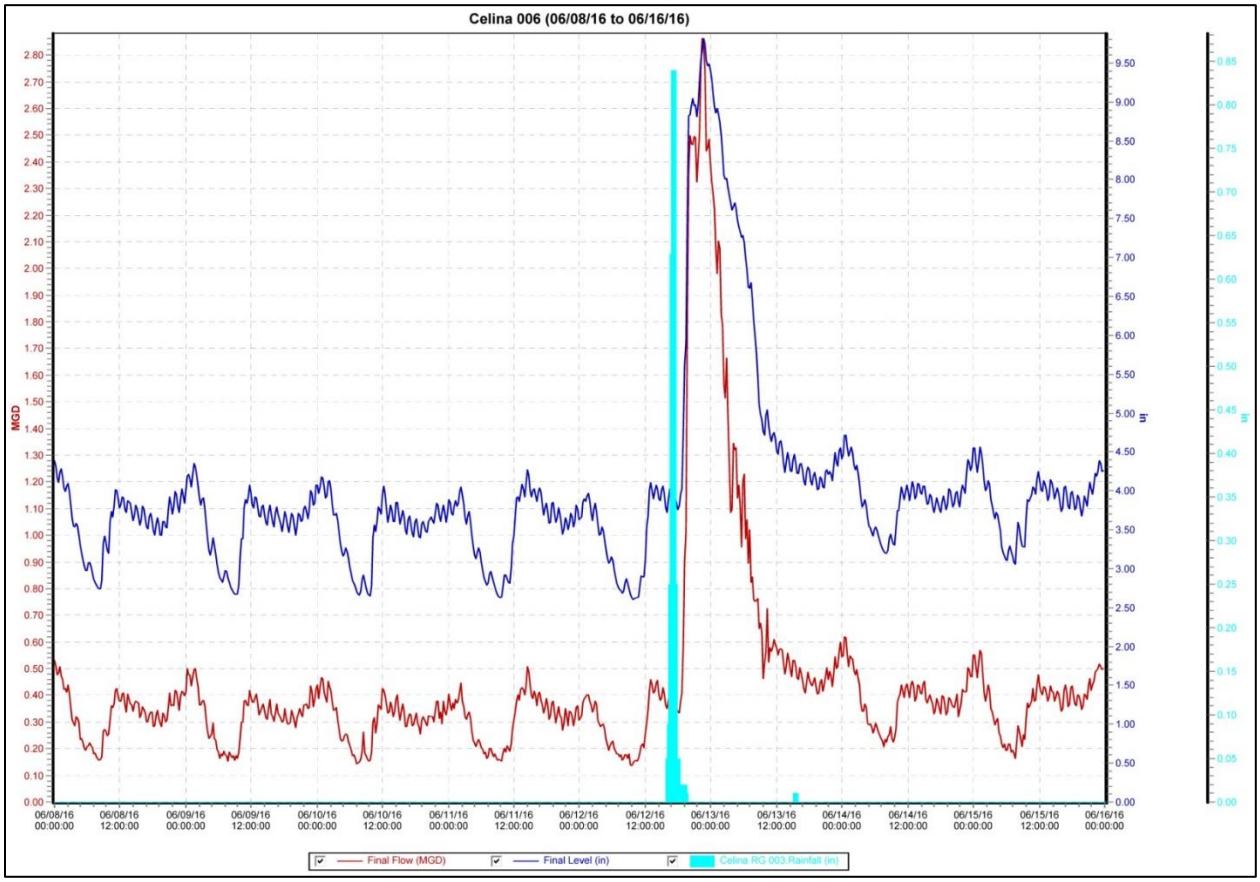


Figure 9-3: Wet Weather Flow at Meter Site 006

The wet weather analysis summarizes the system responses observed during the wet weather periods. The analysis computes the volume of wet weather I/I, also known as rainfall dependent I/I (RDII), which entered the collection system during the storm. The total discrete RDII for each meter basin was normalized using the average rainfall which established the rainfall dependent infiltration/inflow volume per inch of rainfall. Figure 9-4 presents the ranking of the metered basins based on the observed wet weather flows. It is important to note that this priority ranking does not take into account basin footage.

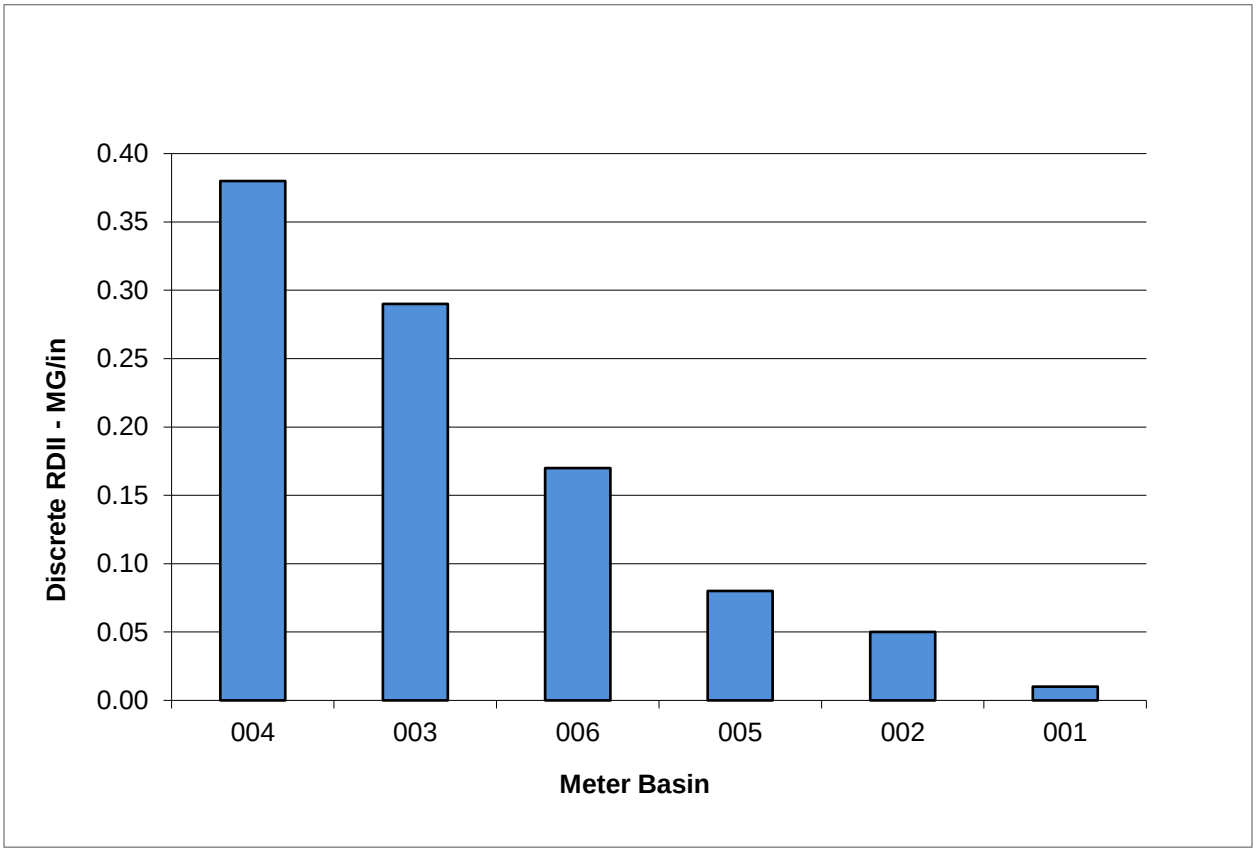


Figure 9-4: RDII Priority Ranking of Meter Basins

The major issue with wet weather inflow is the inability of the collection system to transport the peak flow rates due to the influx of extraneous rainfall dependent infiltration/inflow. Peak flows generally do not have long durations, but even short durations may create surcharge and the potential for Sanitary Sewer Overflows (SSO's). Figure 9-5 presents a summary of peak flow rates recorded compared to a representative average dry weather day. Wet weather surcharging was observed at meter sites 002 and 004 for at least one rain event during the monitoring period.

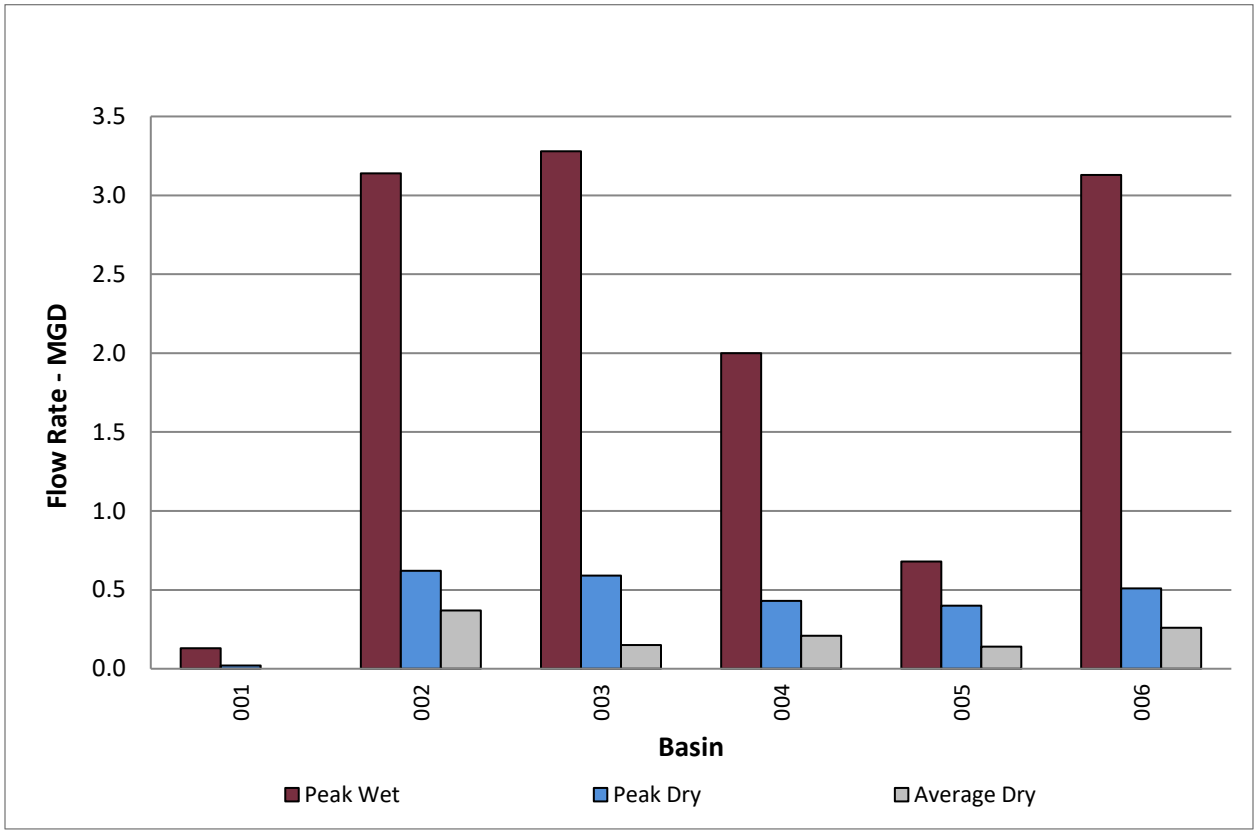


Figure 9-5: Peak Flow Rates-Dry Weather vs Wet Weather Comparison

Without rehabilitation, the rate of extraneous water that enters the collection system will increase over time. Defects within the collection system will continue to deteriorate and allow additional RDII to enter the system. Periodic rehabilitation will reduce (but not eliminate) RDII, restore system capacity, and extend the life of the underground assets.

The calculated RDII rate is 0.98 million gallons per inch of rainfall for the Celina collection system. In general, RDII rates can be highly variable spatially and temporally, and they depend, to some degree, on soil moisture conditions prior to the rainfall event. The data presented in this report is based on a higher than normal rainfall season. Using the normal annual precipitation of 33.7 inches, the annual projected wet weather RDII for the monitored areas is 33 million gallons (0.98 MG/in x 33.7 inches).

9.5.3 Conclusion

Extraneous water from infiltration/inflow (I/I) sources reduces the capacity of the collection system to transport wastewater and may result in SSO's. Infiltration and inflow occurs when existing sewer lines undergo deterioration. Groundwater infiltration may enter the collection system through defects such as open pipe joints, cracks, broken pipe, dropped joints, etc. Infiltration occurs, to some degree, at all times, and the dry weather flow includes both the wastewater loading and the base infiltration. However, during wet weather events and periods of elevated groundwater levels, the infiltration into the collection system

increases. Inflow, which is the rapid response portion of RDII, normally occurs when rainfall enters the sewer system through yard drains, missing cleanout caps, roof leaders, manhole covers and frame seals, storm sewer cross connections, etc.

The reduction in infiltration/inflow by rehabilitation and on-going operation and maintenance will extend the life of the collection system assets and restore capacity. Following is a summary of conclusions:

- Dry weather flows are adequately transported and treated without surcharge. Settling and debris was not noted at any of the sites during the monitoring period.
- Using the normal annual precipitation of 33.7 inches, the annual projected wet weather RDII for the monitored areas is 33 million gallons (0.98 MG/in x 33.7 inches).
- Hydraulic data from six metering sites and three rainfall gauges has been compiled. This data will be used for hydraulic model calibration.
- Priority ranking of basins based on RDII provides guidance for analysis of wet weather infiltration/inflow alternatives. It is important to note that this ranking does not take into account discrete basin footage.

10.0 Wastewater Design Criteria

Similar to the water distribution system, the wastewater system is regulated by criteria set by the TCEQ and the City of Celina's Standard Design Criteria set forth by both the City of Celina Engineering Department and Texas Administrative Code.

10.1 Site Security, Maintenance, and Housekeeping

The City of Celina requires, in addition to TAC regulations listed in Table 10-1, that roads used to access lift stations must be a minimum of 15 feet in width, as compared to the TCEQ minimum of 12 feet.

10.2 Wastewater Lift Stations

Lift stations were minimized in the system wherever feasible based on requests by the City. The parameters set forth by TCEQ for design of wastewater lift stations are detailed below.

10.2.1 TCEQ Requirements

The design criteria below summarizes the TAC 30 Chapter 217, subchapter C requirements for pumps, pump capacity, and electrical systems.

Table 10-1: Texas Administrative Code (TAC)

Parameter	Reference	Requirements
Site Requirements		
Site Access	§217.59 (a)	Road surface minimum width of 12 feet
Security	§217.59 (b)	(1) Restrict access by an unauthorized person (2) Intruder-resistant fence, or completely enclosed by intruder-resistant enclosure with approval by the executive director
Design Considerations		
Pump Controls	§217.60 (a)	Level control system provided
Dry Well Access	§217.60 (c)	Ladder/stair provided
Ventilation	§217.60 (d)	Ventilation (passive or mechanical) provided
Pumps		
General Requirements	§217.61 (a)	(1) Designed to prevent clogging (3) Pump must have greater than 3 inch diameter suction and discharge openings
Pumping Capacity	§217.61 (c)	At least two pumps present. Firm pumping capacity of a lift station must handle the peak flow.
Pipes		
Valves	§217.62 (b)	Discharge side must be followed by a full-closing isolation valve and check valve
Emergency Provisions		
Signage	§217.63 (a)	Sign must dictate name of WWTF, 24-hour emergency contact information
Alarm	§217.63 (c)	Audiovisual alarm system/SCADA provided
Back-up Power	§217.63 (i)	Alternate power sources provided to prevent discharge of wastewater. System must operate for a duration at least equal to the longest power outage on record for the past 60 months or at least 20 minutes, whichever is longer.

10.2.1.1 Pumps

Stations had to contain a minimum of two pumps and be capable of handling peak flows with one pump out of service. Furthermore, the minimum acceptable efficiency of operation was 60% at the operating point. The pumps were designed in order to prevent unnecessary motor wear due to lack of hydraulic head.

10.2.1.2 Pump Capacity

The TCEQ regulates pump capacity design via rule §217.61 which has the following pertinent sections: (e) Flow Control. (1) A lift station or a transfer pumping station located at or discharging directly to a wastewater treatment facility must have a peak pump capacity equal to or less than the peak flow, unless equalization is provided. (2) Each lift station or transfer pumping station located at or discharging directly to a wastewater treatment facility with a peak flow that is greater than 300,000 gallons per day must use three or more pumps, unless duplex, automatically controlled, variable capacity pumps are used. (3) Each lift station or transfer pumping station located at or discharging directly to a wastewater treatment facility with a peak flow that is less than or equal to 300,000 gallons per day must use at least two pumps.

10.3 Line Requirements

10.3.1 Line Sizing and Grades

The sizing of wasterwater mains are required to meet the maximum flow condition with the pipe being 100% full. The calculation of flowrates should be based on Manning's equations with a roughness coefficient of 0.013 per the criteria set forth by the City's Engineering Standards.

The grade needed for designs of wastewater mains are displayed in Table 10-2.

Table 10-2: Minimum and Maximum Grades for Wastewater Mains

Size of Pipe (inches)	Minimum Slope (%)	Maximum Slope (%)
6	0.5	12.35
8	0.33	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.30
24	0.08	1.93
27	0.06	1.65
30	0.055	1.43
33	0.05	1.26
36	0.045	1.12
39	0.04	1.01
>39	**	**

***For lines larger than 39" in diameter, the slope shall be determined using the Manning's Equation using the roughness coefficient above. There will be no vertical bends or vertical curves made between two manholes. The lines will be designed in such a way as to be within a velocity range of: 2-10ft/s.*

10.4 Flow Projections

Flow projections were calculated using a method that applied a 4x peaking factor to all pipe sizes. The peaking factor is applied to the average daily flows and considers infiltration and inflow.

The wastewater model used this criteria on all lines sized for maximum flow projections. In the sewer model, the existing system was assessed based on the peak wet weather loadings experienced during the flow monitoring period. The rainfall events that occurred during the monitoring period were in the 2- to 5-year range for a duration of 2-hours. This is a reasonable method for assessing peak flows.

The flow per capita used for average daily flow was based on the criteria listed in Section 3.0.

11.0 Wastewater Model Development

The wastewater collection system for the City of Celina consists of the service pipelines, collection pipelines, interceptors, lift stations, and connections to the Downtown WWTP and UTRWD. The model of the Celina collection system was developed in Bentley SewerGEMS V8i. Service lines are not included in the model.

11.1 Manholes

Manhole information in the model is based on a combination of City GIS data, measuredowns (rim to invert distances) from manhole inspection (performed by others), and survey to fill data gaps identified during model construction.

The elevation data from the City's existing GIS and a 2015 I/I study conducted by Pacheco Koch has been utilized to the extent possible for model development. However, the City did not possess reliable elevation data for approximately 30% of the existing manholes. Therefore, Garver and a survey subconsultant conducted field survey in early Spring 2017 on 297 manholes. This data was incorporated into the GIS and model.

11.2 Sewer Pipelines

Sewer pipelines were imported into the model from GIS. The pipe inverts were defined based on record drawings or surveyed data whenever possible. When neither record drawing nor survey data were available, assumptions were made regarding the sewer pipe inverts. Typical assumptions that were made are that pipe inverts are at the bottom of the manhole and slopes are constant across multiple pipe segments with unknown invert data. A Manning's roughness value of 0.013 was used for all pipes. All sewer lines (not services) were included in the model. However, sewer lines at the upstream end of basins were deactivated in the model if adequate invert elevation information was not included.

11.3 Lift Stations

Lift stations were modeled based on a combination of survey, GIS, and other City-provided data (e.g., pump information) to define the wet wells, pumps, and force mains. The City desires to eliminate lift stations as practical. Therefore, lift stations were eliminated from the existing system model as CIP projects and replaced with gravity bypass sewer lines when possible and practical.

11.4 Connections to Downtown WWTP and UTRWD

The connections to the Downtown WWTP and UTRWD were modeled as free outfalls in the collection system model. This model treatment assumes there is adequate capacity at each of those locations to receive the delivered flows without imposing backwater conditions on the collection system. Therefore, impacts to the collection system from hydraulic capacity limitations at the Downtown WWTP and UTRWD connection, if any exist, were not investigated.

11.5 Spatial Delineation of Flows

Flows were delineated spatially based on the flow monitoring data and water service connections. It was assumed that water service connections were a good surrogate for sanitary sewer service connections

within sewered areas. The flow meter locations create six discrete sewersheds. Each of these sewersheds was broken down into smaller sub-areas. Loadings for the sub-area were calculated based on the percentage of water meters in that sub-area (relative to the sewershed), and loads were applied to manholes assuming a constant per manhole loading within the sub-area. The methodology described above was applied for both the dry and wet weather flows.

11.6 Dry Weather (Base) Flows

The dry weather flow data from the flow monitoring period is summarized in the table below. For modeling of dry weather conditions, the model was loaded with the peak dry weather flow.

Table 11-1: Flow Meter Dry Weather Flow Data

Flow Meter	Average Flow (MGD)	Peak Flow (MGD)	Peaking Factor
1	0.00	0.02	NA
2	0.37	0.62	1.68
3	0.15	0.59	4.03
4	0.21	0.43	2.07
5	0.14	0.40	2.94
6	0.26	0.51	2.00

11.7 Wet Weather (RDII) Flows

From a hydraulic capacity standpoint, wet weather events typically present the most challenging conditions for sanitary sewer collection systems. There is not a single return period (recurrence interval) that is universally applied for wet weather analysis of collection systems. Typically, 2- to 10-year storms are used as the basis of evaluation and design for collection systems.

11.7.1 Return Period Estimates for Flow Monitoring Period

Rainfall analysis is typically conducted based on intensity-duration-frequency (IDF) relationships. The IDF coefficients utilized by TXDOT for stormwater evaluations were utilized to assess the rainfall events during the flow monitoring period. Specifically, IDF coefficients for Collin County were applied. The following, Table 11-2 provides rainfall depths associated with different durations and frequencies for Collin County.

Table 11-2: Rainfall Depths (inches) for Different Durations and Frequencies

Frequency	1-hr	2-hr	4-hr	6-hr	12-hr	24-hr
2-year	1.922	2.334	2.772	3.042	3.552	4.128
5-year	2.460	3.014	3.604	3.978	4.668	5.472
10-year	2.938	3.606	4.324	4.776	5.616	6.576
25-year	3.406	4.180	5.004	5.526	6.504	7.608
50-year	3.825	4.702	5.644	6.234	7.356	8.616
100-year	4.210	5.198	6.276	6.966	8.280	9.792

The 5-minute rainfall data from each of the gauge locations was analyzed to determine the maximum rainfall depth (which corresponds to the maximum rainfall intensity) for each event. This summary data was then assessed to determine the approximate return period (e.g., 2-year, 5-year) that the rainfall event is associated with.

Table 11-3: Rainfall Event Summary Results

Rainfall Event	Dates	Gauge No.	Peak 1-hr (in.)	Peak 2-hr (in)	Peak 4-hr (in.)
1	April 29	1	0.40	0.61	0.65
		2	0.31	0.38	0.39
		3	0.05	0.06	0.06
2	May 8 - 9	1	0.33	0.43	0.64
		2	0.44	0.62	0.84
		3	0.36	0.48	0.58
3	May 23 - 24	1	0.59	0.92	1.02
		2	0.35	0.68	0.77
		3	0.43	0.56	0.58
4	May 27	1	0.31	0.51	0.57
		2	0.31	0.50	0.56
		3	0.34	0.60	0.70
5	May 30 - June 2	1	0.48	0.60	0.62
		2	1.02	1.50	1.64
		3	0.70	1.02	1.12
6	June 11 - 12	1	2.38	2.74	2.82
		2	1.86	2.23	2.29
		3	1.94	2.21	2.29

Based on analysis of the rainfall data at the gauge sites, it is obvious that the peak intensities occurred as a result of the rainfall event on June 11-12. However, the event spanning May 30-June 2 had more overall precipitation at Gauges 2 and 3, and the 12- and 24-hr hour rainfall totals were a maximum for Gauge 2 for that event. Comparing the peak intensities experienced during the flow monitoring period

with the rainfall depths calculating using the TXDOT IDF coefficients, it is apparent that the most significant rainfall events corresponded to approximately 2- to 5-year events at the gauge locations. Specifically, the June 11-12 event produced nearly 5-year intensities for the peak 1-hr and 2-hr durations at Gauge 1, and approximately 2-year intensities for the same durations at the other two rain gauge locations.

11.7.2 Design Wet Weather Event and Flows

Due to the intensity of the rainfall events experienced during the flow monitoring period, the peak wet weather flow rates for each of the flow monitoring basins was adopted as the design wet weather flow for the existing condition evaluation. Additionally, these design wet weather flows were compared with estimated peak flows based on planning numbers (i.e., number meters in the basin, 3 people/meter, 102 gpcd, peaking factor of 4). For 5 of the 6 flow meters, the monitored peak flow was at least double the estimated peak. The peak flow was approximately 80% of the planning-level estimate for the other monitored basin, FM 005.

11.7.3 RDII Allocation

As discussed previously for spatial delineation of flow, the wet weather flows were distributed spatially based on the number of service connections and manholes in particular areas within each of the six flow monitoring basins. In reality, RDII does not impact all areas equally. This can be seen in comparing the wet weather response for one flow monitoring basin to the others. And, it applies at more local scales, as well. Within a given basin, there will be areas that contribute more RDII than the basin average, and there will also be areas that contribute less RDII than the basin average. However, while it is recognized that these microscale variations do exist, sufficient data was not available to accurately predict these variations for use in wet weather load allocation.

11.8 Future Load Allocation

The existing model loads were used as the basis for developing loading for future model scenarios. The dry and wet weather loads for the existing model were carried over to the future scenarios. The additional loads to account for future buildout were based on the methods documented in Section 3.0.

Dry weather load allocation was completed using an approximate load per unit area for each land use type. For residential areas, these loads were based on the approximate number people per acre for the different land use types. For commercial and industrial areas, a load per unit area was assigned. For mixed-use areas, these residential and non-residential values were combined.

Future wet weather design loads were projected by applying a peaking factor of 4.0 on the dry weather loads that were added. This 4.0 peaking factor was applied uniformly to all areas, regardless of land use type.

12.0 Wastewater Model Results

12.1 Existing Pipe Slopes

The minimum pipe slopes for gravity sanitary sewer lines required by TCEQ are specified to achieve a velocity of 2 fps in pipes flowing at least 50% full. Sub-standard pipe slopes can lead to issues such as deposition of materials suspended in the flow and ponding of sanitary flows within the collection system.

There are 41 sewer segments within the modeled system that have slopes less than the TCEQ minimum required slopes. Pipes with inadequate slopes were identified and flagged using a 10% buffer under the TCEQ minimum. Table 12-1 shows the line size with the associated lengths of pipeline displaying inadequate slope and the portion of total pipeline.

Table 12-1: Current System Pipes with Inadequate Slopes

Size (in.)	Length of Pipe with Inadequate Slope (ft)	Total Length of Pipe (ft)	Portion of Total Length (%)
6	3,218	46,081	6.98
8	4,868	220,425	2.21
10	683	12,273	5.56
12	1,366	22,332	6.12
21	758	33,995	2.23
Total	**10,893**	**335,106**	**3.25**

The locations of these pipes can be seen graphically in Exhibit 21.

12.2 2017 Wastewater Model Results

12.2.1 Dry Weather Analysis

Under 2017 dry weather loads, there are only four locations in the model that show issues with capacity and/or surcharging. The first is in the downtown area, in the vicinity of Utah Drive and Cedar Street. In this area, there are multiple pipes with adverse (negative) slopes, which result in high d/D ratios despite relatively low flow rates and sufficient overall capacity to convey flows downstream. The second is the line immediately upstream of the High Point LS, and the surcharging is a result of the system elevations and not high flow conditions. The third is at the downstream end of the 21-inch line from the SE Sector LS. The flow from the SE Sector LS is in excess of 3,000 gpm, and it causes a small amount of surcharging due to the connection of the 21-inch line to an 18-inch line prior to connecting to the 27-inch Doe Branch Interceptor. The fourth area is the southeast sector, which has a couple of short lines near the upstream ends of the basins that show adverse slopes that cause local surcharging. System-wide results for the 2017 dry weather flow pipe capacity are shown in Exhibit 22.

12.2.2 Wet Weather Analysis

During peak wet weather conditions, the southern portion of the system is subject to the same capacity limitation as described above. The northern portion of the system has an elevated number of locations of surcharge or near-full conditions (i.e., average d/D ratios > 0.95):

- Area around Utah Drive and Cedar Street (described above)
- Immediately upstream of Parkside LS
- 10-inch along Utah Drive/Florida Drive prior to connection to the 21-inch
- Main interceptor through northern area of downtown (including FM 002 and FM 004 locations)
- Main collector lines for Heritage area

The majority of the areas of surcharge or near-full conditions in the northern portion of the system are associated with the drainage basins for FM 002 and FM 004. These two basins had significant wet weather peaking factors. The peak wet weather flow to average dry weather ratio was 9.7 for FM 004. The overall peak wet weather flow to dry weather flow ratio was 8.6 for FM 002, while the discrete ratio (after factoring out the flows from FM 004 that contribute to the flows at FM 002) was 7.1. System-wide results for the 2017 wet weather flow pipe capacity are shown in Exhibit 23.

12.3 2018 Wastewater Model Results

12.3.1 Dry Weather Analysis

The only area of concern identified, beyond the areas identified for the 2017 evaluation, is on the 8-inch line along Preston Road to Celina HS. The surcharge on this segment of line is due to the increased flows from installation of the proposed Chalk Hill LS. However, the downstream 12-inch line provides adequate capacity.

12.3.2 Wet Weather Analysis

As for the dry weather analysis, the only new area of concern identified in the wet weather analysis is associated with the 8-inch line that receives flow in the model from the proposed Chalk Hill LS.

12.4 2019 Wastewater Model Results

12.4.1 Dry Weather Analysis

There are no new areas of concern identified in the 2019 dry weather evaluation.

12.4.2 Wet Weather Analysis

There are no new areas of concern identified in the 2019 wet weather evaluation. However, due to the increased overall loadings associated with system growth, there is a slight increase in the extent in the areas of concern.

12.5 2020 Wastewater Model Results

12.5.1 Dry Weather Analysis

There are no new areas of concern identified in the 2020 dry weather evaluation.

12.5.2 Wet Weather Analysis

During the 2020 wet weather evaluation, the majority of the 30-inch portion of the Doe Branch interceptor downstream of the connection for the Creeks of Legacy has d/D ratios exceeding 0.95. However, surcharging is minor and there is still significant freeboard in the model. There are also d/D ratios exceeding 0.95 for the Doe Branch Interceptor in the vicinity of the western tie-in for the Light Farms subdivision. However, there is significant freeboard available, and the model does not predict SSOs.

12.6 2021 Wastewater Model Results

12.6.1 Dry Weather Analysis

There are no new areas of concern identified in the 2021 dry weather evaluation.

12.6.2 Wet Weather Analysis

The additional loads added for the 2021 wet weather scenario result in increased surcharge along the Doe Branch Interceptor. Additionally, there is a segment of 8-inch line in the southeastern area of Light Farms that shows d/D ratios in excess of 0.95.

12.7 2022 Wastewater Model Results

12.7.1 Dry Weather Analysis

There are no new areas of concern identified in the 2022 dry weather evaluation. System-wide results for the 2022 dry weather flow pipe capacity are shown in Exhibit 24.

12.7.2 Wet Weather Analysis

The 2022 wet weather analysis shows a continuation of the trend for increased loads, increasing the extent and degree of surcharge for the Doe Branch Interceptor. The increased water levels in the Doe Branch Interceptor create backwater effects that cause surcharging of adjacent sewer collectors. Additionally, the 21-inch line downstream of the SE Sector LS experiences surcharge conditions, and the model shows some minor surcharging associated with a few sewer lines in the Lakes at Mustang Ranch. System-wide results for the 2022 wet weather flow pipe capacity are shown in Exhibits 25 through 27.

12.8 Future Wastewater Improvements

12.8.1 Ultimate Buildout

As discussed previously in Section 3.0, the population and flow projections form the basis of design for water and wastewater system modeling. Future wastewater improvements were designed based on

wastewater model results for the ultimate buildout. The buildout wastewater improvements can be seen graphically in Exhibit 31.

12.8.1.1 Future Service Provider

The City is currently subscribed to UTRWD at the Doe Branch facility for 0.66 MGD, indicating the immediate need for additional sewer allocation. Preliminary sewer treatment provider discussions with the City indicate that potential options for future treatment include additional allocation from UTRWD, expansion of the Downtown WWTP, the potential for regionalization to the west with Mustang SUD, and becoming a customer member of NTMWD.

Initial discussions with Mustang SUD indicate that they are open to regional partnership and have applied for a discharge permit with excess capacity at a discharge location west of Celina and north of the Doe Branch drainage basin.
Discussions with the NTMWD indicate that the potential to become a sewer customer is in the long term planning stage, and is dependent upon the successful completion of multiple interceptors on the west side of the City. This completion date is currently outside the 2023 timeframe. Therefore, the five year build-out assumes that all sewer is being treated at the UTRWD Doe Branch WWTP and the City's WWTP.

However, a 2022 project will install an interceptor to convey the drainage basins north of the Doe Branch drainage basin to the western Mustang SUD facility. Ultimate buildout projections assume the City will be served in the Doe Branch drainage basin by UTRWD, Mustang SUD to the north of the Doe Branch drainage basin, and NTMWD for western drainage basins. These projections should be updated as further regionalization talks occur.

12.8.2 WWTP Interceptor

The WWTP expansion is discussed in Section 13.0. Even with the expansion currently in design, the Downtown WWTP will rapidly reach capacity. By the end of the 5-year CIP wastewater expansion, Project 12 will be needed to accommodate additional capacity. This project includes a new interceptor from the Downtown WWTP west across undeveloped land to a new, future WWTP. The new WWTP will accommodate flow from ongoing and future development in the City. The City prefers to decommission the Downtown WWTP when the future WWTP goes online and all wastewater flow will be redirected to the new WWTP.

12.9 Lift Station Gravity Bypass

12.9.1 Introduction

The City expressed interest in identifying gravity bypass alternatives for all lift stations currently in the system. Additionally, the following lift stations will go offline from planned City projects:

- Carter Ranch Phase II
- Tolleson Lift Station

This section evaluates each lift station for decommissioning feasibility.

12.9.2 Old Celina Park LS

The Old Celina Park LS conveys flow to the Parkside LS. Gravity bypass of the Old Celina Park LS is not feasible at this time. However, there is a proposed sewer shed south of the Old Celina Park LS that flows west. As this area south and west of the Old Celina Park LS develops, an interceptor can be extended to provide an alternative to gravity bypass, and decommission the Old Celina Park LS.

12.9.3 Parkside LS

The Parkside LS conveys flow through a force main east and then north to a manhole near the intersection of Utah Drive and Cedar Street. Similar to the Old Celina Park LS, gravity bypass of the Parkside LS is not feasible at this time. However, ultimately, the same interceptor serving the gravity bypass for the Old Celina Park LS can be used for gravity bypass for the Parkside LS.

12.9.4 Lucy's LS

The Lucy's LS conveys flow through a force main south to the gravity collection system. Gravity bypass of the Lucy's LS should be feasible utilizing an alignment parallel to the existing force main.

12.9.5 Winn Road LS

The Winn Road LS conveys flow through a force main north to the 15-inch sewer main along Cedar Street. A number of alternatives were evaluated for gravity bypass of the Winn Road LS. The first alternative evaluated was gravity bypass to the manhole near the intersection of Utah Drive and Cedar Street where the force main from Parkside LS discharges. Based on existing elevation data it is anticipated that adequate slope can be achieved to allow gravity bypass with an 8-inch line. An engineering study investigating the optimal route and elevations should be completed to confirm feasibility prior to design of this gravity bypass. It should be noted that minimum slope requirements decrease as pipe sizes increase. However, it is not advisable from a hydraulic standpoint to install a larger pipe than necessary in order to use a smaller slope. Oversizing the pipe and installing at a flatter grade will both act to reduce the flow velocity in the pipe. Minimum slopes are specified to achieve 2 fps at half-full and full conditions. Therefore, oversizing the pipe to utilize a shallower slope will result in velocities that are insufficient for self-cleansing of the pipe, and this could result in a need for routine maintenance (i.e., cleaning/flushing) of the line.

The second gravity bypass alternative is west to the Parkside LS. However, the Parkside LS is not sized to handle additional gravity bypass flows.

The third gravity bypass alternative is to the southeast, to a potential future interceptor alignment (which could also serve the Business 289 LS). However, at present, there are no plans for construction of this interceptor.

12.9.6 Business 289

The Business 289 LS conveys flow through a force main north to the southern side of the gravity network for the downtown area. Gravity bypass of the Business 289 LS is not feasible at this time . However,

ultimately, the Business 289 LS could be bypassed if an interceptor is extended from the Glen Crossing development. This same interceptor could be used for gravity bypass of the Winn Road LS, if necessary.

12.9.7 Shawnee Trail No. 1

The Shawnee Trail No. 1 LS conveys flow through a force main north to the gravity interceptor along CR 94. Gravity bypass of the Shawnee Trail No. 1 LS is feasible to the west, generally parallel to CR 44.

12.9.8 Shawnee Trail No. 2

The Shawnee Trail No. 2 LS conveys flow through a force main north to a gravity line that subsequently carries flow to the Shawnee Trail No. 1 LS. The Shawnee Trail No. 2 LS handles flow from three residences immediately surrounding the LS. Gravity bypass of the Shawnee Trail No. 2 LS is not recommended, as approximately 1,200 to 1,500 LF of new gravity sewer would be required in order to eliminate the LS.

12.9.9 High Point

The High Point LS conveys flow through a force main south to CR 455, then west-southwest along CR 455 to a gravity line along CR 94. The High Point LS is on the east side of the main ridge that divides the Celina CCN. As such, gravity flow to the main portions of the existing system (which are west of the main ridge) is not feasible. The High Point LS can be bypassed once there is a gravity interceptor that can convey flow east out of the CCN or to a regional LS to the east of the High Point addition. However, it is not anticipated that this will be an option in the near-term horizon.

12.9.10 Carter Ranch Phase II

The Carter Ranch Phase II LS conveys flow through a force main north to a gravity sewer for the northern areas of Carter Ranch. The Carter Ranch Phase II LS can be bypassed through installation of a line across Preston Road and installation of gravity sewer pipe to connect to either of two existing lines that ultimately convey flow to the Doe Branch Interceptor.

It is recommended that the bypass connect to the existing 21-inch line that receives flow from the SE Section LS and FM. Redirecting flow to this 21-inch line will increase the loads that the line receives, as flow for the Carter Ranch Phase II LS is currently handled by the 15-/18-inch line between Carter Ranch and the new Glen Crossing extension.

12.9.11 Willock Hils

The Willock Hills LS conveys flow through a force main east to the 21-inch line along North Florida Drive. At present, gravity bypass of the Willock Hills LS is not feasible due to the elevations of the gravity network in the area. However, when the WWTP is decommissioned and flow is sent to the new western WWTP, the new interceptor is anticipated to follow the natural drainage immediately northwest of the Willock Hills addition. Bypass of the Willock Hills LS should be planned in conjuction with the project to decommission the WWTP and send flows to the new western WWTP.

A summary of the bypass feasibility of each lift station is included below in Table 12-2.

Table 12-2: Lift Station Bypass Feasibility

Lift Station	Bypass Feasible	Bypass Not Feasible	Comments
Old Celina Park		X	Gravity bypass of the Old Celina Park LS is not feasible in the near-term (2017-2022 improvements).
Parkside		X	Gravity bypass of the Parkside LS is not feasible in the near-term (2017-2022 improvements).
Lucy's	X		Gravity bypass of the Lucy's LS is feasible and implementation of the design process can begin immediately. No negative impacts to downstream capacity are anticipated due to the gravity bypass.
Winn Road	X		Gravity bypass of the Winn Road LS to the north and west to the manhole near the intersection of Utah Drive and Cedar Street is recommended.
Business 289		X	Gravity bypass of the Business 289 LS is not feasible in the near-term (2017-2022 improvements).
Shawnee Trail No. 1	X		Gravity bypass of the Shawnee Trail No. 1 LS is feasible and implementation of the design process can begin immediately. No negative impacts to downstream capacity are anticipated due to the gravity bypass.
Shawnee Trail No. 2	X		Gravity bypass of the Shawnee Trail No. 2 LS is not recommended.
High Point		X	Gravity bypass of the High Point LS is not feasible in the near-term (2017-2022 improvements).
Carter Ranch Phase II	X		Gravity bypass of the Carter Ranch Phase II LS is feasible and implementation of the design process can begin immediately.
Willock Hills		X	Gravity bypass of the Willock Hills LS is dependent on installation of a new interceptor to handle flows following decommissioning of the Downtown WWTP.

13.0 Wastewater Treatment Expansion Evaluation Results

13.1 Overview

The City of Celina engaged Garver to provide professional design services necessary for preliminary and final design developments of the Celina Wastewater Treatment Plant Improvements project. A PDR containing findings and recommendations along with 30% preliminary design level drawings were completed and delivered on June 23, 2017. Work on subsequent design recommendations is ongoing.

The design of the new and rehabilitiated plant processes is based on a permitted average daily flow capacity of 0.75 MGD (Interim II phase) with an effluent peak of 3.0 MGD (2-hour).The final phase expansion is based on a permitted average daily flow capacity of 0.95 MGD with an effluent peak of 3.8 MGD (2-hour).

The City has identified a five-year horizon for decommissioning the existing plant and sending all the drainage basin flow to a new western facility. Therefore, CIP Project 12 constructs a gravity interceptor for this purpose.

14.0 Recommended Wastewater Improvements

14.1 Project Identification and Ranking

Similar to the previously detailed water project identification and ranking, several key factors were identified as triggers for a project. These triggers were developed in conjunction with the previously established design criteria. The improvements recommended in the following sections address all triggers for that identified need.

The identified triggers are as follows (in order of priority, from greatest to least):

1) Capacity
This trigger is activated if a section or segment of sewer is not able to provide the modeled flow during peak demand to all meters within that portion of the system.

2) Condition
This trigger is activated if a known condition requires repair or replacement of the infrastructure. For pipeline groupings, if greater than 50% of the manholes on each group's sewer segments have been identified as needing repair, the condition trigger is activated. City staff input was also solicited to identify known pipe condition issues in the collection system.

3) Operational
Operational triggers are activated when an improvement will provide increased operational benefit, such as decommissioning aged infrastructure. This includes any lift station decommissioning.

4) City-identified
City-identified triggers include pipelines that City staff have identified as anticipated to be replaced.

14.1.1 Project Subgroupings

Following initial project identification and priority ranking, Garver and the City identified the main drivers necessitating each project. Three primary drivers were identified and consisted of: 1) development driven projects, which are driven by the system expansion due to development, 2) operational projects, which aimed to improve current operations and reduce operations and maintenance costs, and 3) I/I projects which will alleviate stormwater inflow into the system thereby reducing the total cost of wastewater treatment.

14.2 Wastewater Infrastructure Improvements

See Appendix D for detailed infrastructure improvements, cost estimates descriptions, and recommendations. A contingency factor of 30% has been applied to accommodate unforeseen design considerations, and changes in market pricing. The wastewater CIP projects can be seen graphically in Exhibit 29.

A summary of proposed projects, time-frame for implementation, and forecasted costs is displayed in Table 14-1.

Table 14-1: Wastewater Capital Improvements Summary

Project Identification			Schedule	2017 Cost ($1000)[1]
Project	**Grouping**	**Description**	**Trigger Date**	**OPCC**
1	AC	WWTP expansion to 0.75 MGD	Oct-17	$8,300
2	B	12" line to replace Carter Ranch LS	Oct-17	$1,502
3	P	6" line to replace Lucy's LS	Oct-17	$120
4	Q	8" and 10" line to replace Shawnee Trail No. 1 LS	Oct-17	$1,172
5	C	8" line to replace Winn Road LS	Oct-17	$486
6	R	10" and 12" line to provide additional capacity for the addition of the Chalk Hill LS	Oct-17	$915
7	AA	Manhole rehabilitation from PK I/I study	Oct-17	$422
8	AB	Pipeline rehabilitation from PK I/I study	Oct-17	$761
9	O	12" line replacement to increase capacity to Heritage	Oct-17	$1,244
10	A	24" line replacement to increase capacity along Light Farms	Oct-17	$1,362
11	AD	WWTP expansion to 0.95 MGD	Oct-18	$3,000
12	N	New 30", 36", 42", and 60" interceptor from Downtown WWTP to future WWTP; 8" interceptor to replace Willock Hills LS	Oct-19	$43,144
13	T	18" line replacement to increase capacity Downtown	Oct-19	$3,066
14	U	15" line along FM 455 across Preston Rd	Oct-19	$734
		Total 2017 OPCC:		**$66,227,007**

(1) Project Costs are the Opinion of Probable Construction Costs (OPCC) based in year 2017, and include Engineering and Contingency. A three percent escalation for inflation to the Trigger Date month and year has been added for a Forecasted Cost in Appendix D.

Table 14-2 divides up the projects by their subgroupings as described in Section 14.1.1.

Table 14-2: Wastewater CIP – Project Subgroupings

Project Identification			Schedule	2017 Cost ($1000)[1]
Project	**Grouping**	**Description**	**Trigger Date**	**OPCC**
Development Driven				
1	AC	WWTP expansion to 0.75 MGD	Oct-17	$8,300
6	R	10" and 12" line to provide additional capacity for the addition of the Chalk Hill LS	Oct-17	$915
10	A	24" line replacement to increase capacity along Light Farms	Oct-17	$1,362
11	AD	WWTP expansion to 0.95 MGD	Oct-18	$3,000
12	N	New 30", 36", 42", and 60" interceptor from Downtown WWTP to future WWTP; 8" interceptor to replace Willock Hills LS	Oct-19	$43,144
		Development Subtotal =		**$56,720,948**
Operational				
2	B	12" line to replace Carter Ranch LS	Oct-17	$1,502
3	P	6" line to replace Lucy's LS	Oct-17	$120
4	Q	8" and 10" line to replace Shawnee Trail No. 1 LS	Oct-17	$1,172
5	C	8" line to replace Winn Road LS	Oct-17	$486
		Operational Subtotal =		**$3,279,312**
I/I				
7	AA	Manhole rehabilitation from PK I/I study	Oct-17	$422
8	AB	Pipeline rehabilitation from PK I/I study	Oct-17	$761
9	O	12" line replacement to increase capacity to Heritage	Oct-17	$1,244
13	T	18" line replacement to increase capacity Downtown	Oct-19	$3,066
14	U	15" line along FM 455 across Preston Rd	Oct-19	$734
		I/I Subtotal =		**$6,226,747**
		Total 2017 OPCC =		**$66,227,007**

15.0 Conclusion

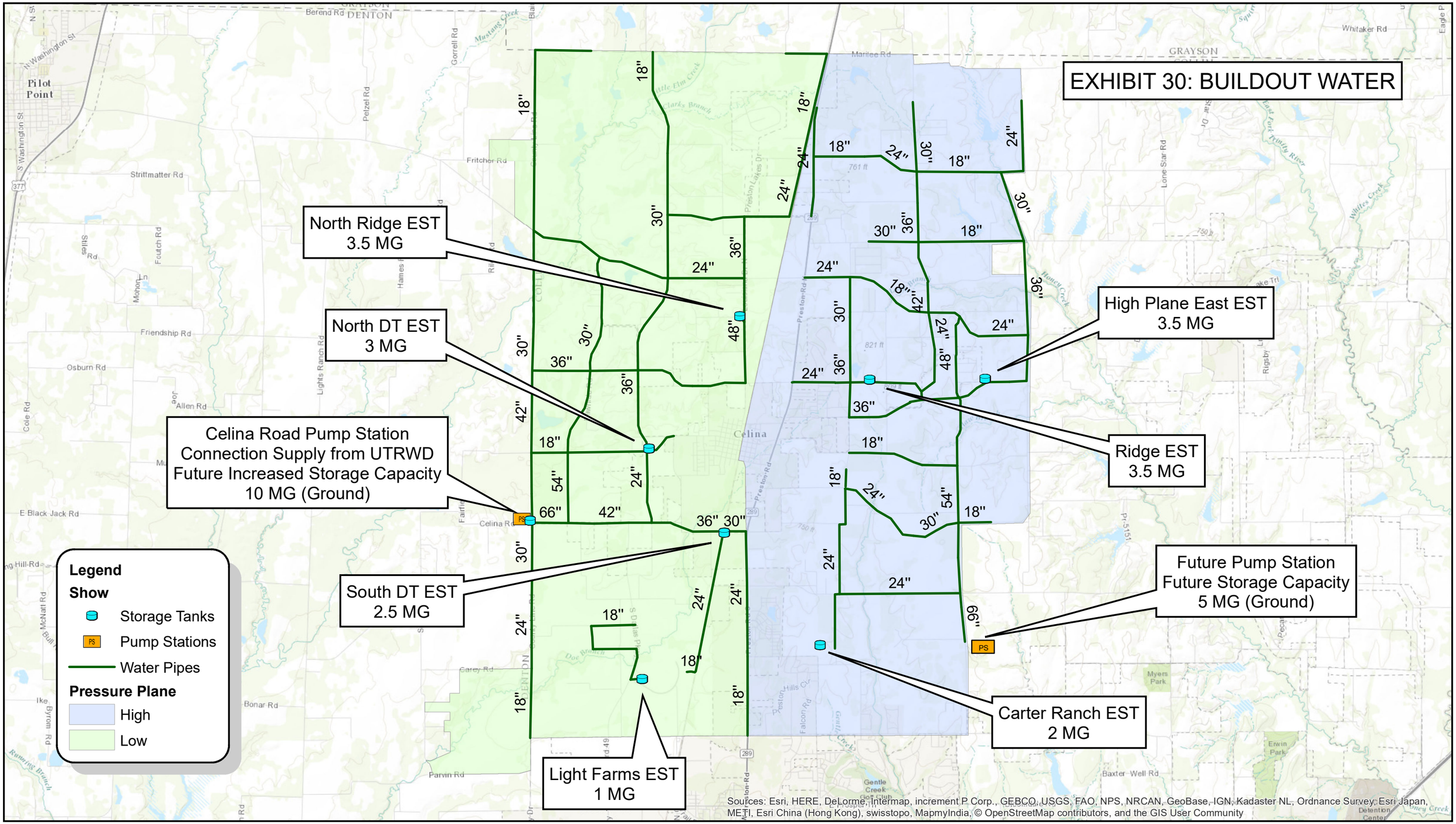
This Water and Wastewater Improvements Plan has identified key recommendations for water and sewer infrastructure and operations based on multiple field investigations, condition assessments, and model simulations.

The Plan provides key information for future planning efforts as well, including:

- Projected water usage and sewer loading rates based on existing conditions
- Updated design criteria for future planning and project development
- Condition assessments of all existing facilities, with recommendations for near and long term improvements
- Flow monitoring and a ranking of meter basins based on RDII
- Updated City water and wastewater models
- Updated City water and wastewater GIS
- A list of water projects to reach identified 5-year and ultimate buildout growth plans and maintain existing infrastructure, totaling $94.1 Million.
- A list of wastewater projects to reach identified 5-year and ultimate buildout growth plans and maintain existing infrastructure, totaling $66.3 Million.

15.1 Recommendations

It is recommended to implement the Water and Wastewater CIPs concurrently, as funding allows. This will allow the City to be equipped for the ultimate buildout that is anticipated. This plan should be re-evaluated at a minimum of every 5 years to ensure projected growth and usage rates have not significantly changed.



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

CITY OF CELINA
CELINA, TEXAS
WATER & WASTEWATER MODELING AND
CIP REPORT EXHIBITS

3010 Gaylord Parkyway
Suite 190
Frisco, TX 75034
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GARVER

EXHIBIT 28: WATER CIP

Water CIP Project Legend

Development Driven Projects

2017

1. Project B - Downtown EST shutdown and SCADA switchover
2. Project A - Capacity upgrades to CRPS and installation of 4 new pumps
3. Project H - Capacity upgrades to DTPS and installation of 3 new pumps
4. Project E - 12" line and valves to switch LPP to HPP
5. Project F - 18", 30", and 36" line along Celina Road from CRPS
6. Project G - 24" and 30" lines to Downtown GST
7. Project J - 24" and 30" discharge lines to DTPS

2018

8. Project D - 18" and 24" line to Morgan Lake area
9. Project C - 18" line east of Light Farms EST along Cypress Creek Way
10. Project L - Additional capacity upgrades to CRPS
11. Project Z - New 6 MG GST at CRPS
12. Project R - Additional capacity upgrades to DTPS

2019

16. Project M - 12" line along Settlers Ridge
17. Project Q - Additional capacity upgrades to CRPS
19. Project P - 8", 12", and 18" line from Morgan Lake to DC Ranch

2020

18. Project AC - 2020 5-year Master Plan (not shown)
20. Project O - 24" line to increase capacity in the Low Pressure Plane

Operational Projects

2019

13. Project K - Decommission Morgan Lake facilities
14. Project AB - SCADA improvements (not shown)
15. Project AA - 8" line upgrades in Downtown area

2021

22. Project S - 18" and 24" lines along Legacy Drive

Fire Flow Projects

2020

21. Project T - 18" and 24" lines along Hwy. 455
24. Project W - 8" and 12" line along E. Malone St. and Preston Road
25. Project V - 8" lines in the Low Pressure Plane

2021

23. Project X - 8" and 24" lines to connect Preston Lakes to Preston Road Corridor
26. Project Y - 18" line from the Parks at Wilson Creek to Lakes at Mustang Ranch
27. Project U - 12" line from Preston Road to Morgan Lake Estates

WATER SYSTEM RECOMMENDED CAPITAL IMPROVEMENTS

LEGEND

Existing Structures

- Existing Structure
- Existing Storage Tanks (GST, EST)
- Existing Pump Stations

Development Driven Projects

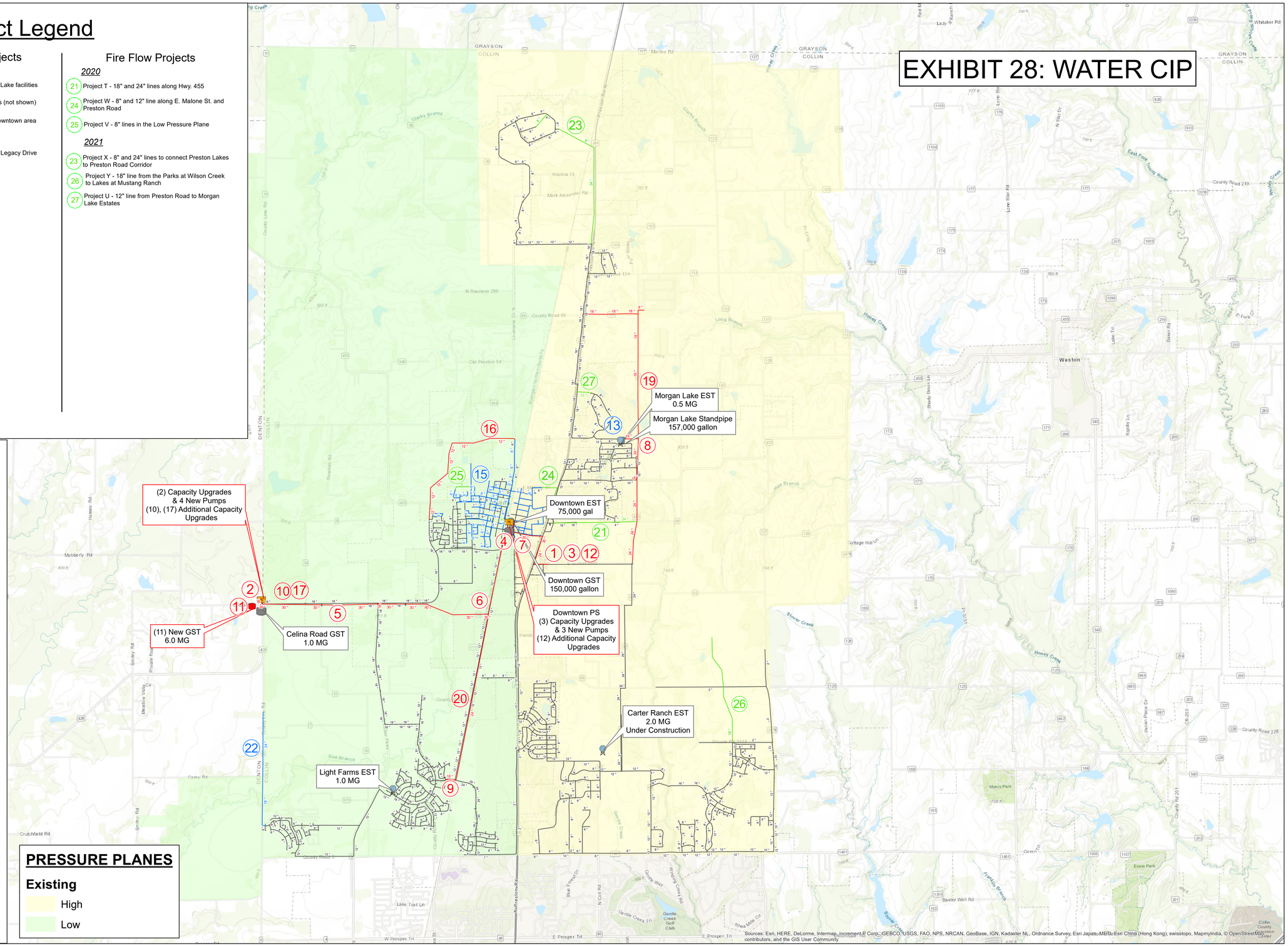
- Proposed Improvement

Operational Projects

- Proposed Improvement

Fire Flow Projects

- Proposed Improvement



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: TCR

N

0 0.75 1.5 3 Miles

CITY OF CELINA
CELINA, TEXAS
WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS

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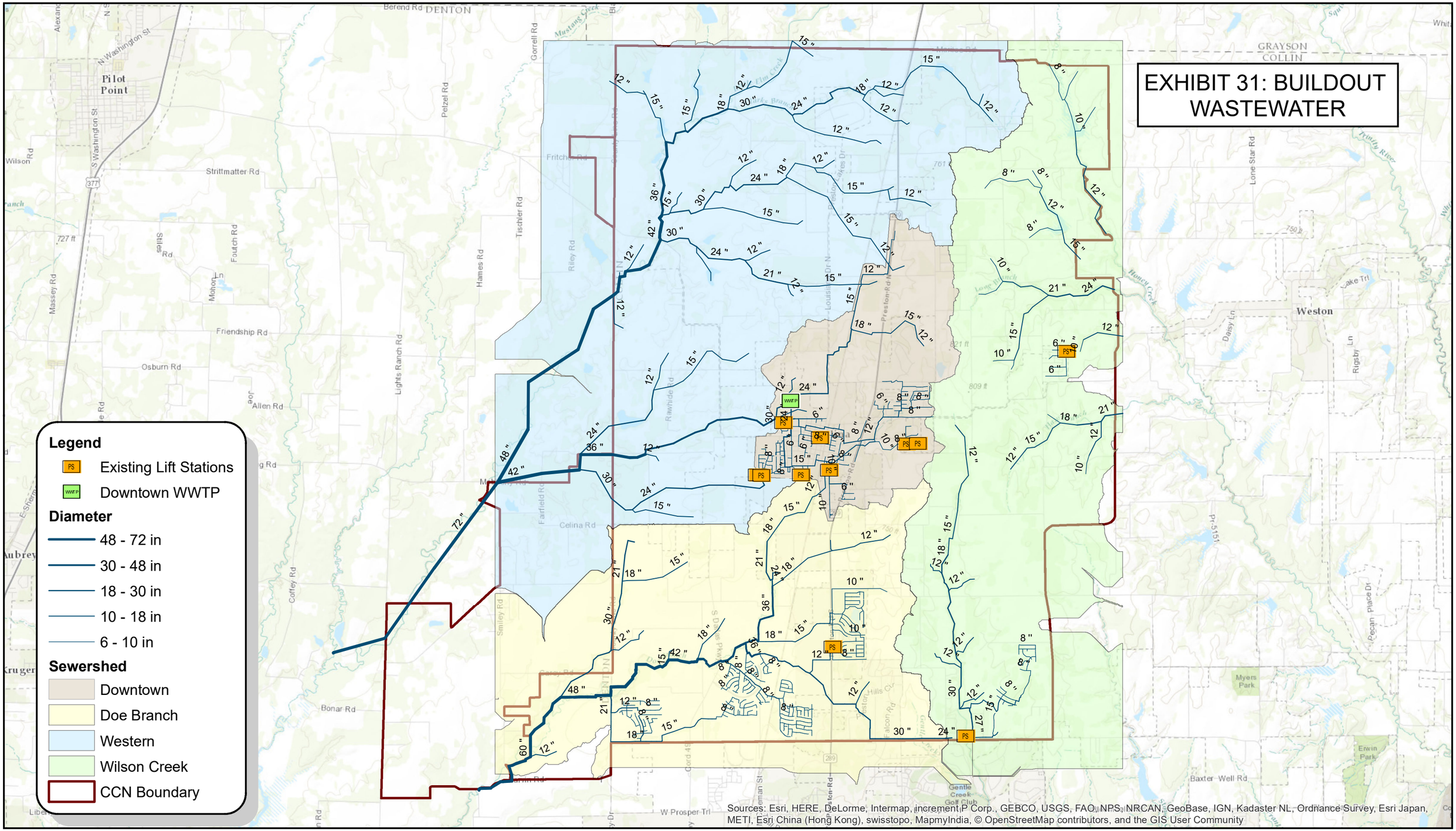

JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.75 1.5 3 Miles

CITY OF CELINA
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WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS

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EXHIBIT 29: WASTEWATER CIP

Wastewater CIP Project Legend

Development Driven Projects

2017

1 Project AC - WWTP expansion to 0.75 MGD

6 Project R - 10" and 12" line to provide additional capacity for the addition of the Chalk Hill LS

10 Project A - 24" line replacement to increase capacity along Light Farms

2018

11 Project AD - WWTP expansion to 0.95 MGD

2019

12 Project N - New 30", 36", 42", and 60" interceptor from Celina WWTP to future WWTP

Operational Projects

2017

2 Project B - 12" line to replace Carter Ranch LS

3 Project P - 6" line to replace Lucy's LS

4 Project Q - 8" and 10" line to replace Shawnee Trail No. 1 LS

5 Project C - 8" line to replace Winn Road LS

I/I Projects

2017

7 Project AA - Manhole rehabilitation from PK I/I study

8 Project AB - Pipeline rehabilitation from PK I/I study

9 Project O - 12" line replacement to increase capacity to Heritage

2019

13 Project T - 18" line replacement to increase capacity Downtown

14 Project U - 15" line along FM 455 across Preston Rd

WASTEWATER SYSTEM RECOMMENDED CAPITAL IMPROVEMENTS

LEGEND

Existing Structures

Existing Conduits

Development Driven Projects

Proposed Improvements

Operational Projects

Proposed Improvements

I/I Projects

Proposed Improvements

WASTEWATER INFRASTRUCTURE

Existing WWTP

Existing Lift Stations

Sewershed

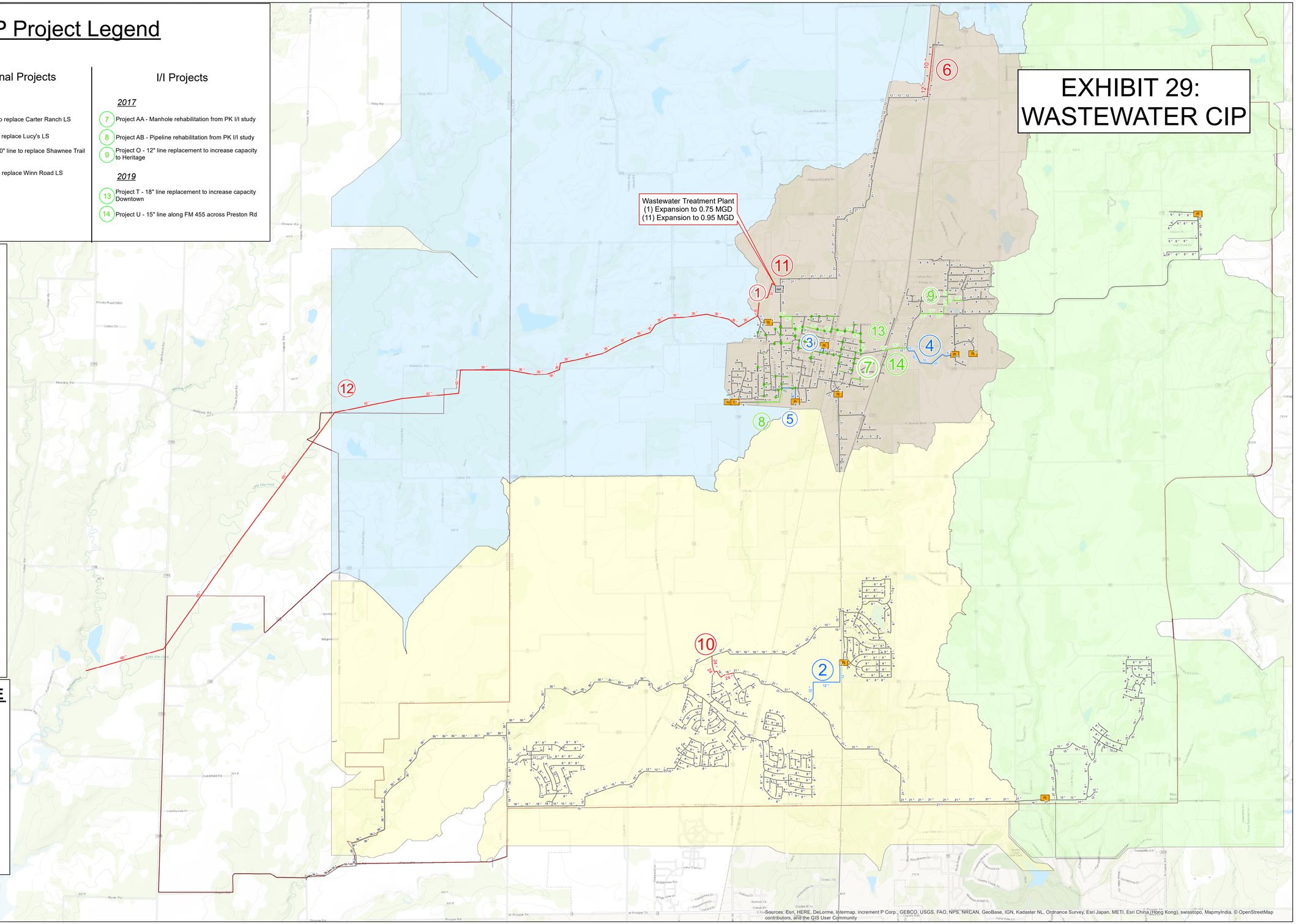
Downtown

Doe Branch

Western

Wilson Creek

CCN Boundary



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: TCR

N

0 0.5 1 2 Miles

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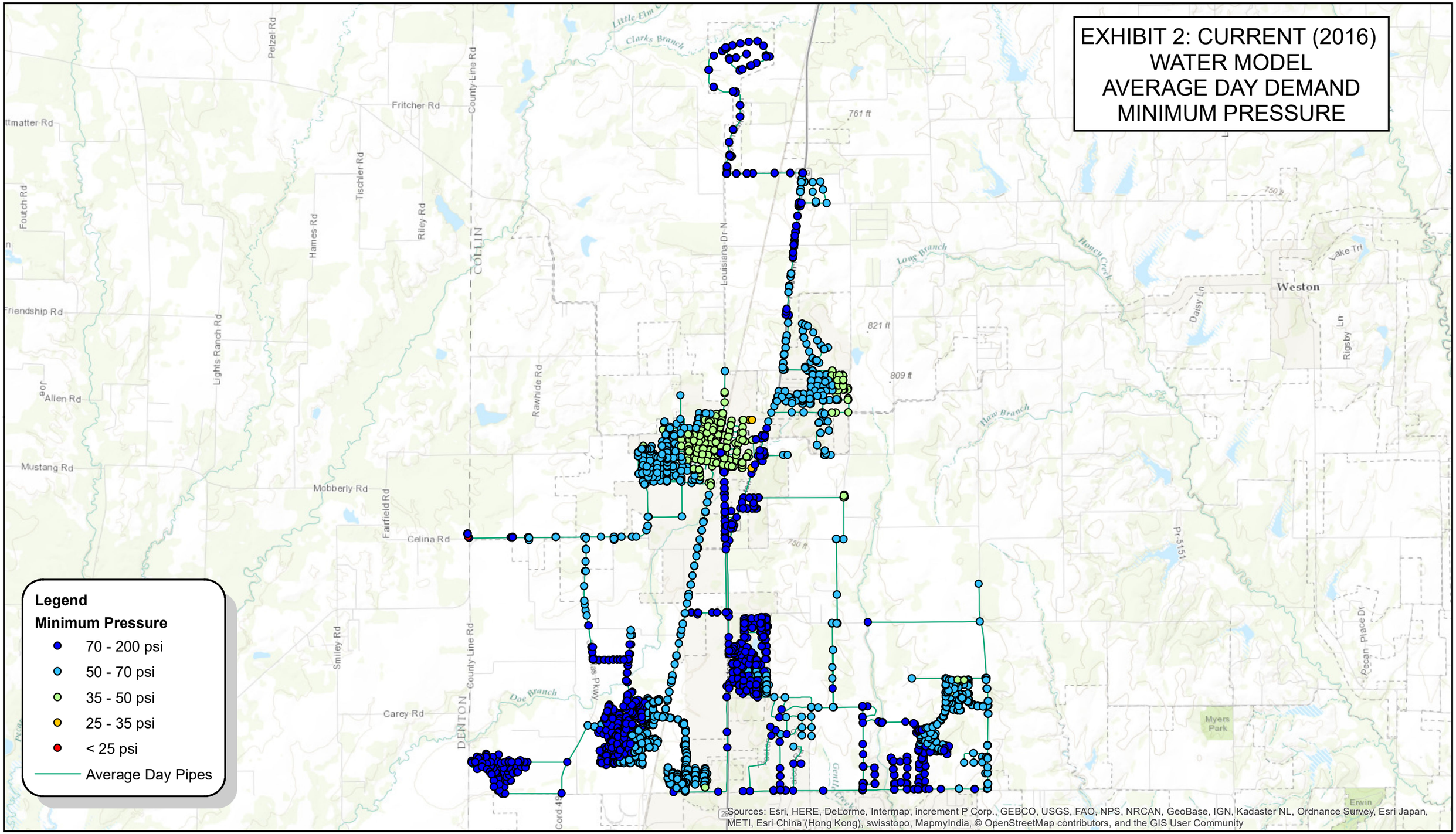

JOB NO.: 16088050
DATE: AUGUST 2017
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N

0 0.5 1 2 Miles

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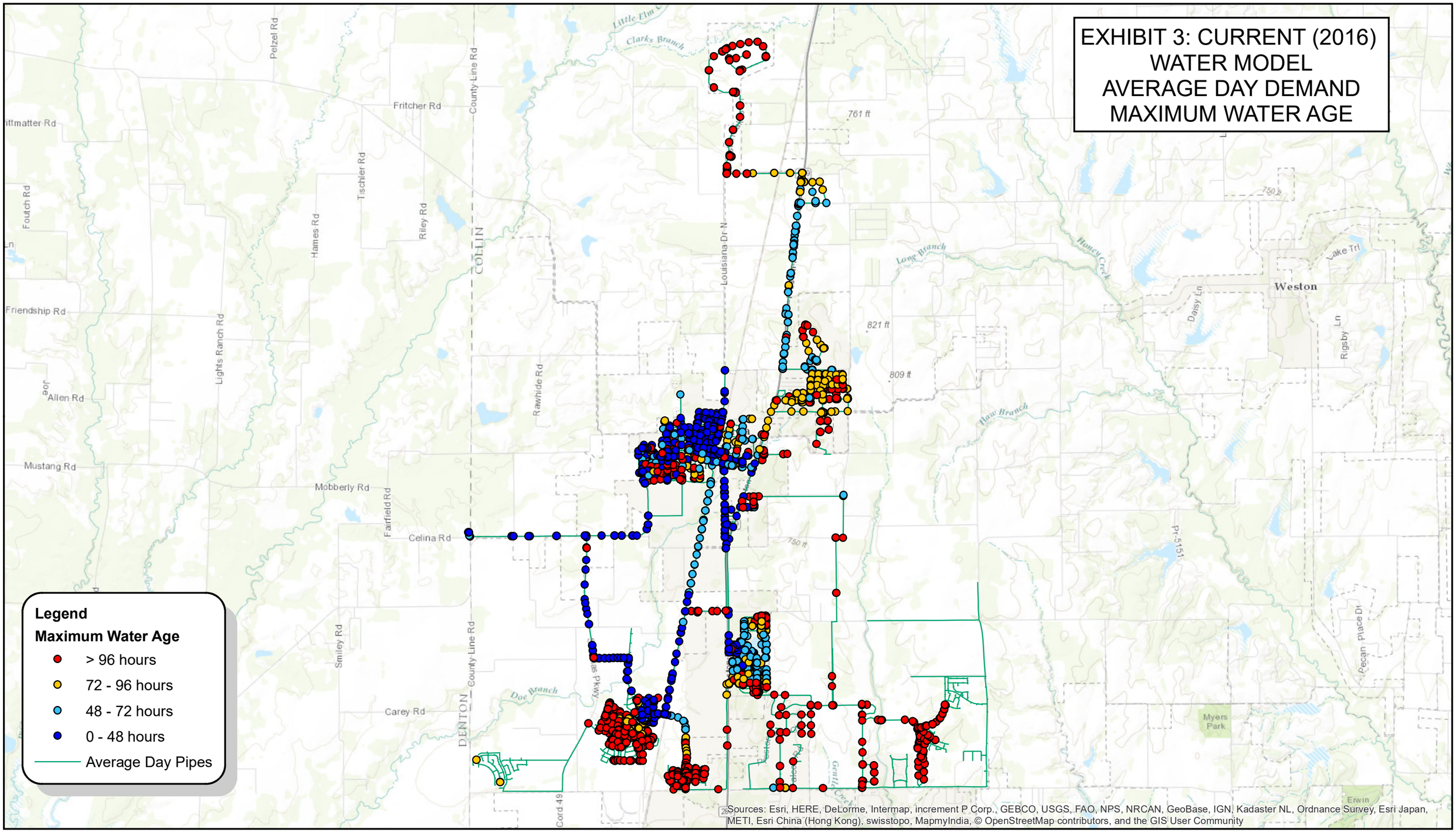

JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

CITY OF CELINA
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WATER CIP PROJECTS OVERVIEW

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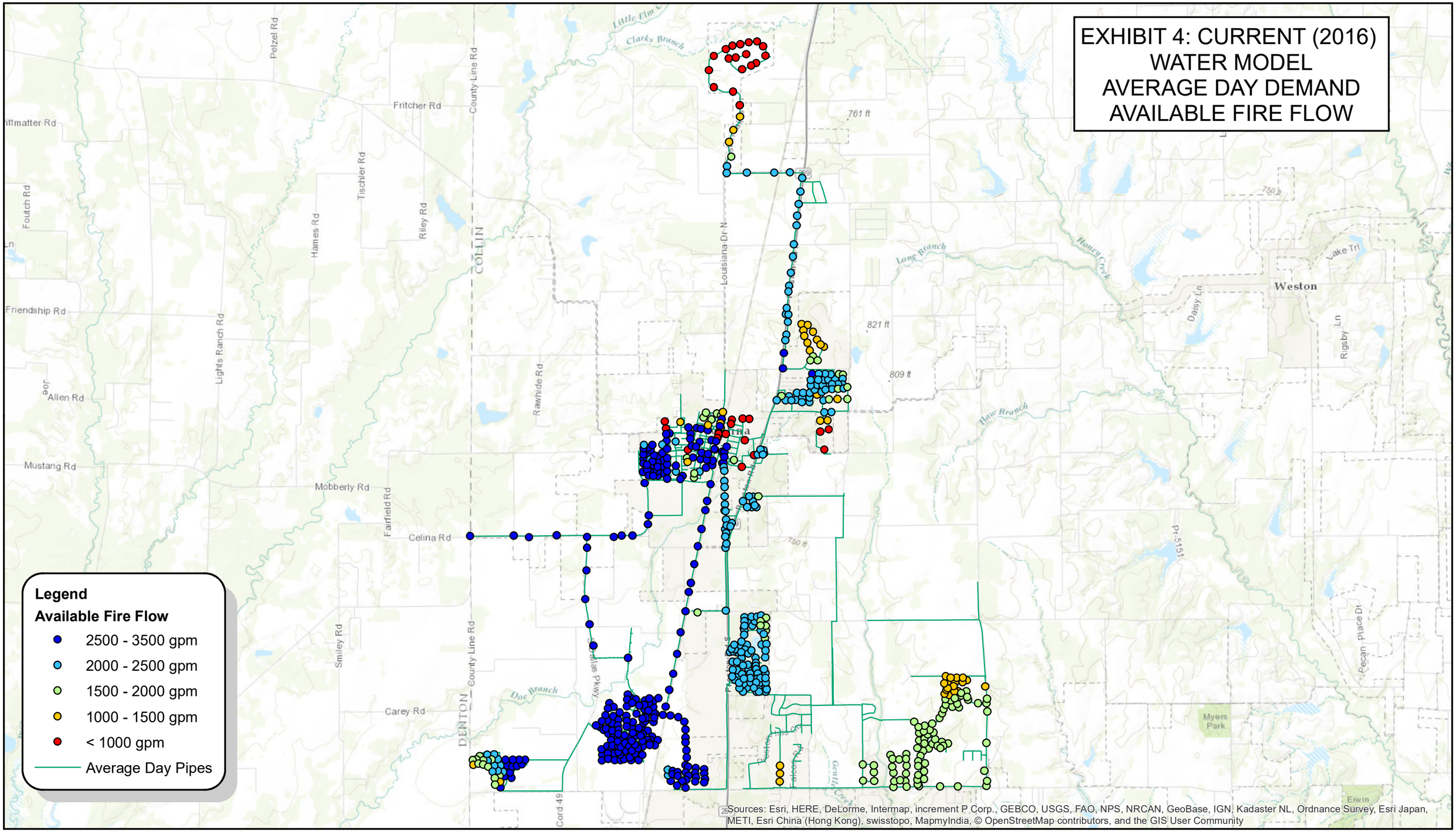
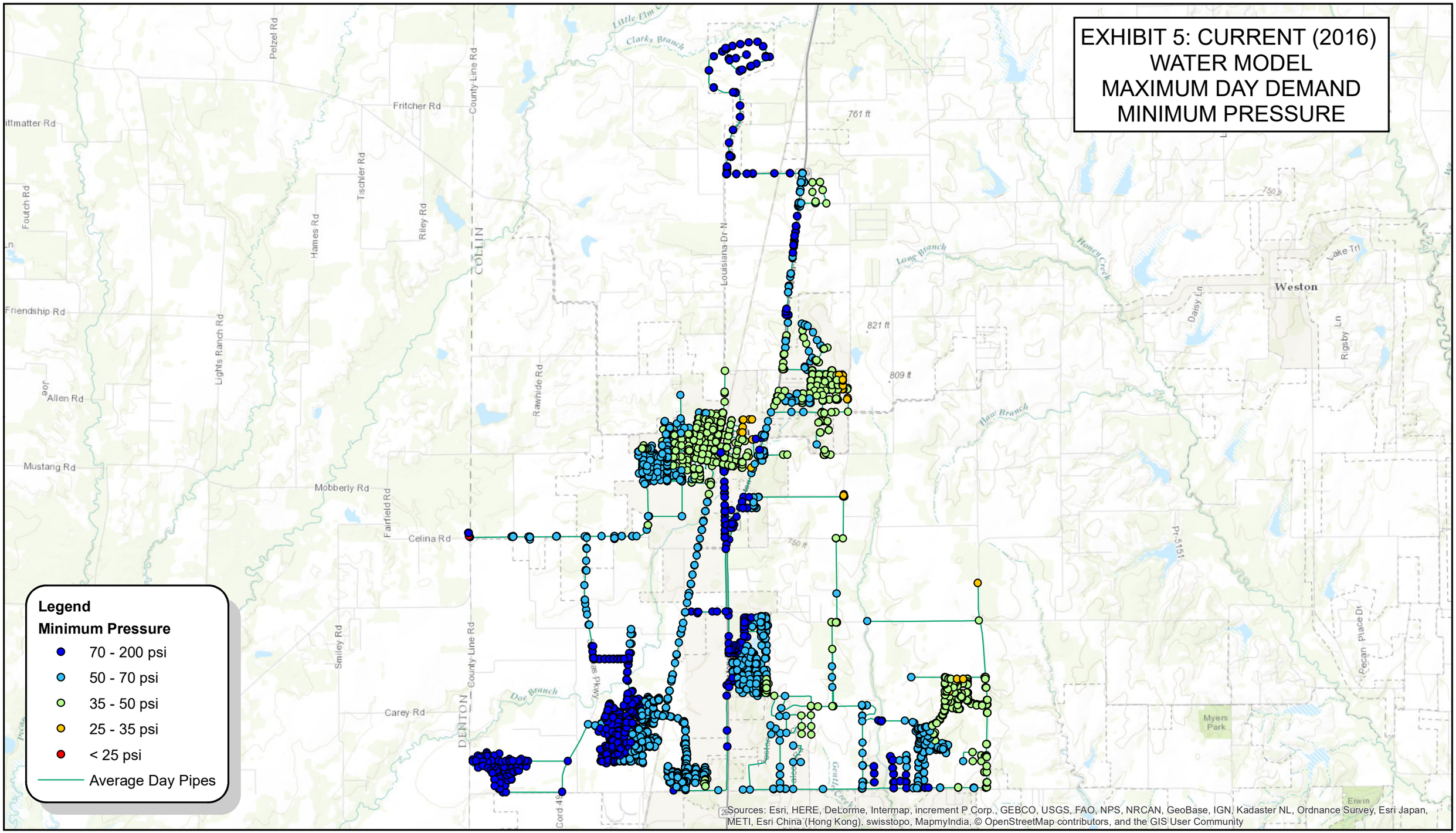
EXHIBIT 4: CURRENT (2016) WATER MODEL AVERAGE DAY DEMAND AVAILABLE FIRE FLOW



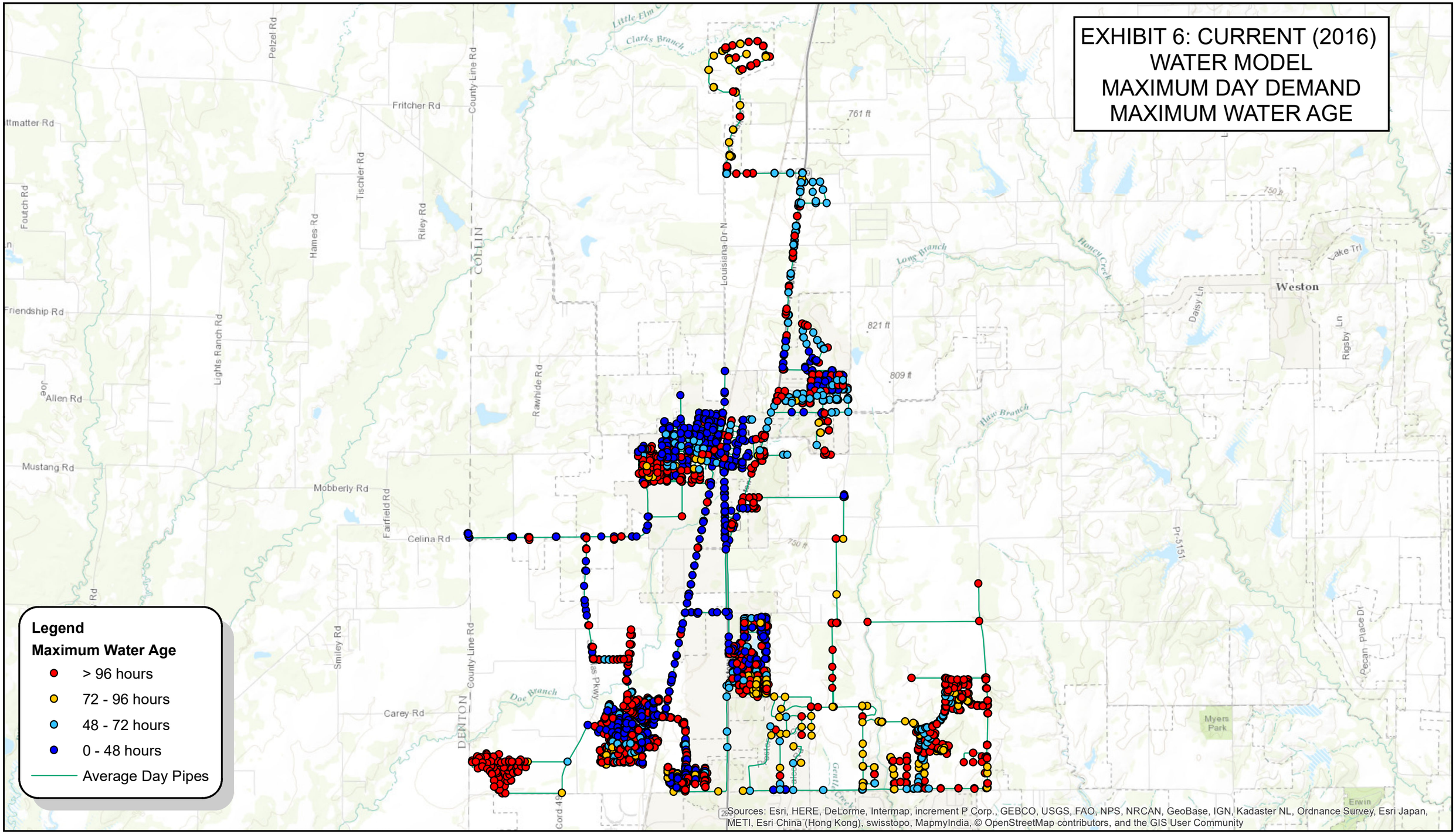
JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 5: CURRENT (2016) WATER MODEL MAXIMUM DAY DEMAND MINIMUM PRESSURE



JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 6: CURRENT (2016) WATER MODEL MAXIMUM DAY DEMAND MAXIMUM WATER AGE



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

CITY OF CELINA
CELINA, TEXAS
WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS

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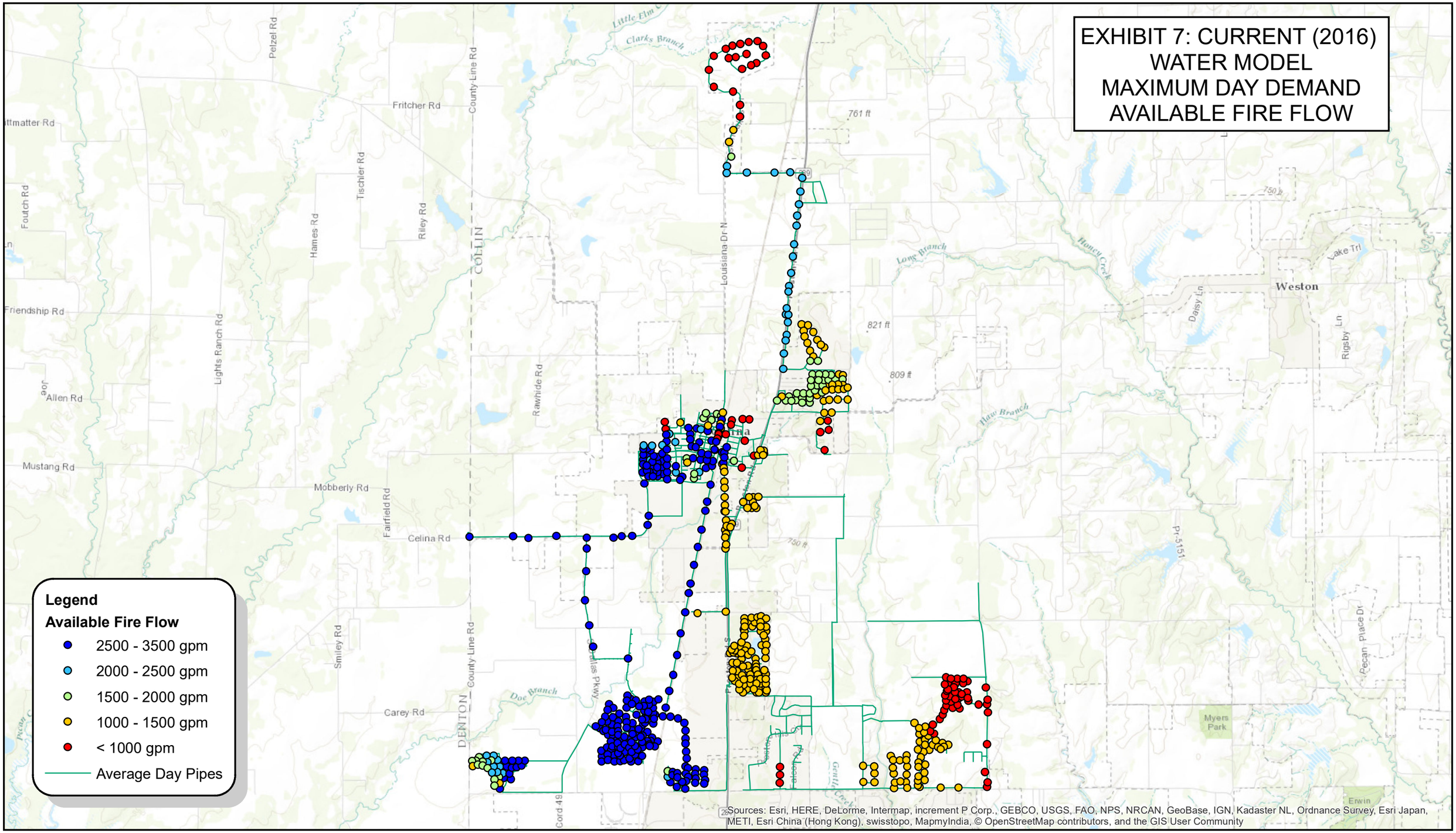
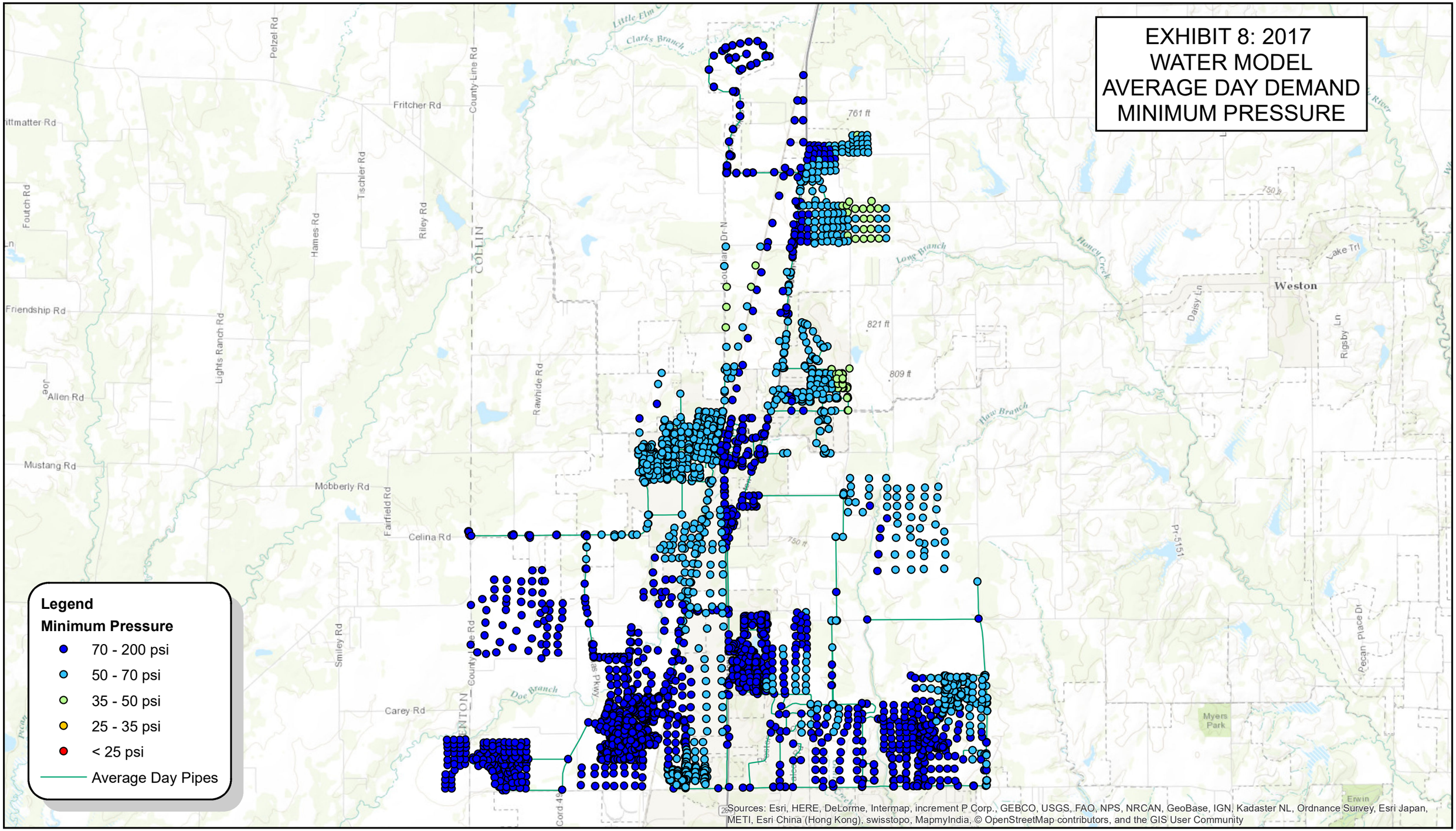
EXHIBIT 7: CURRENT (2016) WATER MODEL MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW



JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 8: 2017 WATER MODEL AVERAGE DAY DEMAND MINIMUM PRESSURE



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

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WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS

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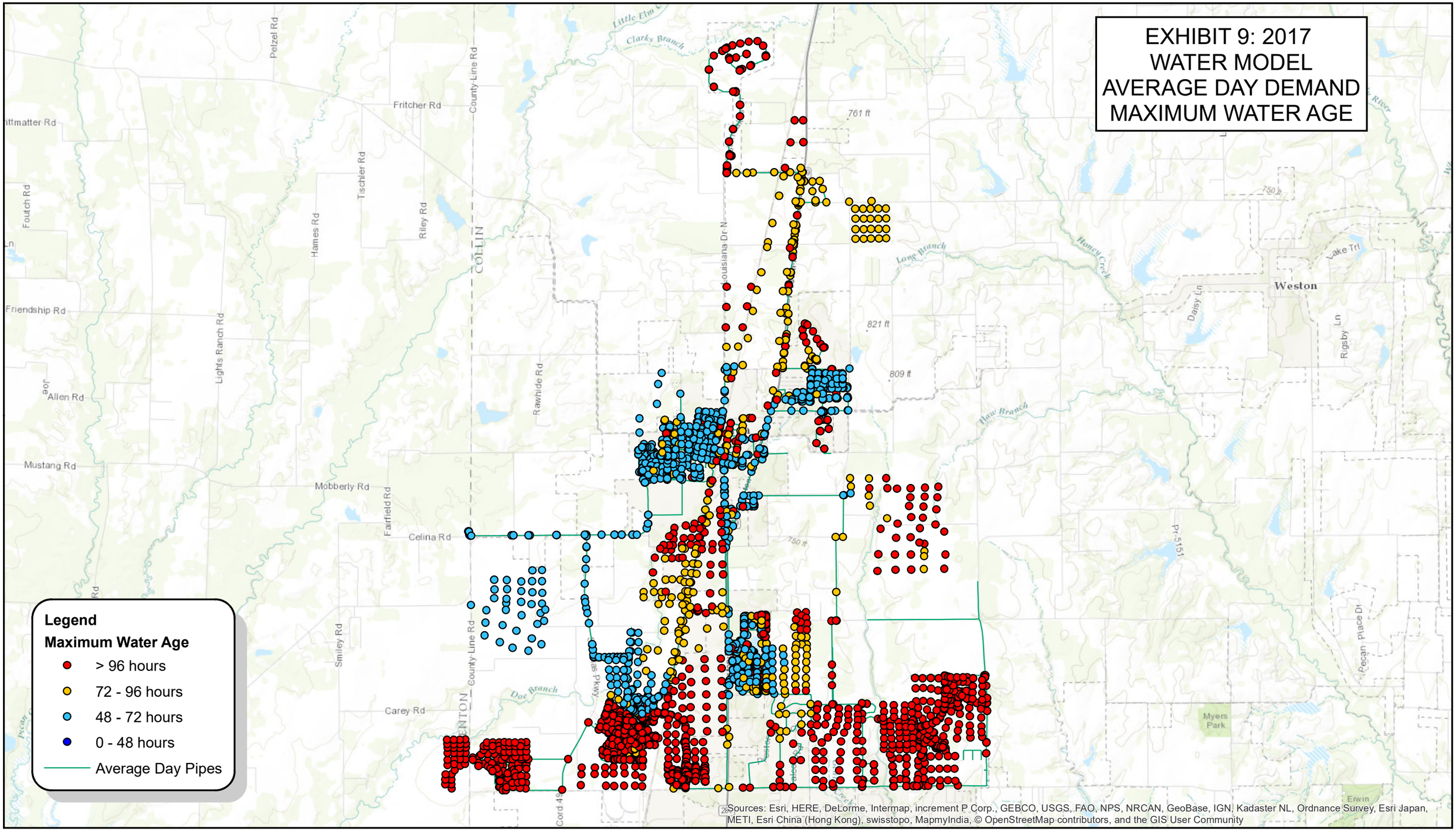
EXHIBIT 9: 2017 WATER MODEL AVERAGE DAY DEMAND MAXIMUM WATER AGE



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

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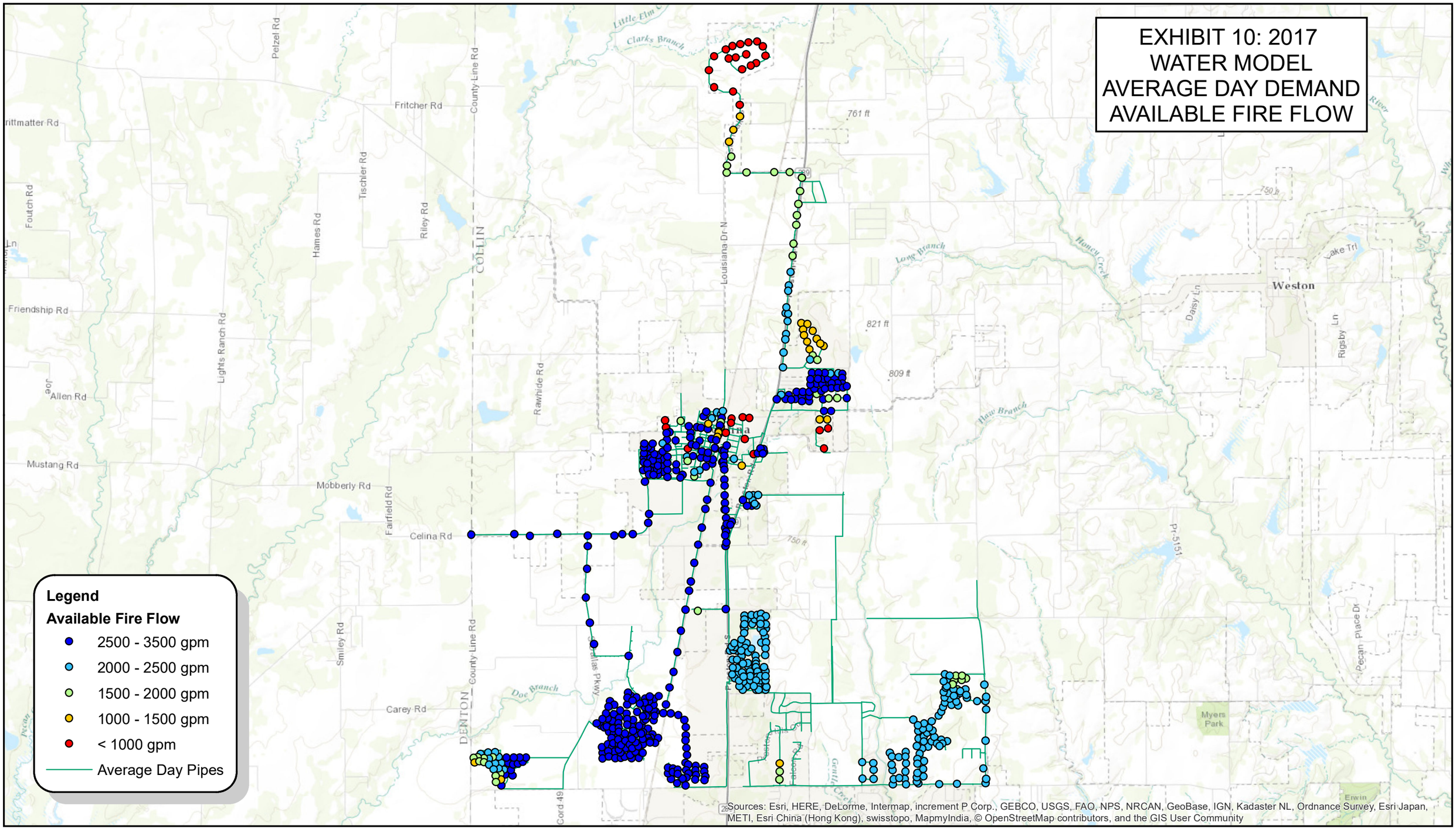
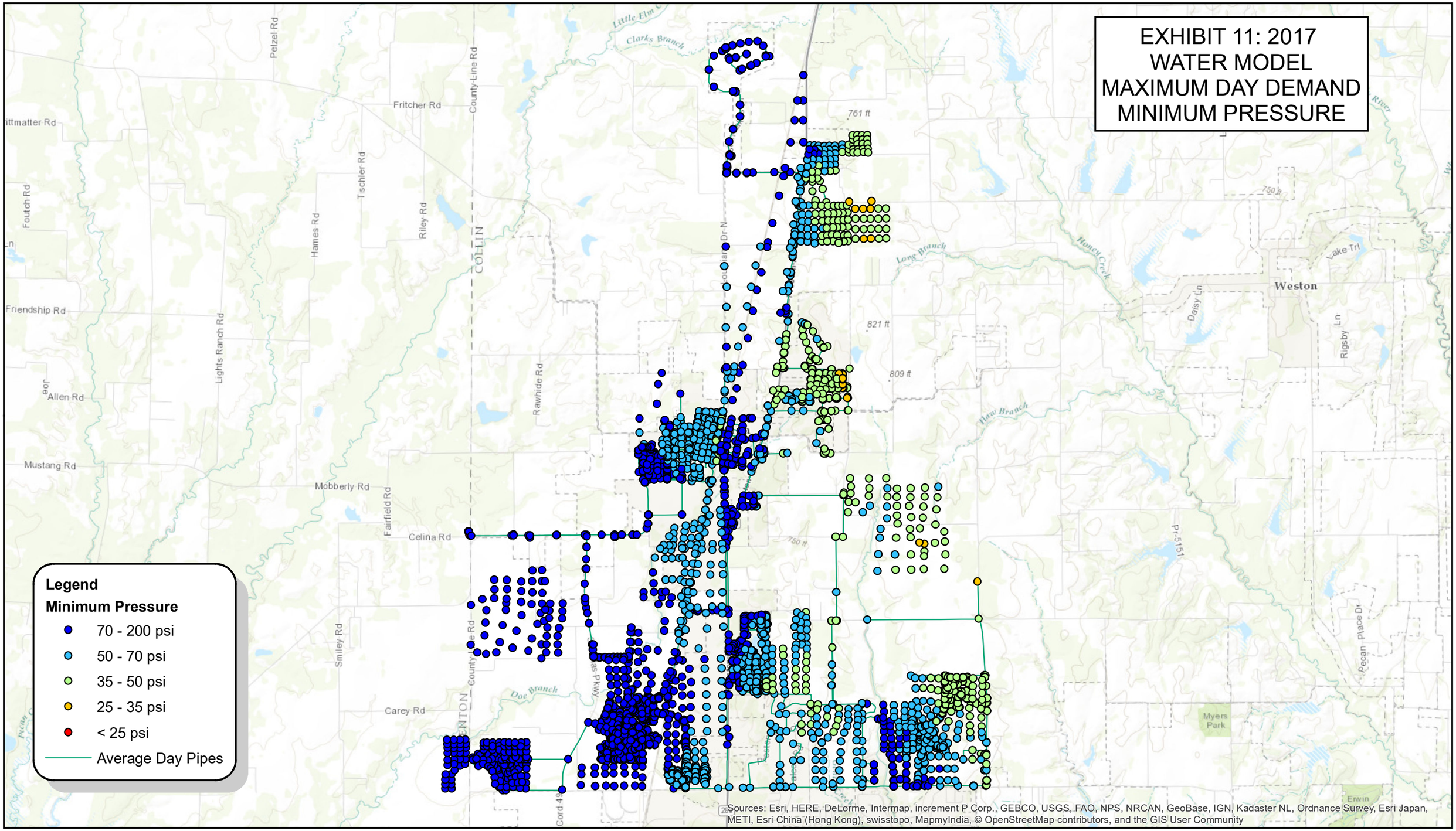


JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER



JOB NO.: 16088050
DATE: AUGUST 2017
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N

0 0.5 1 2 Miles

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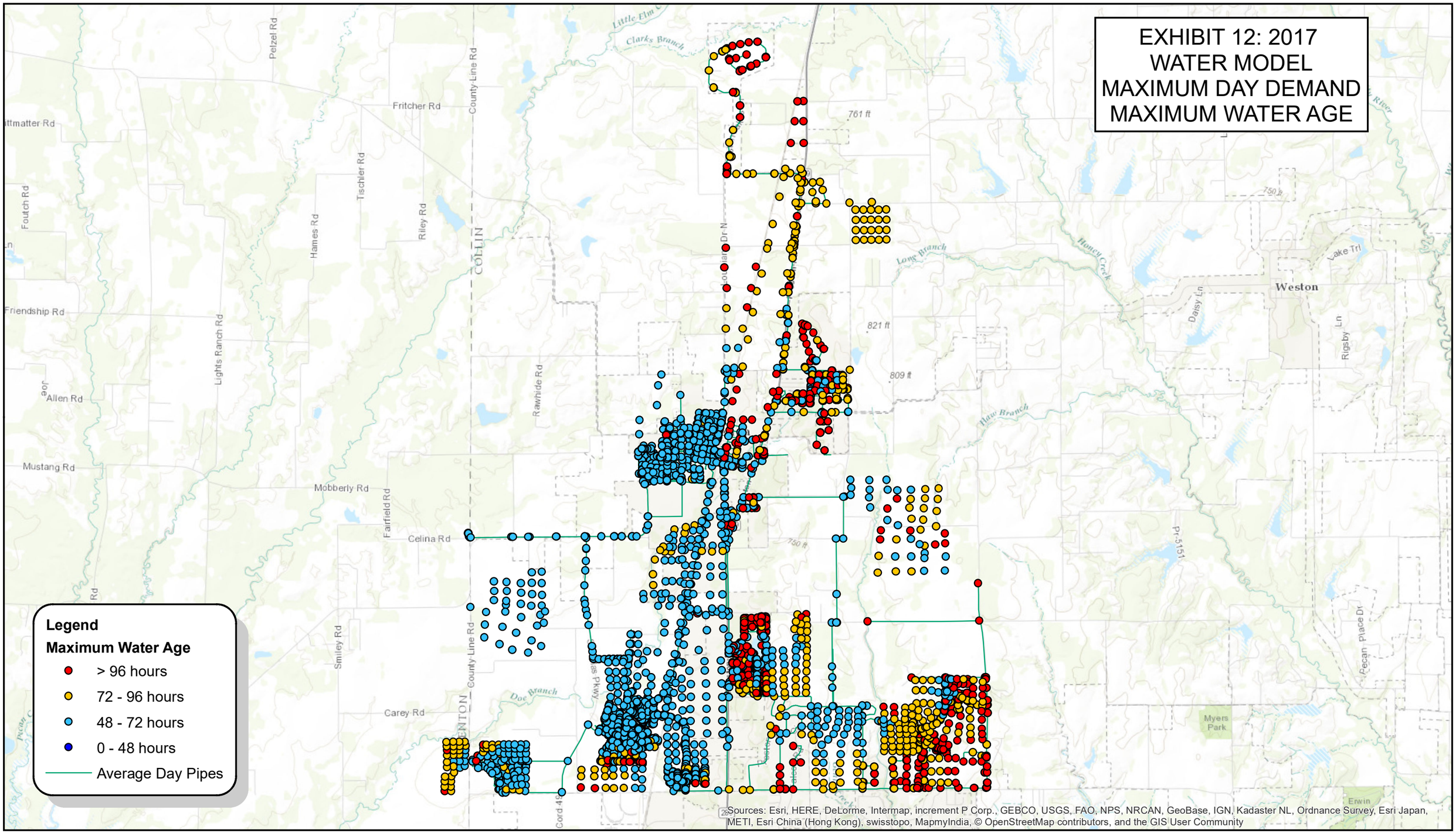
EXHIBIT 12: 2017 WATER MODEL MAXIMUM DAY DEMAND MAXIMUM WATER AGE



JOB NO.: 16088050
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N

0 0.5 1 2 Miles

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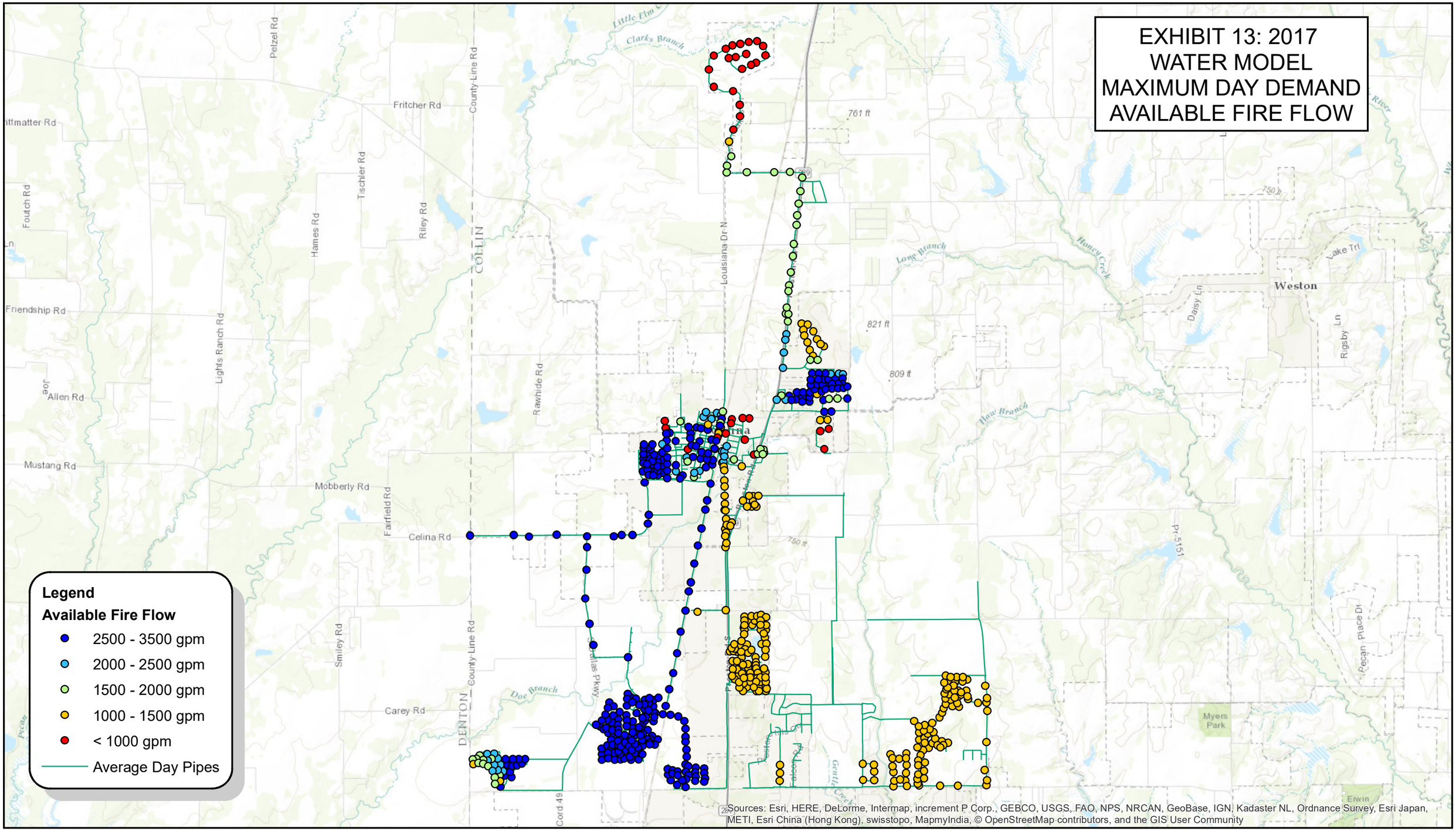
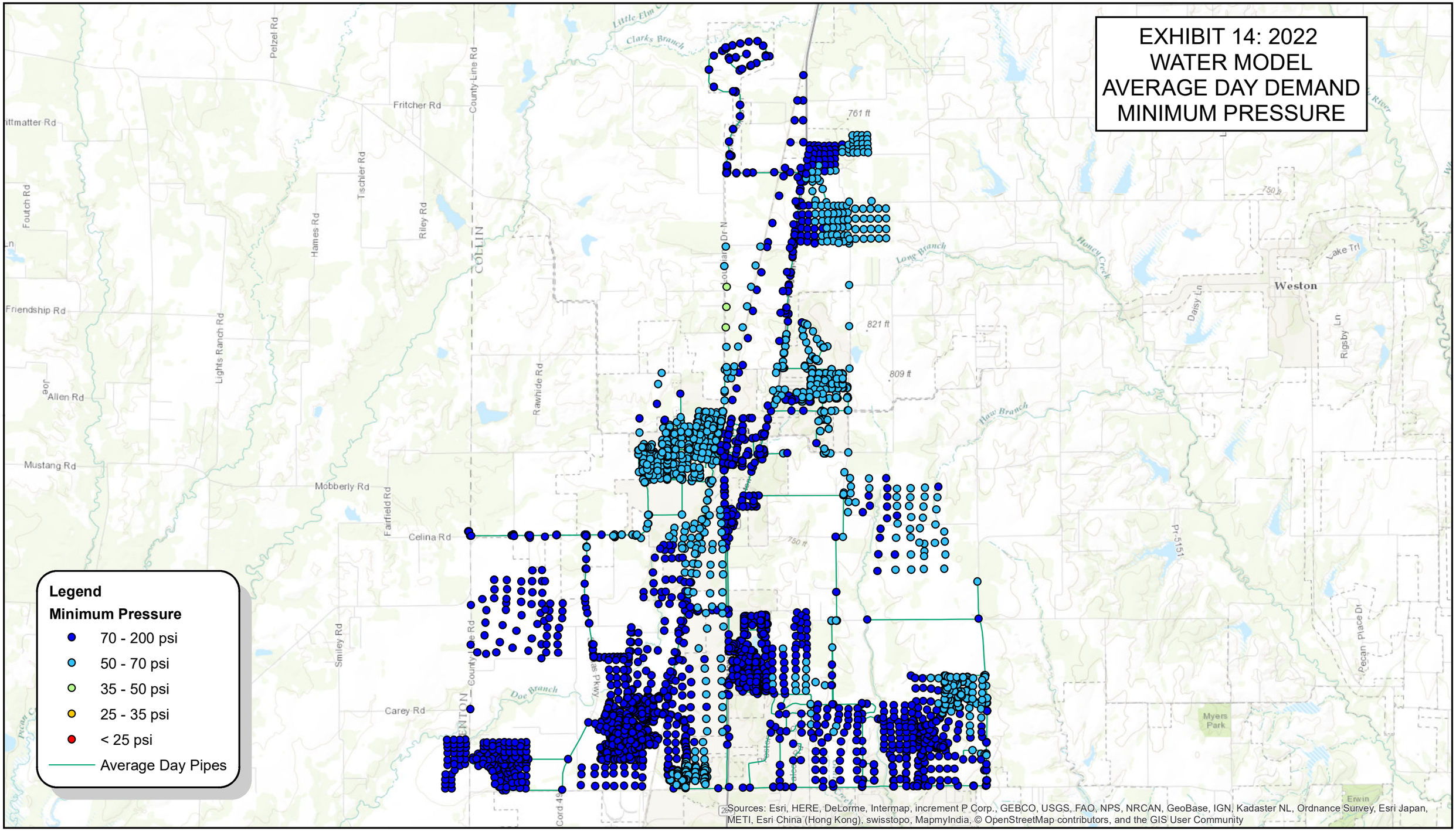
EXHIBIT 13: 2017 WATER MODEL MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW



JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 14: 2022 WATER MODEL AVERAGE DAY DEMAND MINIMUM PRESSURE



JOB NO.: 16088050
DATE: AUGUST 2017
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N

0 0.5 1 2 Miles

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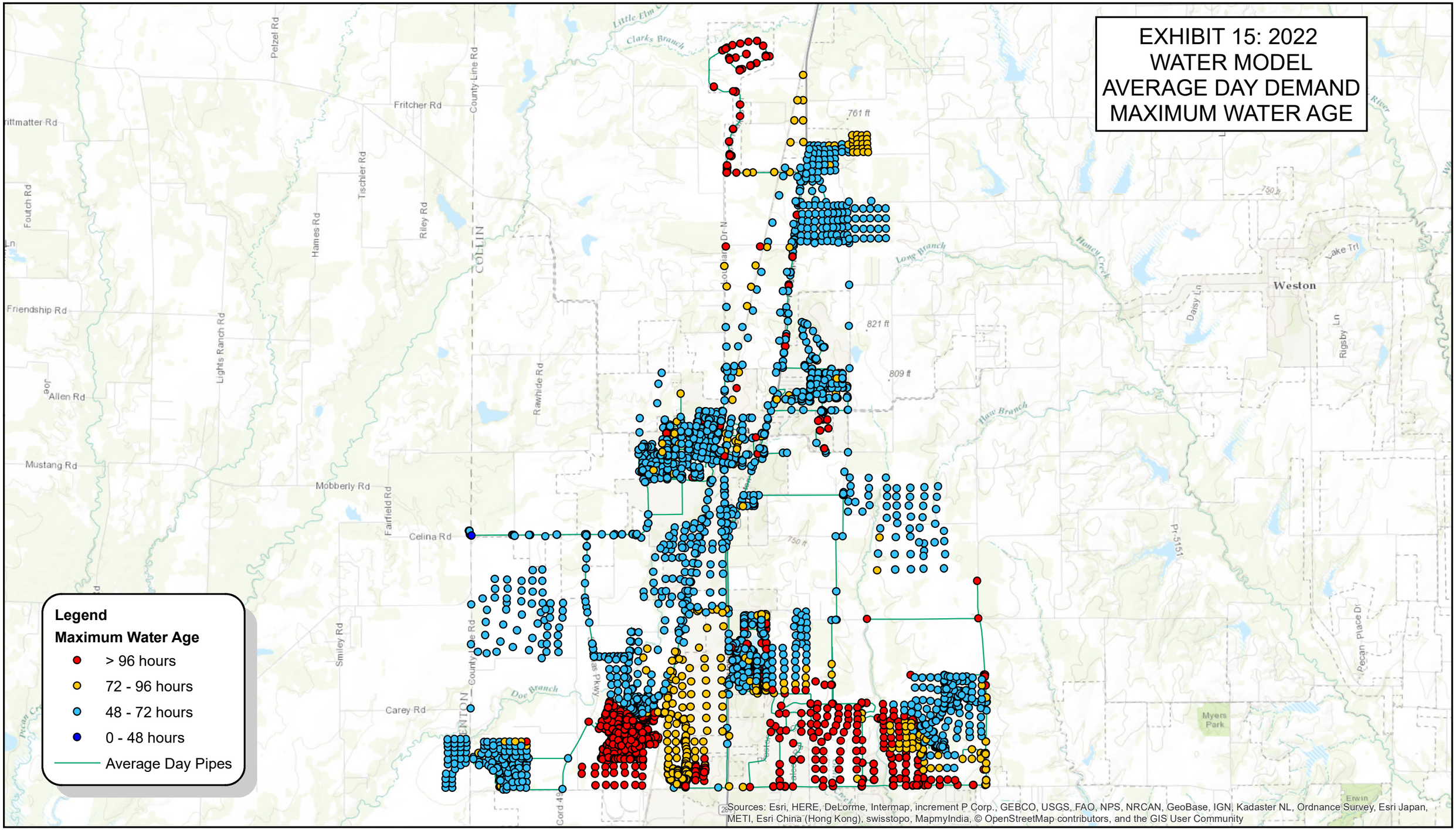

JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

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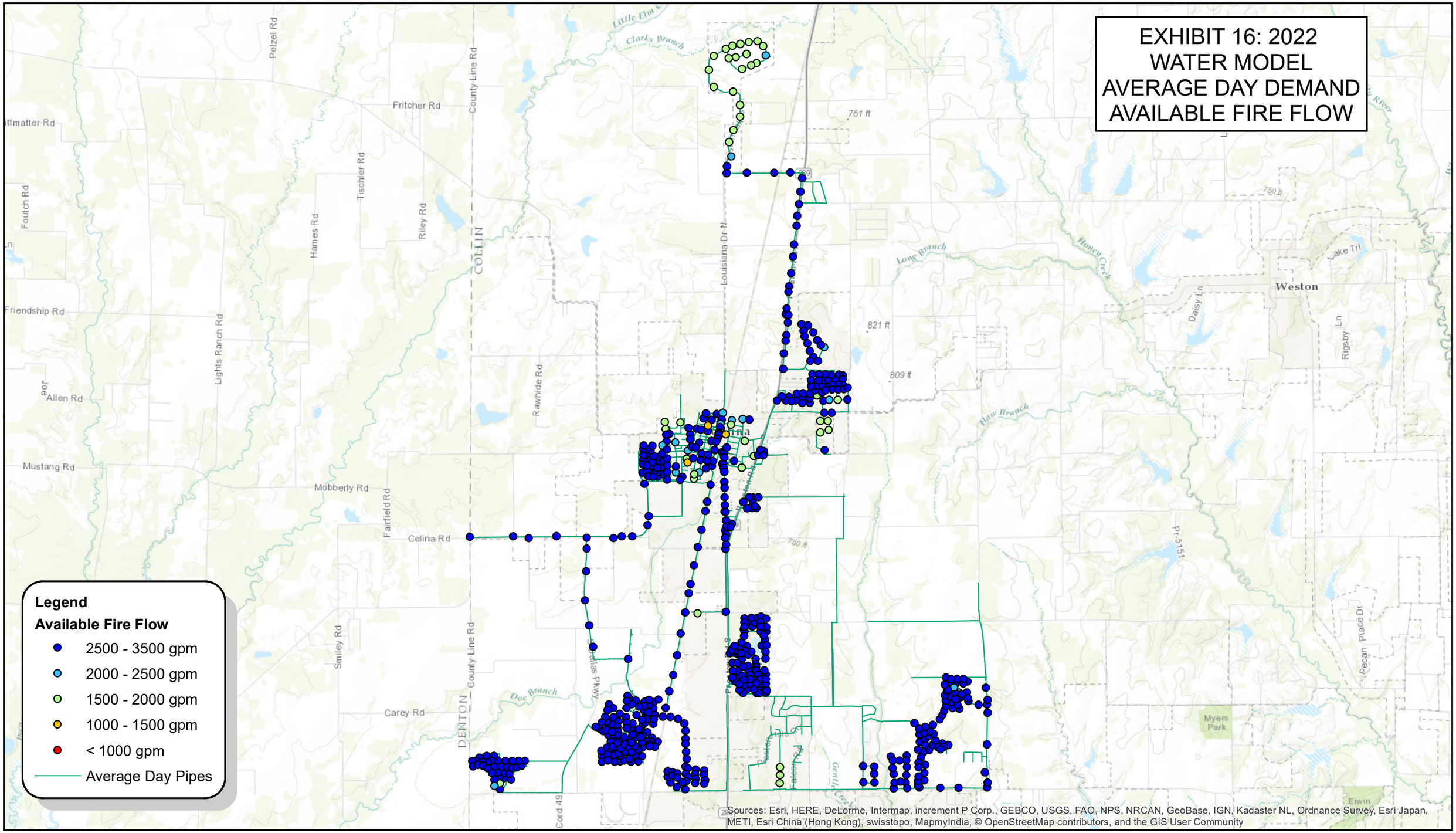

JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

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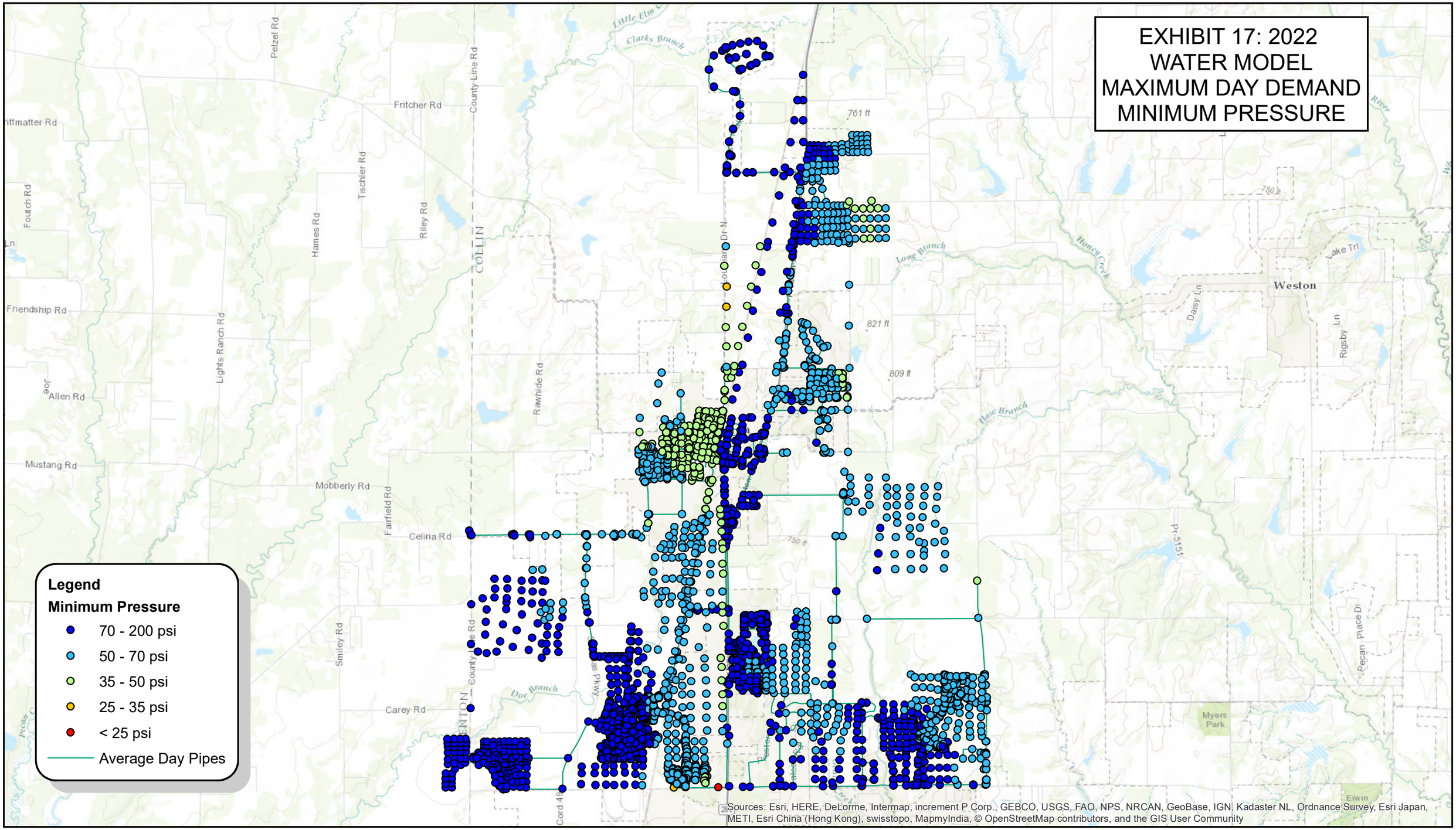
EXHIBIT 17: 2022 WATER MODEL MAXIMUM DAY DEMAND MINIMUM PRESSURE



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

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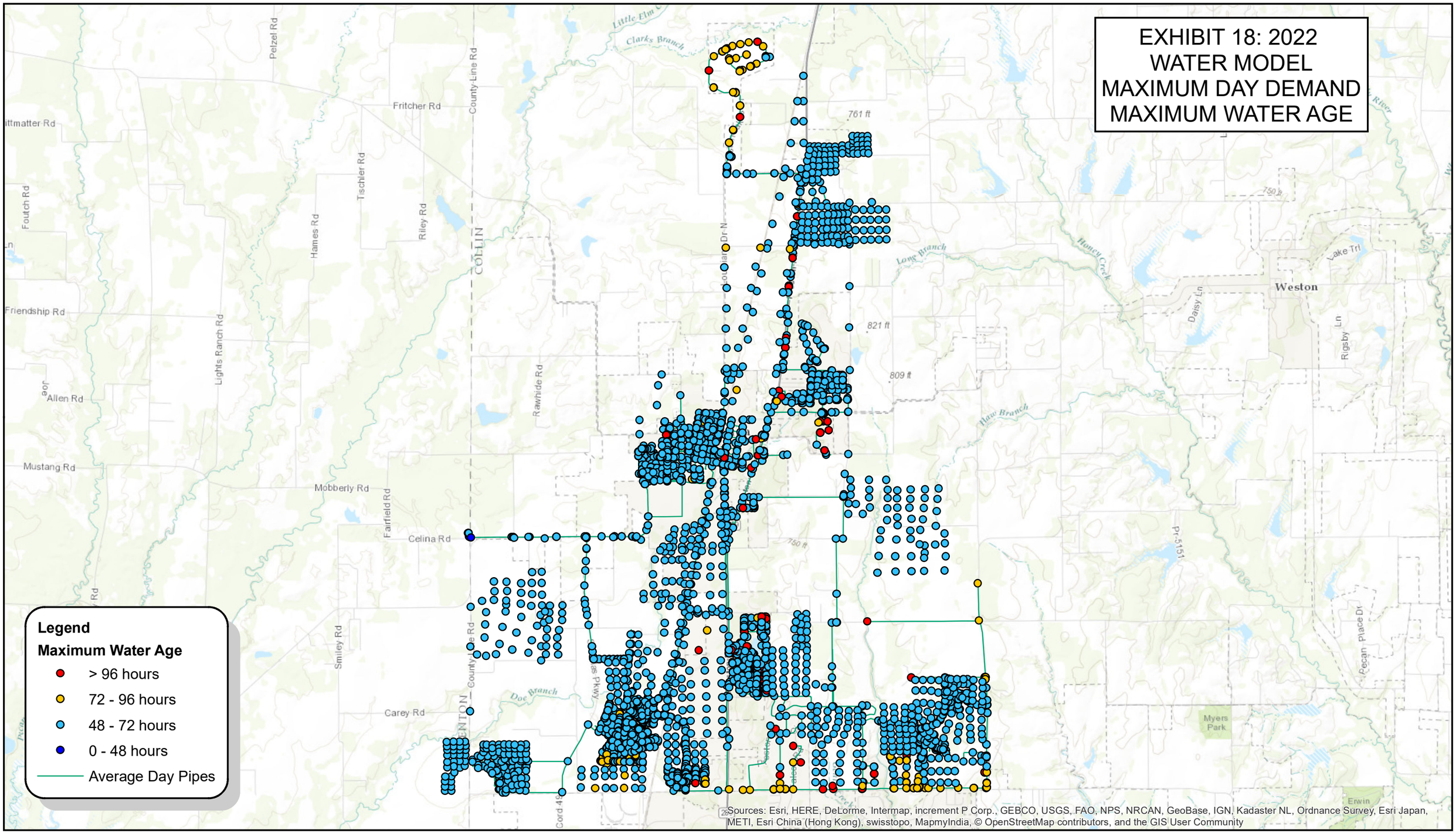
EXHIBIT 18: 2022 WATER MODEL MAXIMUM DAY DEMAND MAXIMUM WATER AGE



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

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WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS

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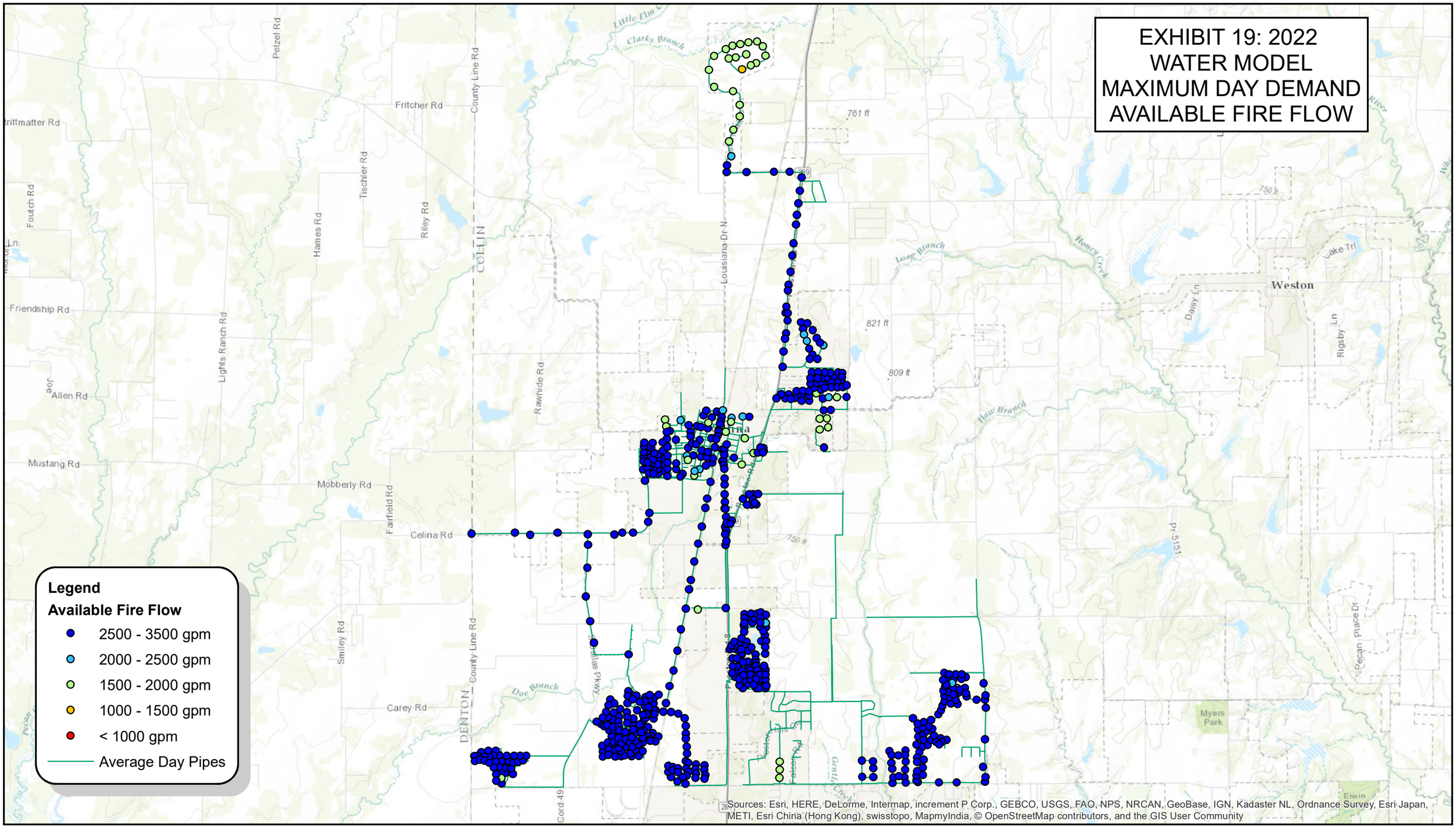
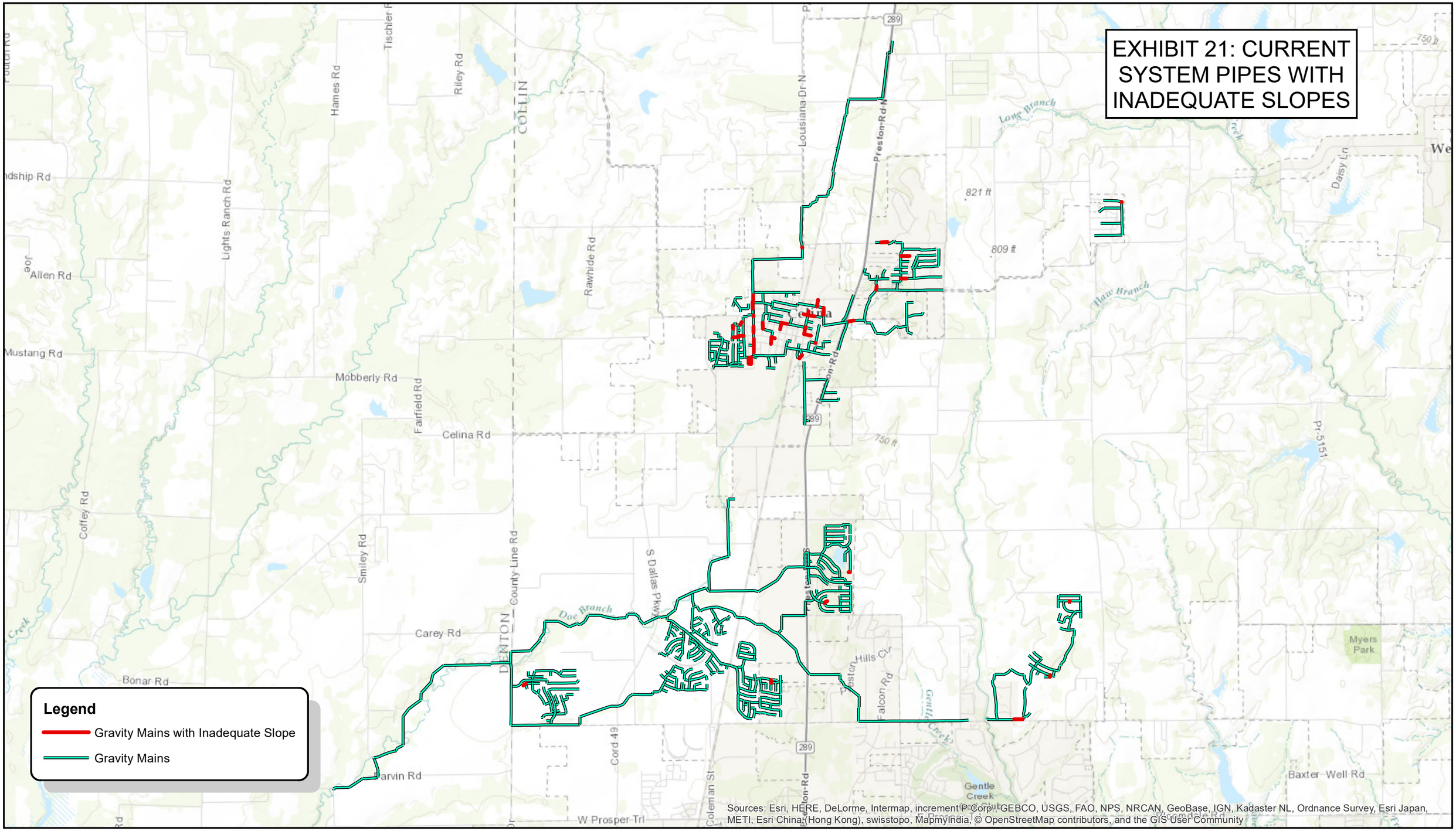
EXHIBIT 19: 2022 WATER MODEL MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW



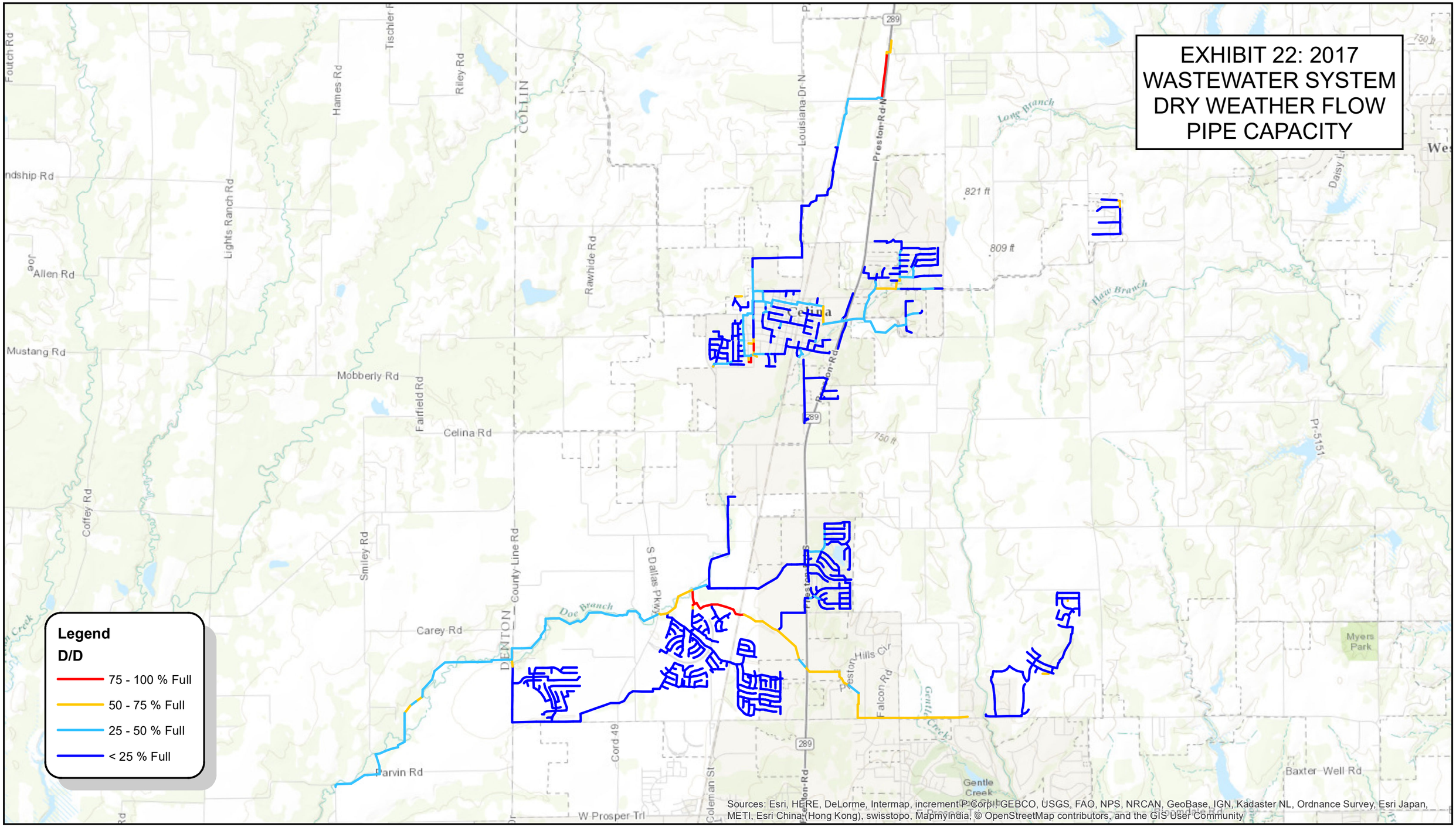
JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480

EXHIBIT 21: CURRENT SYSTEM PIPES WITH INADEQUATE SLOPES



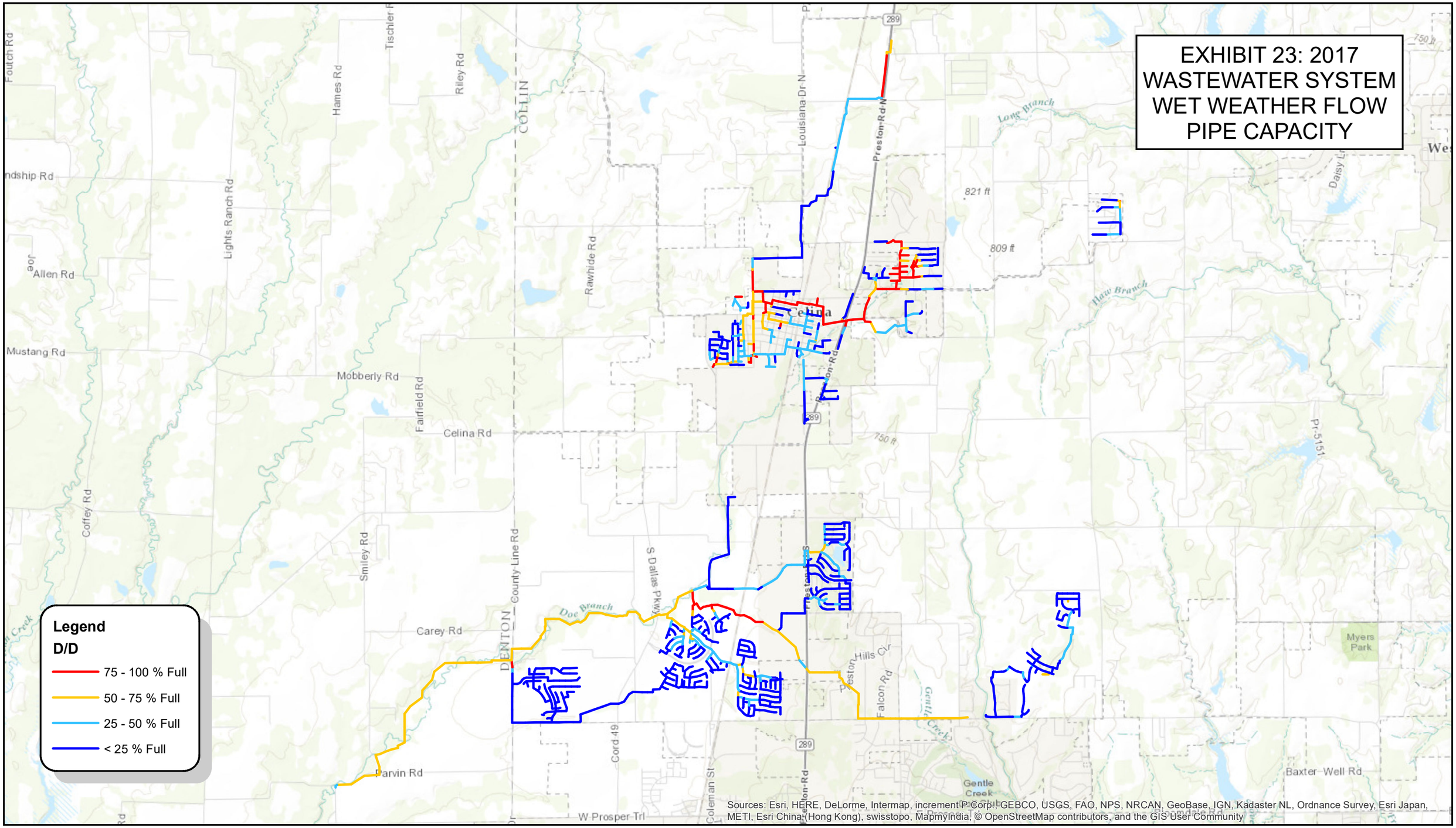
JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 22: 2017 WASTEWATER SYSTEM DRY WEATHER FLOW PIPE CAPACITY

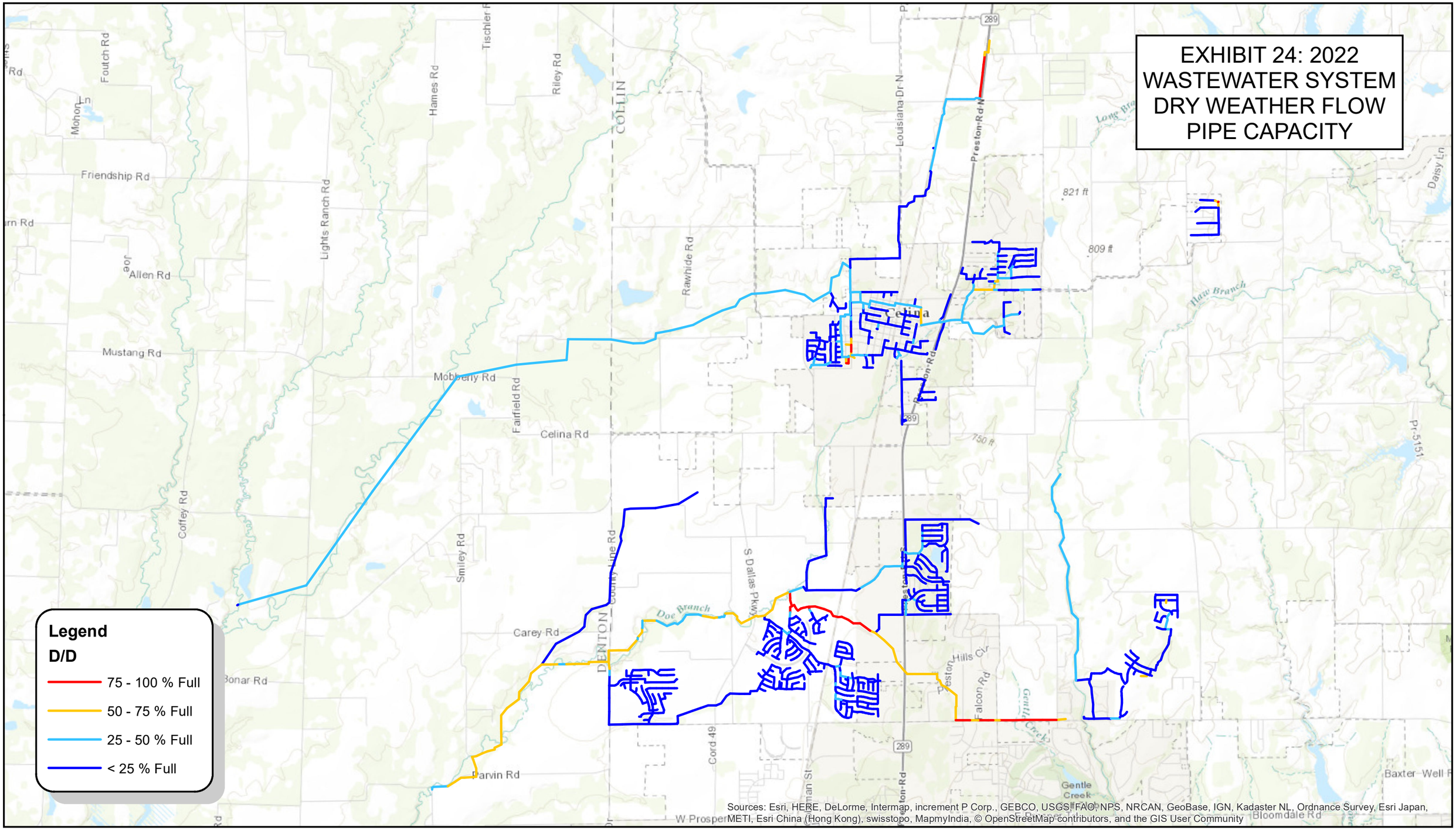


JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 23: 2017 WASTEWATER SYSTEM WET WEATHER FLOW PIPE CAPACITY



JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

CITY OF CELINA
CELINA, TEXAS
WATER & WASTEWATER MODELING AND
CIP REPORT EXHIBITS

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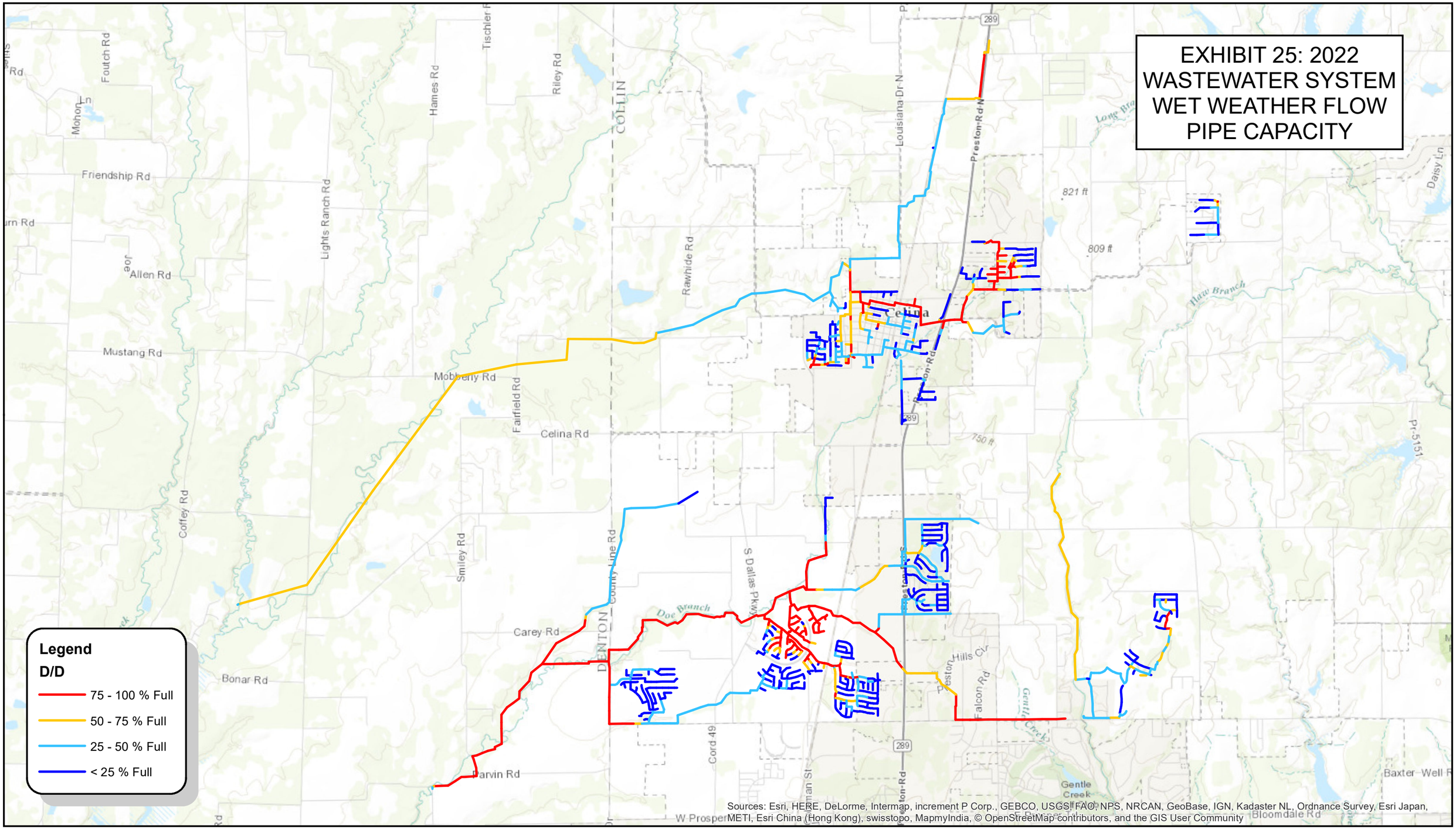
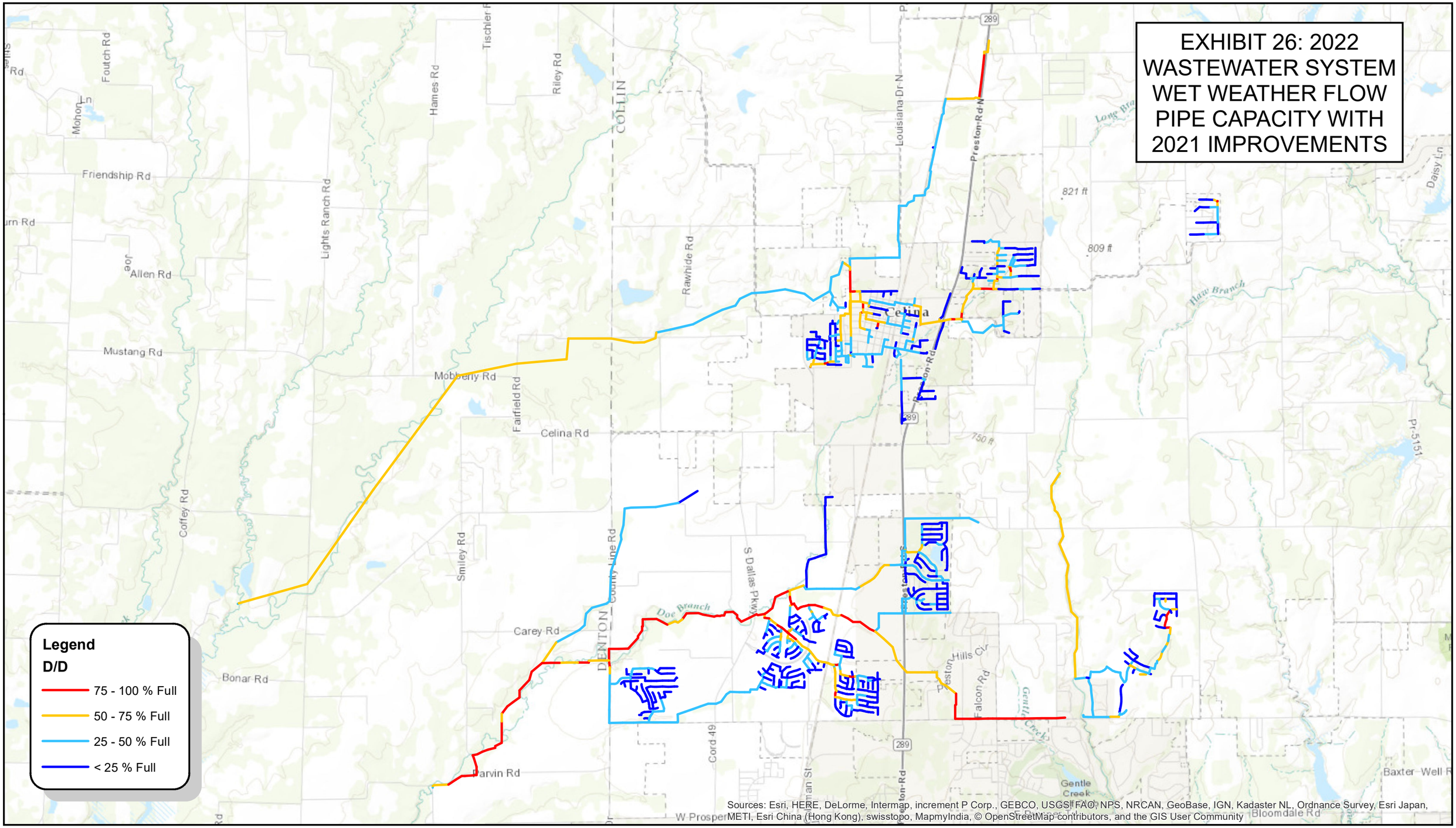
EXHIBIT 25: 2022 WASTEWATER SYSTEM WET WEATHER FLOW PIPE CAPACITY



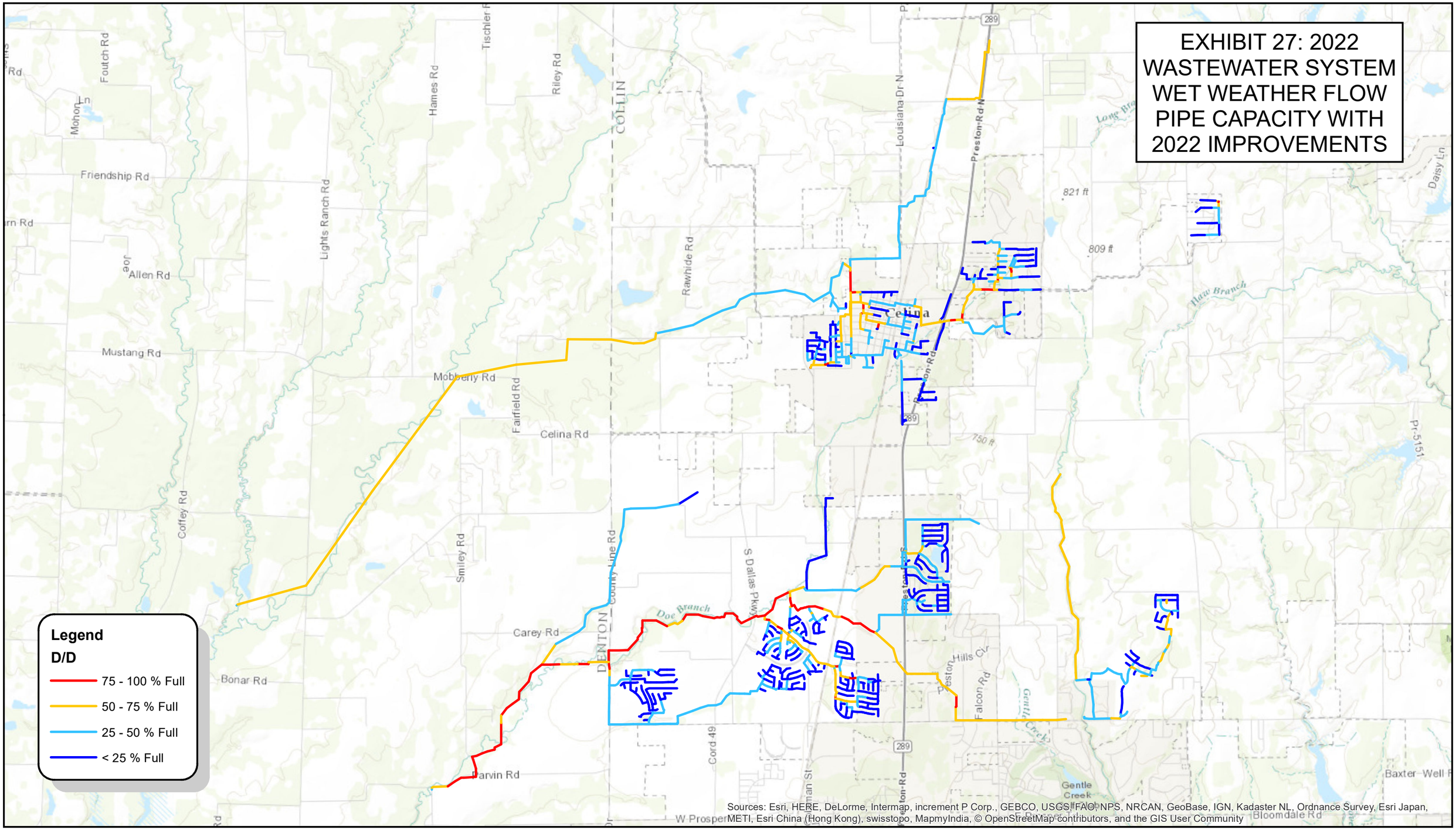
JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 26: 2022 WASTEWATER SYSTEM WET WEATHER FLOW PIPE CAPACITY WITH 2021 IMPROVEMENTS



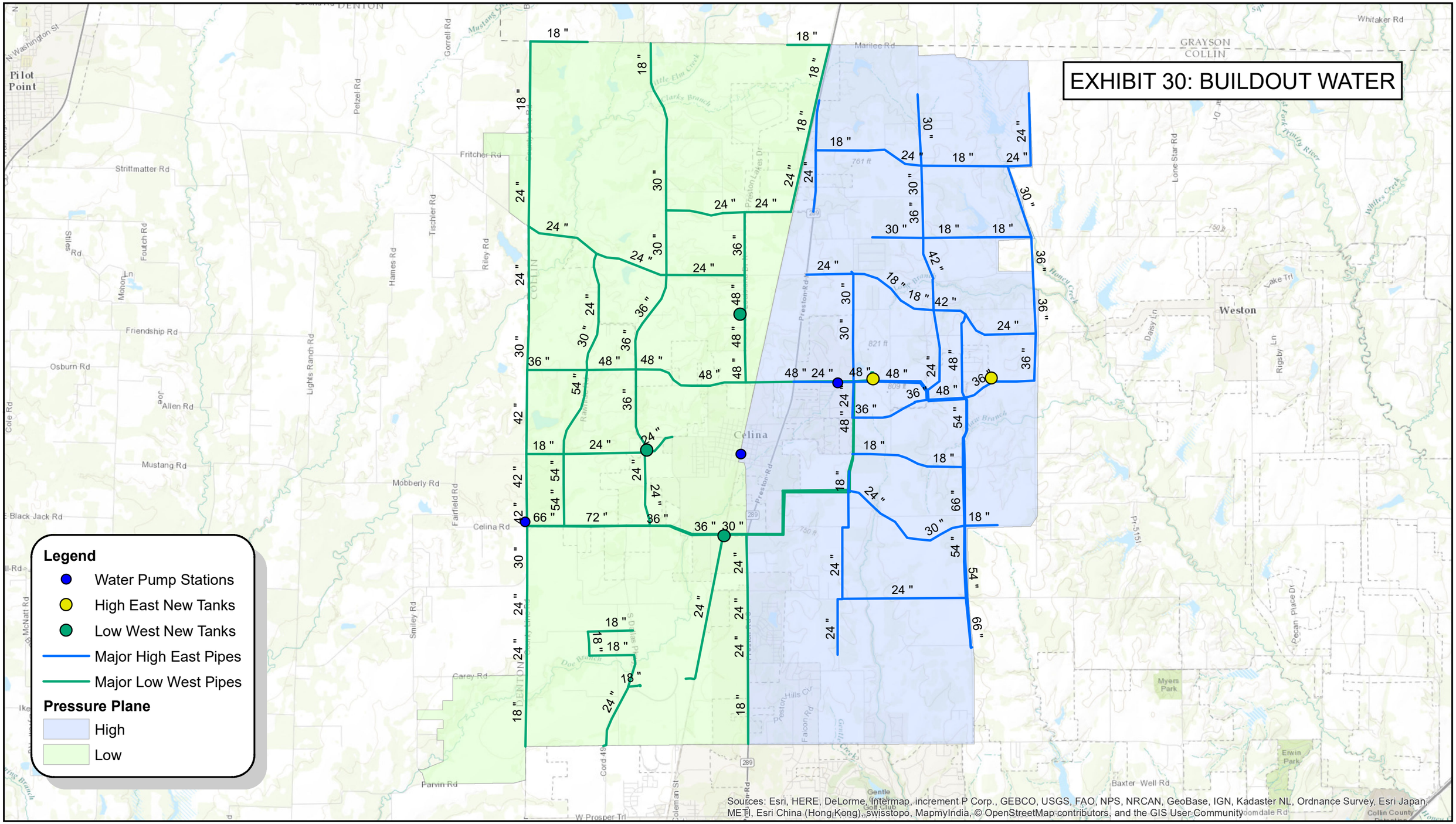
JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 27: 2022 WASTEWATER SYSTEM WET WEATHER FLOW PIPE CAPACITY WITH 2022 IMPROVEMENTS

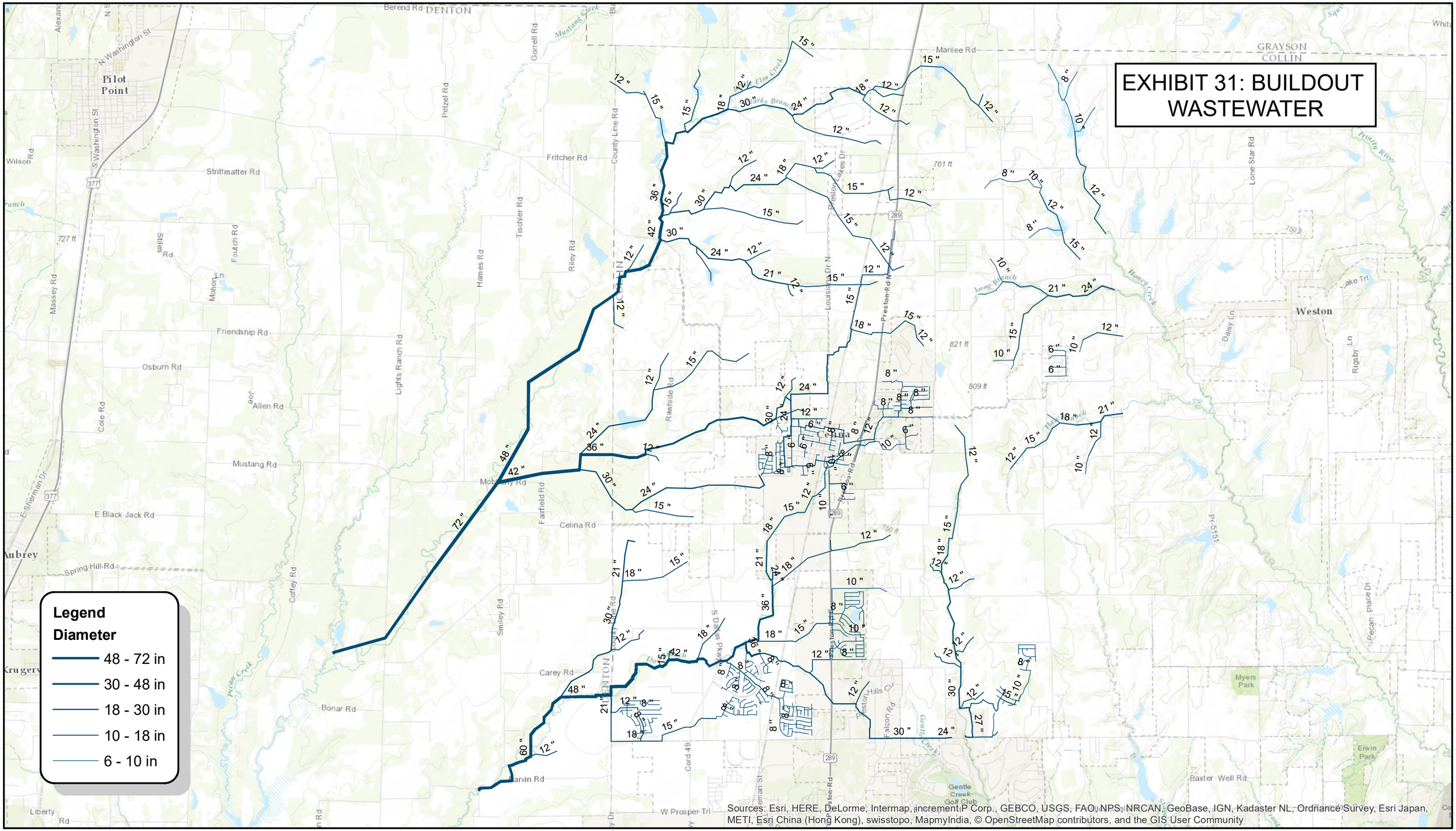


JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER

EXHIBIT 30: BUILDOUT WATER



JOB NO.: 16088050 DATE: AUGUST 2017 DESIGNED BY: EMT DRAWN BY: HMM	N 0 0.5 1 2 Miles	CITY OF CELINA CELINA, TEXAS WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS	3010 Gaylord Parkyway Suite 190 Frisco, TX 75034 (972) 377-7480	GARVER



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: HMM

N

0 0.5 1 2 Miles

CITY OF CELINA
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WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS

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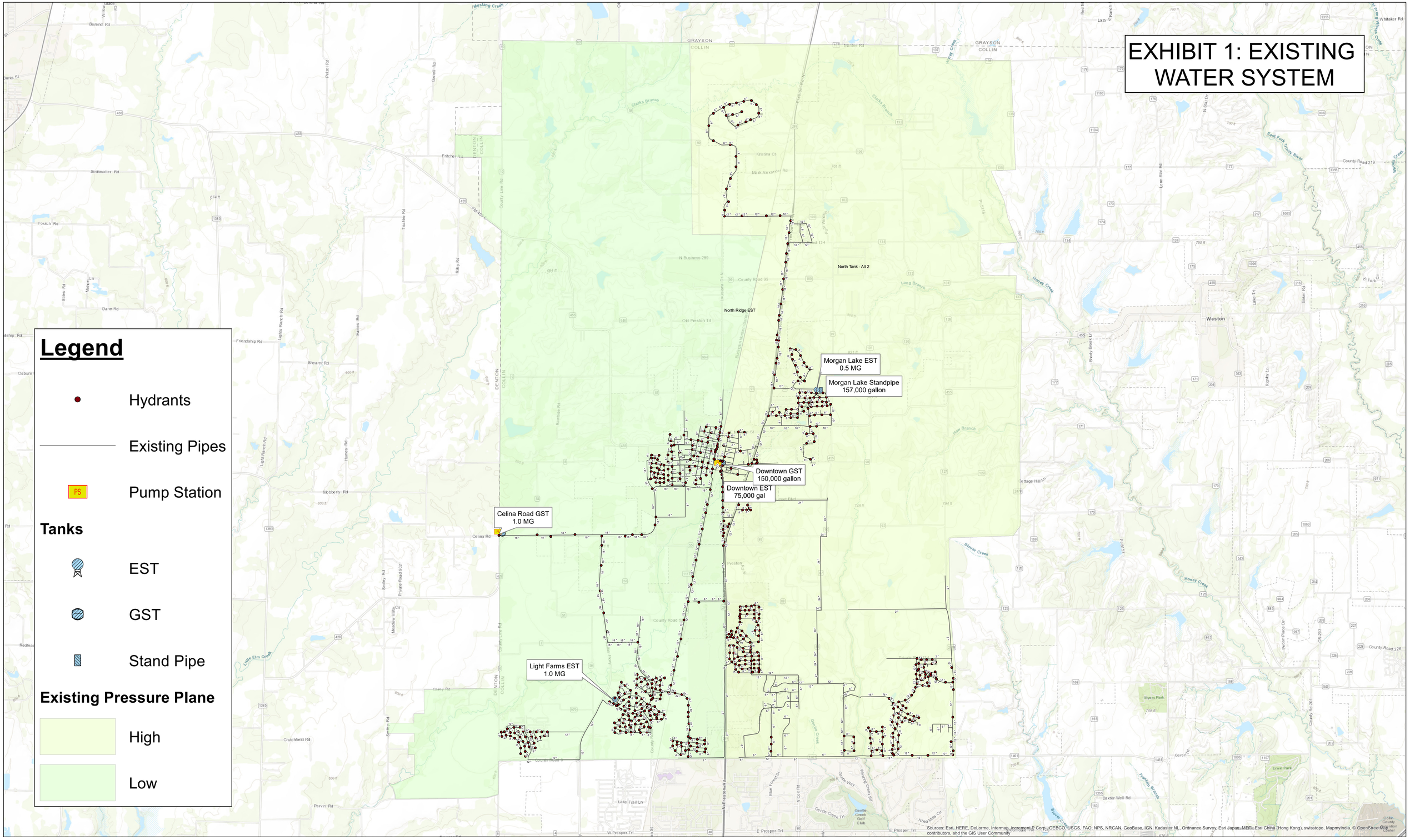
EXHIBIT 1: EXISTING WATER SYSTEM



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: TCR
DRAWN BY: HMM

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CITY OF CELINA
CELINA, TEXAS
WATER & WASTEWATER MODELING AND
CIP REPORT EXHIBITS

3010 Gaylord Parkyway
Suite 190
Frisco, TX 75034
(972) 377-7480

EXHIBIT 20: EXISTING WASTEWATER SYSTEM

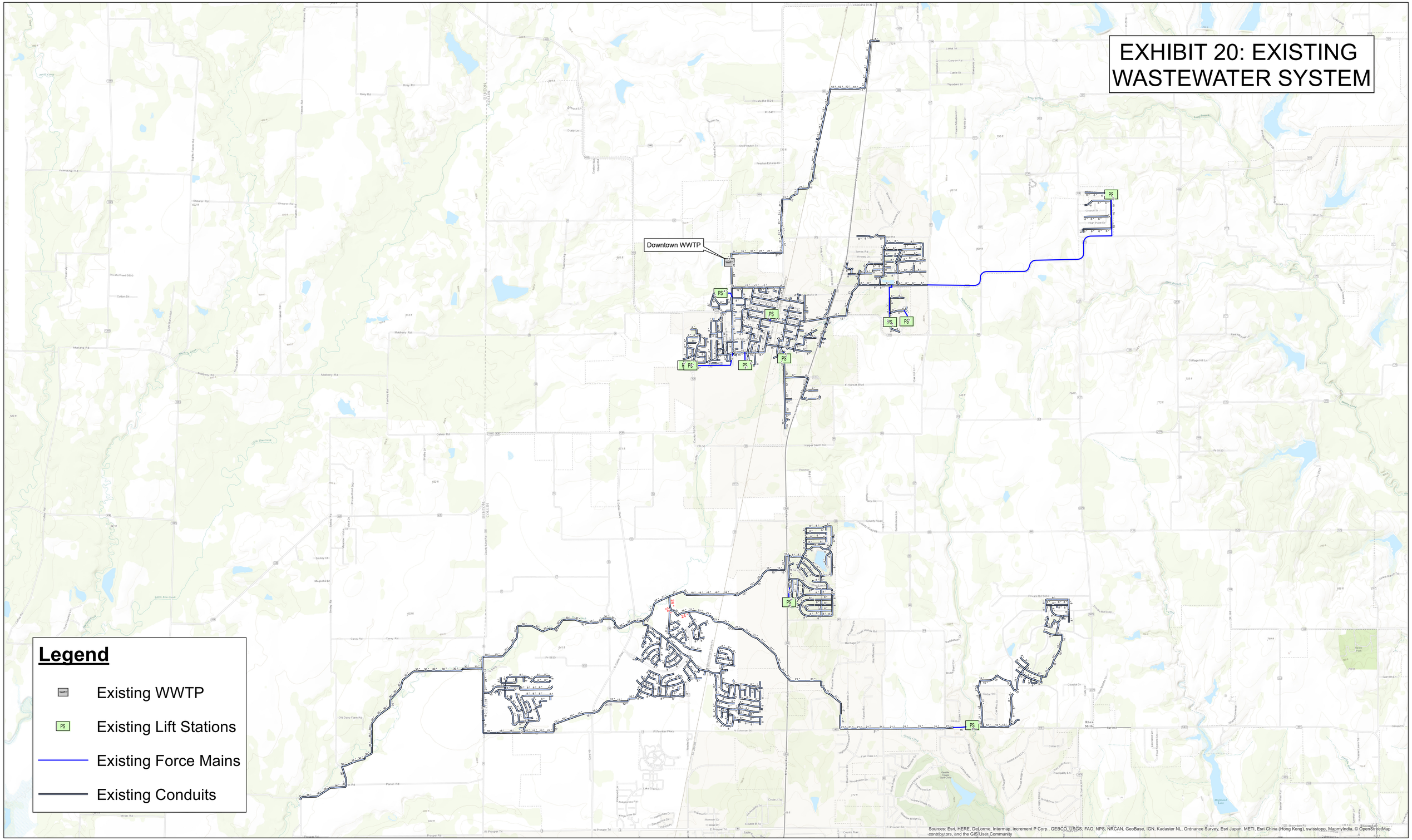

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EXHIBIT 28: WATER CIP

Water CIP Project Legend

Development Driven Projects

1. Project B - Downtown EST shutdown and SCADA switchover
2. Project A - Capacity upgrades to CRPS and installation of 4 new pumps
3. Project H - Capacity upgrades to DTPS and installation of 3 new pumps
4. Project E - 12" line and valves to switch LPP to HPP
5. Project F - 18", 30", and 36" line along Celina Road from CRPS
6. Project G - 24" and 30" lines to Downtown GST
7. Project J - 24" and 30" discharge lines to DTPS
8. Project D - 18" and 24" line to Morgan Lake area
9. Project C - 18" line east of Light Farms EST along Cypress Creek Way
10. Project L - Additional capacity upgrades to CRPS
11. Project Z - New 6 MG GST at CRPS
12. Project R - Additional capacity upgrades to DTPS
16. Project M - 12" line along Settlers Ridge
17. Project Q - Additional capacity upgrades to CRPS
18. Project AC - 2020 5-year Master Plan (not shown)
19. Project P - 8", 12", and 18" line from Morgan Lake to DC Ranch
20. Project O - 24" line to increase capacity in the Low Pressure Plane

Operational Projects

13. Project K - Decommission Morgan Lake facilities
14. Project AB - SCADA improvements (not shown)
15. Project AA - 8" line upgrades in Downtown area
22. Project S - 18" and 24" lines along Legacy Drive

Fire Flow Projects

21. Project T - 18" and 24" lines along Hwy. 455
23. Project X - 8" and 24" lines to connect Preston Lakes to Preston Road Corridor
24. Project W - 8" and 12" line along E. Malone St. and Preston Road
25. Project V - 8" lines in the Low Pressure Plane
26. Project Y - 18" line from the Parks at Wilson Creek to Lakes at Mustang Ranch
27. Project U - 12" line from Preston Road to Morgan Lake Estates

CITY OF CELINA

WATER SYSTEM RECOMMENDED CAPITAL IMPROVEMENTS

LEGEND

Existing Structures

- Existing Structure
- Existing Storage Tanks (GST, EST)
- Existing Pump Stations

Development Driven Projects

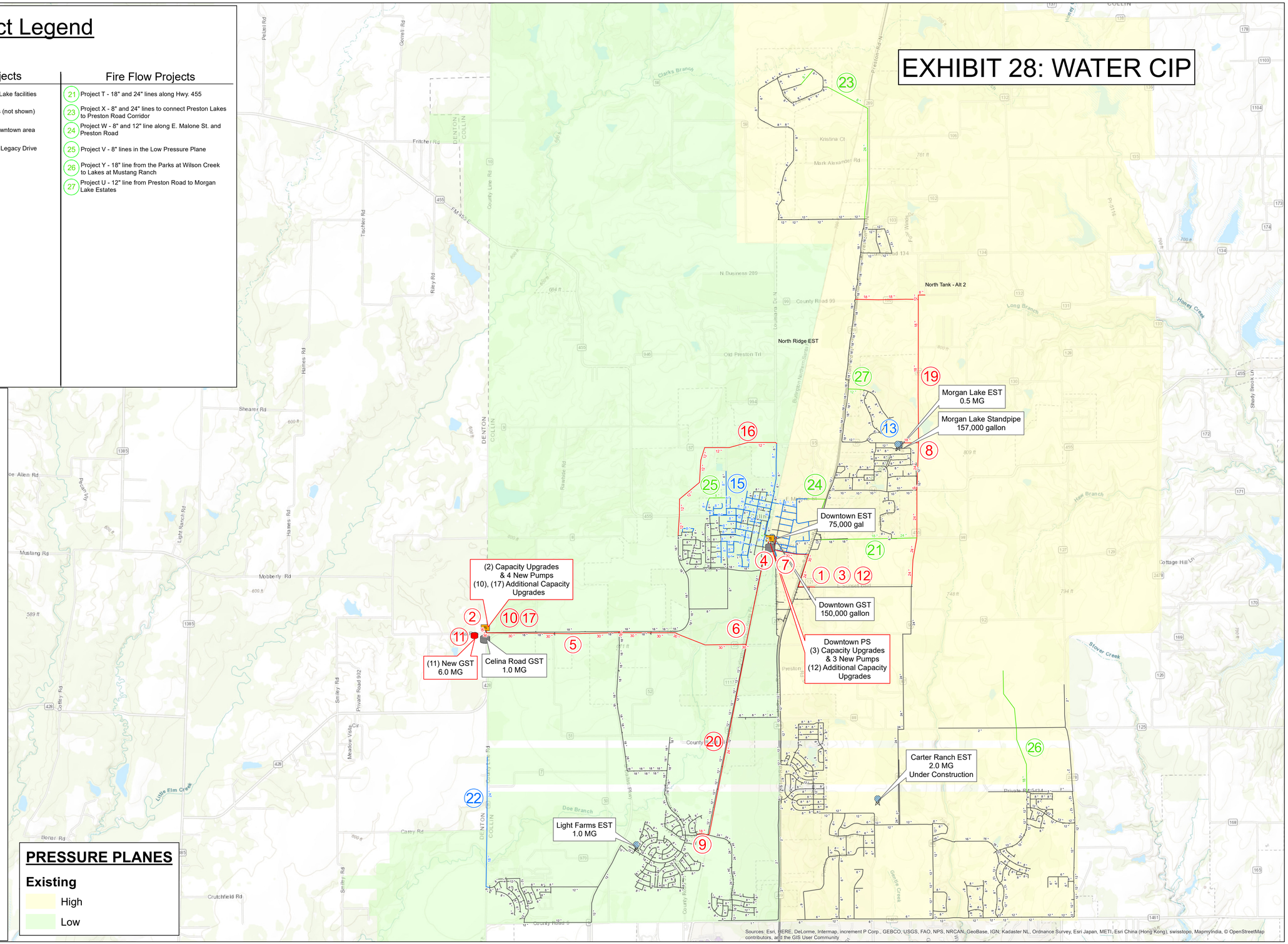
- Proposed Improvement

Operational Projects

- Proposed Improvement

Fire Flow Projects

- Proposed Improvement



JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
DRAWN BY: TCR

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CITY OF CELINA
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WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS

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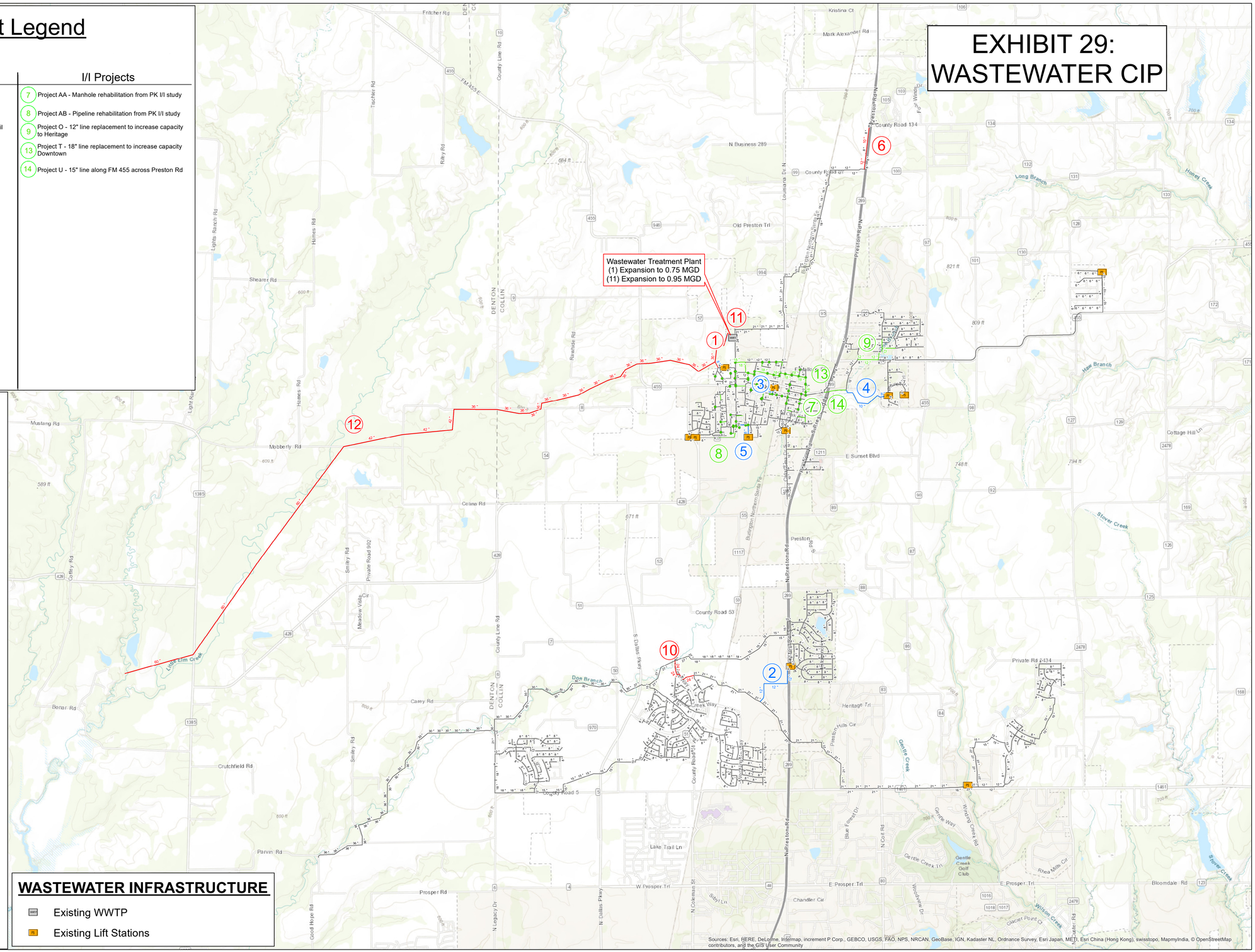
Wastewater CIP Project Legend

Development Driven Projects	Operational Projects	I/I Projects
1 Project AC - WWTP expansion to 0.75 MGD	2 Project B - 12" line to replace Carter Ranch LS	7 Project AA - Manhole rehabilitation from PK I/I study
6 Project R - 10" and 12" line to provide additional capacity for the addition of the Chalk Hill LS	3 Project P - 6" line to replace Lucy's LS	8 Project AB - Pipeline rehabilitation from PK I/I study
10 Project A - 24" line replacement to increase capacity along Light Farms	4 Project Q - 8" and 10" line to replace Shawnee Trail No. 1 LS	9 Project O - 12" line replacement to increase capacity to Heritage
11 Project AD - WWTP expansion to 0.95 MGD	5 Project C - 8" line to replace Winn Road LS	13 Project T - 18" line replacement to increase capacity Downtown
12 Project N - New 30", 36", 42", and 60" interceptor from Celina WWTP to future WWTP		14 Project U - 15" line along FM 455 across Preston Rd

EXHIBIT 29: WASTEWATER CIP



CITY OF CELINA

WASTEWATER SYSTEM RECOMMENDED CAPITAL IMPROVEMENTS

LEGEND

Existing Structures

Existing Conduits

Development Driven Projects

Proposed Improvements

Operational Projects

Proposed Improvements

I/I Projects

Proposed Improvements

JOB NO.: 16088050
DATE: AUGUST 2017
DESIGNED BY: EMT
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CELINA, TEXAS
WATER & WASTEWATER MODELING AND CIP REPORT EXHIBITS

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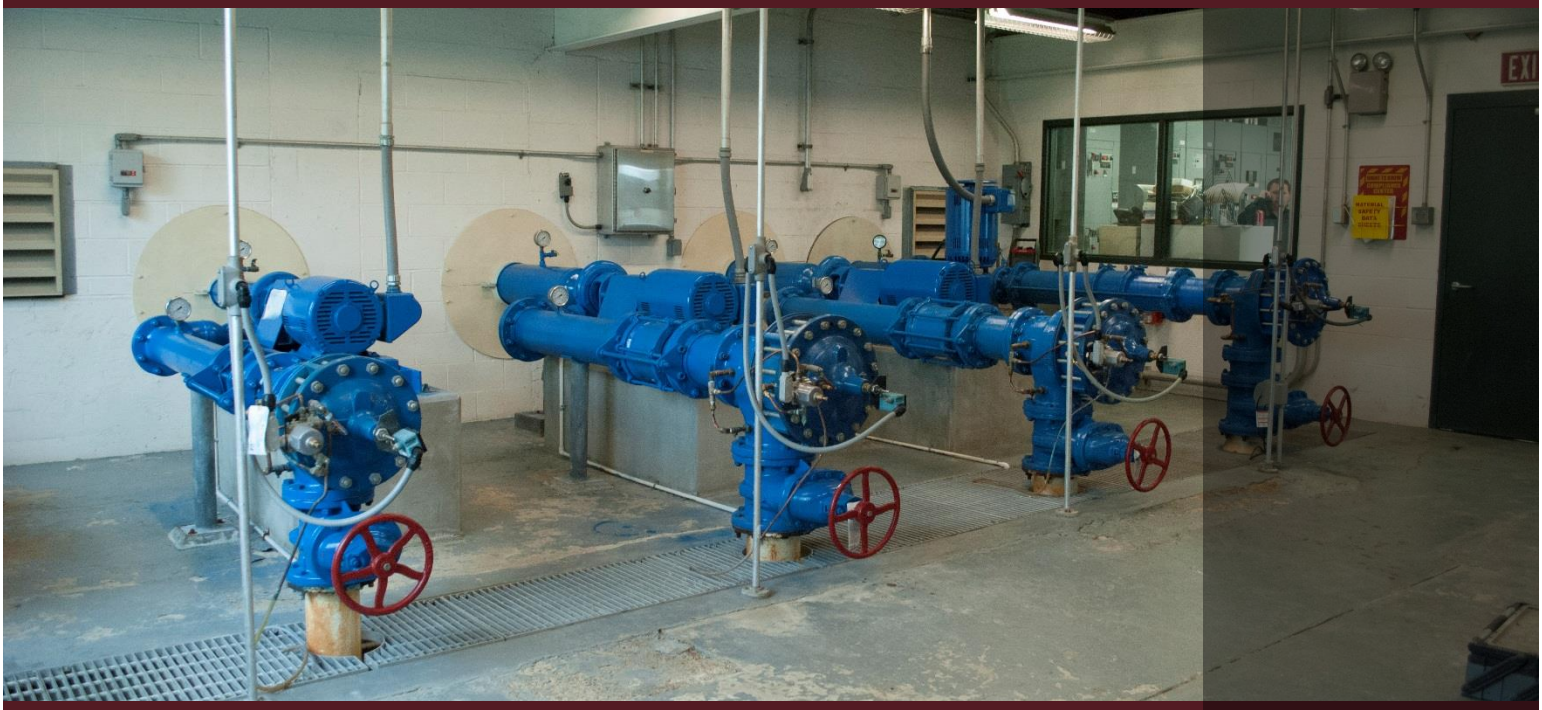
Appendix A

Water/Wastewater System Improvements

Water Facilities Evaluation



Prepared For:

City of Celina

September 2017

GARVER

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Appendix A

Water & Wastewater System Improvements
Water Facilities Evaluation

City of Celina, Texas

Prepared by:

3010 Gaylord Parkway
Suite 190
Frisco, TX 75034

September 2017

Garver Project No.: 16088050

Engineer's Certification

I hereby certify that this Technical Memorandum for the Water and Wastewater System Improvements – Water Facilities Evaluation was prepared by Garver under my direct supervision for the City of Celina, Texas.

Lance P. Klement, PE
State of Texas PE License 113630

STATE OF TEXAS
LANCE P. KLEMENT
113630
LICENSED
PROFESSIONAL ENGINEER

Digitally Signed 9/18/2017

Table of Contents

Engineer's Certification 2
Table of Contents 3
List of Figures 5
List of Tables 7
1.0 Executive Summary 8
2.0 Introduction 9
2.1 Project Scope 9
2.2 Site Description 9
3.0 Assessment Process 13
3.1 Data Collection and Review 13
3.2 Field Review and Condition Assessment 13
3.3 Identification of Deficiencies 13
3.4 TCEQ Site Requirements 13
4.0 Downtown Facility 15
4.1 Facility Overview 15
4.2 Condition Assessment 16
4.2.1 Security 16
4.2.2 Civil and Structural 17
4.2.3 Access 19
4.2.4 Pumping and Mechanical 20
4.2.5 Controls and Instrumentation 21
4.2.6 Summary 22
4.3 Conclusions 23
4.4 Recommendations 24
4.5 OPCC 24
5.0 Celina Road Facility 26
5.1 Facility History and Overview 26
5.2 Condition Assessment 26
5.2.1 Security 26
5.2.2 Civil and Structural 27
5.2.3 Access 28

5.2.4 Pumping and Mechanical 29
5.2.5 Controls and Instrumentation 30
5.2.6 Summary 32
5.3 Conclusions 32
5.4 Recommendations 33
5.5 OPCC 33
6.0 Light Farms Facility 34
6.1 Facility Overview 34
6.2 Condition Assessment 34
6.2.1 Security 34
6.2.2 Civil and Structural 35
6.2.3 Access 36
6.2.4 Pumping and Mechanical 37
6.2.5 Controls and Instrumentation 37
6.2.6 Summary 38
6.3 Conclusions 38
6.4 Recommendations 39
6.5 OPCC 39
7.0 Morgan Lake Facility 40
7.1 Facility Overview 40
7.2 Condition Assessment 42
7.2.1 Security 42
7.2.2 Civil and Structural 42
7.2.3 Access 44
7.2.4 Pumping and Mechanical 45
7.2.5 Controls and Instrumentation 46
7.2.6 Summary 47
7.3 Conclusions 48
7.4 Recommendations 48
7.5 OPCC 48
8.0 Summary 50
8.1 Recommended Improvements 50

List of Figures

Figure 2-1: Water Facilities Site Map 10
Figure 2-2: Downtown Site Location 11
Figure 2-3: Celina Road Site Location 11
Figure 2-4: Light Farms Site Location 12
Figure 2-5: Morgan Lake Site Location 12
Figure 4-1: Downtown Site Perimeter 17
Figure 4-2: Downtown Site Landscape 17
Figure 4-3: Downtown Elevated Storage Tank 18
Figure 4-4: Downtown Ground Storage Tank 18
Figure 4-5: Downtown Storage Tank (abandoned) 19
Figure 4-6: Downtown Pump Station 19
Figure 4-7: Downtown Pump Building 20
Figure 4-8: Downtown Chlorine Building 21
Figure 4-9: Downtown Groundwater Well Pumps 21
Figure 4-10: Downtown Controls and Instrumentation 22
Figure 5-1: Celina Road Site Perimeter 27
Figure 5-2: Celina Road Site Area 27
Figure 5-3: Celina Road Ground Storage Tank 28
Figure 5-4: Celina Road Pump Building 28
Figure 5-5: Celina Road Site Access 29
Figure 5-6: Celina Road Pumps 29
Figure 5-7: Celina Road Exhaust Fan 30
Figure 5-8: Celina Road Chlorine Feed 30
Figure 5-9: Celina Road Control Panels 31
Figure 5-10: Celina Road SCADA System 31
Figure 5-11: Celina Road Exhaust Fan Control Panel 32
Figure 6-1: Light Farms Site Security 35
Figure 6-2: Light Farms Pump Security 35
Figure 6-3: Light Farms Site Area 36
Figure 6-4: Light Farms Elevated Storage Tank 36
Figure 6-5: Light Farms Access 37

Figure 6-6: Light Farms Pump 37
Figure 6-7: Light Farms Controls 38
Figure 7-1: Morgan Lake Security 42
Figure 7-2: Morgan Lake Site Area 42
Figure 7-3: Morgan Lake Elevated Storage Tank 43
Figure 7-4: Morgan Lake Ground Storage Tank 43
Figure 7-5: Morgan Lake Standpipe 44
Figure 7-6: Morgan Lake Well Pump 44
Figure 7-7: Morgan Lake Site Access 45
Figure 7-8: Morgan Lake EST Access Ladder 45
Figure 7-9: Morgan Lake Chlorine Feed 46
Figure 7-10: Morgan Lake Controls 47

List of Tables

Table 1-1: Summary of Recommended Improvements 8
Table 3-1: TCEQ Site Requirements 14
Table 4-1: Downtown Facility Design Data 15
Table 4-2: Downtown EST Condition Assessment Ratings 22
Table 4-3: Downtown GST Condition Assessment Ratings 23
Table 4-4: Downtown Pump Station Condition Assessment Ratings 23
Table 4-5: Downtown Capital Improvements 25
Table 5-1: Celina Road Facility Design Data 26
Table 5-2: Celina Road Pump Station and GST Condition Assessment Ratings 32
Table 5-3: Celina Road Capital Improvements 33
Table 6-1: Light Farms Elevated Storage Tank Design Data 34
Table 6-2: Light Farms EST Condition Assessment Ratings 38
Table 6-3: Light Farms Capital Improvements 39
Table 7-1: Morgan Lake Facility Assets 41
Table 7-2: Morgan Lake EST Condition Assessment Ratings 47
Table 7-3: Morgan Lake Capital Improvements 49
Table 8-1: Summary of Recommended Improvements 50

1.0 Executive Summary

The City of Celina (City) has commissioned Garver to perform field investigations of its water facilities in order to develop an accurate understanding of the condition and expected service life of the existing facilities. The City's water system includes the following facilities:

- Three pump stations (PS): Celina Road PS, Downtown PS, and Morgan Lake PS
- Three ground storage tanks (GST): Celina Road GST, Downtown GST, and Morgan Lake GST
- Three elevated storage tanks (EST): Downtown EST, Light Farms EST, and the Morgan Lake EST
- One standpipe
- Four groundwater wells

Recommended improvements were evaluated for four water system facility locations: Downtown, Celina Road, Light Farms, and Morgan Lake. Table 1-1 displays a summary of recommended improvement costs at each location. Engineering and professional services have not been included in this cost evaluation, as it is anticipated that these projects would be developed and executed by the City engineering staff.

Table 1-1: Summary of Recommended Improvements

Facility	OPCC	
Downtown Subtotal	$	151,025
Celina Road Subtotal	$	283,656
Light Farms Subtotal	$	130,750
Morgan Lake Subtotal	$	471,885
Total	**$**	**1,037,316**

2.0 Introduction

2.1 Project Scope

The City of Celina's water distribution system is comprised of 591,460 LF of water lines and three pump stations. The scope of service was to perform a field investigation of the water facilities, which was accomplished by means of a site visit where an engineering team evaluated the facility including: storage tanks, piping, pumps, instrumentation, and controls. The site visit findings are documented in this technical memorandum, along with background data, field notes, recommendations for replacement & repair (if needed), and associated cost estimates to undertake any recommendations.

Structural and electrical condition assessments were not performed. The field investigations are based on visual observations for the facilities in regards to general condition of the pumping facilities, security, drainage, and TCEQ compliance. The team also conducted interviews with operations and maintenance staff and reviewed all available data regarding the facilities such as maintenance records and inspection documentation. It is important to note that field investigation of the facilities is not a full condition assessment.

2.2 Site Description

The water facilities are all located within the City's Extraterritorial Jurisdiction (ETJ) boundary, covering a large portion of the city. The existing water system serves approximately 11,000 people and has 3,644 connections. It consists of two pressure planes; the lower pressure plane and upper pressure plane. The lower pressure plane serves the older areas of Celina, while the upper pressure plane serves the newer developments in the surrounding areas.

The four water system facility locations are listed below, and the corresponding location of each are shown in Figure 2-1:

1. Downtown
2. Celina Road
3. Light Farms
4. Morgan Lake

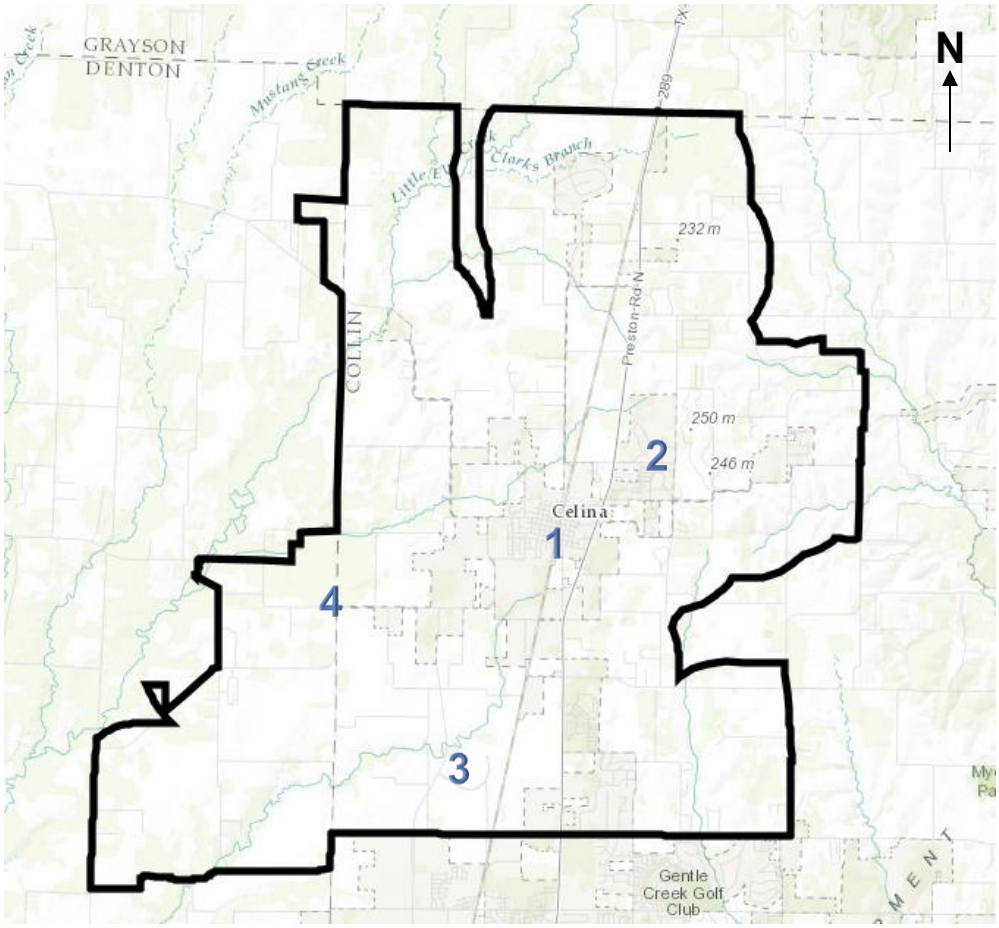


Figure 2-1: Water Facilities Site Map

The Downtown facility is located at 107 E Elm Street between S Louisiana Drive and S Oklahoma Drive. Figure 2-2 provides an overview of the site location. It consists of an elevated storage tank, ground storage tank, three wells, and a pump station. The facility is located near a residential area; the property is bordered by homes on the north, east, and south and a rail line to the west.

Figure 2-2: Downtown Site Location

The Celina Road facility is located at 17099 Celina Road, near the intersection of Celina Road and County Road 9. Figure 2-3 provides an overview of the site location. The ground storage tank and pump station are located directly north of Celina Road, and the site itself is situated in a rural area.

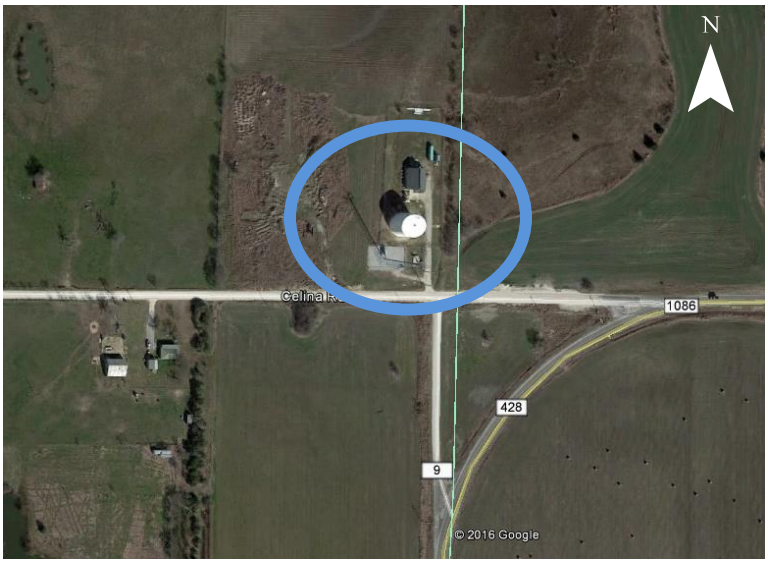


Figure 2-3: Celina Road Site Location

The Light Farms facility is located at 1803 Light Farms Way, northeast of the intersection of Dallas Parkway and Light Farms. Figure 2-4 provides an overview of the site location. The elevated storage tank is near a residential neighborhood; the property is bordered by homes to the east and open agricultural land to the west.

Figure 2-4: Light Farms Site Location

The Morgan Lake facility is located at 1766 County Road 96 (Settler's Ridge Road), west of County Road 97. Figure 2-5 provides an overview of the site location. It consists of an elevated storage tank, a horizontal ground storage tank, a standpipe, one well, and a pump station. The horizontal ground storage tank, the standpipe, and the well have been decommissioned by the City. The elevated storage tank and standpipe are located near a residential neighborhood; the property is bordered by homes on the south and open agricultural land to the north.

Figure 2-5: Morgan Lake Site Location

3.0 Assessment Process

To have an effective assessment of a water facility, it is important to understand the outcomes desired before the assessment is completed. This serves as a quality control measure and ensures the end product meets high standards. The approach used in the assessment process is summarized below.

3.1 Data Collection and Review

This task consisted of assembling and reviewing all available and relevant documents, which include the following sources:

1. City operator input through staff interviews
2. Existing water/wastewater base maps
3. Record drawings
4. Pump performance curves & controls
5. Past comprehensive master plans
6. Storage tank inspection reports
7. TCEQ requirements for the site

3.2 Field Review and Condition Assessment

Garver visited the sites on May 2, 2016 to complete the field reviews as well as staff interviews. The field reviews included photographing equipment and appurtenances as well as visually observing fit and function. The staff interviews included documenting deficiencies as input was provided at each water facility. No in-depth structural or electrical condition assessments were performed.

3.3 Identification of Deficiencies

Once the documentation review and site assessments were completed, the deficiencies in the system could be identified and addressed. The following categories were addressed and compared against existing codes or other criteria applicable to each category.

- Accessibility
- Safety
- Mechanical
- Controls
- Instrumentation
- Environmental
- Performance

3.4 TCEQ Site Requirements

The follow TCEQ requirements were used for evaluation of existing facilities and are summarized in Table 3-1.

Table 3-1: TCEQ Site Requirements

Parameter	Reference	Requirements
Site Requirements		
Site Location	§290.43 (b)	No public water supply EST or GST shall be located within • 500 feet of a WWTP • 50 feet of a sanitary sewer or septic tank • 150 feet of a septic tank soil absorption system
Security	§290.43 (e)	Installed in lockable building or enclosed with an intruder resistant fence and lockable gate
Design Considerations		
Pump Controls	§290.43 (f)	Automatic low level cutoff devices
Facilities	§290.43 (c)	Shall be designed according to AWWA standards and shall have no ponding water on any roof
Ventilation	§290.43 (c)	Ventilation (passive or mechanical) provided
Groundwater Wells		
Location	§290.41 (c)	No groundwater well shall be located within • 500 feet of a WWTP • 50 feet from livestock pastures
Flow Monitoring	§290.41 (c)(3)(N)	Flow-measuring devices shall be provided for each well to measure production yields and provide water production data

4.0 Downtown Facility

4.1 Facility Overview

The Downtown facility is located at 107 E Elm Street. The facility consists of one elevated storage tank, one pump building, one ground storage tank, and three groundwater wells. The elevated storage tank helps provide the pressure and supply of water for the lower pressure plane distribution system, while the pump station and ground storage tank service the upper pressure plane water distribution system. The facility pumps water approximately 3.5 miles north to the Morgan Lake elevated storage tank. Additionally, the EST serves as suction equalization storage for the Downtown Pump Station. The groundwater storage tank is supplied by the Celina Road Pump Station and is connected to the booster pumps that supply water to the upper pressure plane. Finally, the groundwater wells are infrequently used and are left available by the City for emergency purposes only. City staff have reported two wells are decommissioned and will be capped soon. Doing so leaves one to offer as an alternate water source. Detailed asset specifications are provided in Table 4-1.

Table 4-1: Downtown Facility Design Data

Parameter	Value
Location	107 E Elm Street
Elevated Storage Tank	
Type of Tank	Elevated Storage
Construction	Galvanized, Riveted
Year Constructed	1925
Builder	Chicago Bridge and Iron
Capacity (gal)	75,000
Height (ft)	120
Diameter (ft)	30
Foundation	Concrete pads
Ground Storage Tank	
Type of Tank	Ground Storage
Construction	Metal, Welded
Year Constructed	Unknown
Builder	Unknown
Capacity (gal)	150,000
Height (ft)	24
Diameter (ft)	32
Foundation	Concrete
Pump Station	
Number of Pumps	4
Pump Capacity (gpm)	Pump #1: 278 Pump #2: 556 Pump #3: 833 Pump #4: 1200
Rated Total Dynamic Head (TDH) (ft)	Pump #1: 214

Parameter	Value
	Pump #2: 214 Pump #3: 228 Pump #4: 241
Type of Pump	Horizontal centrifigual
Pump Manufacturer	PACO
Volts/Ph/Hz	230,460/3/60
Motor Manufacturer	Baldor
Motor Type	Super-E
Motor HP	Pump #1: 30 Pump #2: 50 Pump #3: 75 Pump #4: 100
RPM	Pump #1: 3500 Pump #2: 3500 Pump #3: 3500 Pump #4: 3530
Groundwater Wells	
Well #1	
Aquifer	Woodbine
Yield (GPM) / Drill Year	125 / 1927
Current Yield (GPM) / Year	90 / 2004
Well #2	
Aquifer	Paluxy
Yield (GPM) / Drill Year	125 / 1925
Current Yield (GPM) / Year	80 / 2004
Well #3	
Aquifer	Trinity
Yield (GPM) / Drill Year	230 / 1967
Current Yield (GPM) / Year	188 / 2010

4.2 Condition Assessment

4.2.1 Security

The facility is located directly east of a rail line and is enclosed by a chain-link perimeter fence equipped with three strands of barb wire to prevent trespassing. Vegetation near the elevated storage tank is relatively well-kept; however, the exterior near the perimeter fencing is overgrown. Landscaping or removing this vegetation is recommended in order to improve perimeter visibility and limit climbing access.

Figure 4-1: Downtown Site Perimeter

4.2.2 Civil and Structural

The site area is covered with grass. There are drainage problems due to grading within the facility as shown in Figure 4-2.

Figure 4-2: Downtown Site Landscape

The elevated storage tank exterior appears to be in fair condition with signs of corrosion and chipping paint. Inspection conducted by a City contractor in November 2015 concluded the following observations.

- The external sidewall plates were designated as being in good condition with minor signs of corrosion and thinning/chipping paint.
- The overflow pipe & flapper and external support legs/strut rods are in good condition.
- The external roof plates are in fair condition with signs of corrosion and thinning/chipping paint.
- Pits on the interior wall/floor and 90% sediment coverage on the internal floor plates were reported.

Figure 4-3: Downtown Elevated Storage Tank

The groundwater storage tank appears to be in fair condition. Inspection conducted by a City contractor in November 2015 concluded the following observations.

- The external sidewall plates show staining
- The external roof plates have thinning/chipping paint, and the water access hatch is heavily corroded.
- Corrosion was evident internally with the internal roof plates, internal sidewall plates, water access ladder, overflow flume, and internal floor plates.
- 90% sediment coverage on the internal floor plates was reported.

The inlet also shows signs of corrosion as shown in Figure 4-4. Figure 4-5 shows the abandoned downtown ground storage tank.

Figure 4-4: Downtown Ground Storage Tank

Figure 4-5: Downtown Storage Tank (abandoned)

The pump building appears to be in good condition with no significant cracking, weathering, or erosion. The walls do not show any signs of settlement or undulations. City staff reported MVA will recoat the outside of building and pipes. The chlorine building appears to be in fair working condition.

Figure 4-6: Downtown Pump Station

4.2.3 Access

Accessibility into the facility is adequate and meets TCEQ's requirements.

Accessibility into the elevated storage tank is sufficient although improvement is recommended. According to the 2015 inspection report, the roof access ladder and side manway access hatch are in good condition. However, intruder protection and fall protection for the roof access ladder are recommended in order to improve overall safety. Additionally, installation of slider protection and tightening of hardware for the catwalk to roof ladder is recommended as well as installation of 'confined space entry' placards on the water access hatch and the side manway access hatch.

Accessibility into the ground storage tank is sufficient although improvement is recommended. According to the 2015 inspection report, the roof access ladder is in good condition, however intruder protection and slider fall protection installation are recommended to improve overall safety. Due to the poor state of the

water access hatch, a new hatch is recommended. Additionally, installation of 'confined space entry' placards are recommended for the water access hatch and side manway access hatch.

Accessibility into the pump building is adequate; the access roadway leads directly from the gate to the pump building as indicated in Figure 4-6.

4.2.4 Pumping and Mechanical

The pump station consists of four PACO pumps as stated above in Table 4-1. The interior of the pump building is in good condition. The pumps, valves, and piping appear to be in good condition with intact coatings and no signs of corrosion or leakage. City staff reports the equipment to be in good operating condition. A portion of the room is used for storage purposes.

Figure 4-7: Downtown Pump Building

The interior of the chlorine room appears to be in good condition. However, city staff reported the chloramine feed set up is flawed; it is currently based on overall flow, but it needs to be altered to well water flow. Additionally, a residual based feed and full SCADA integration is desired.

Figure 4-8: Downtown Chlorine Building

The three groundwater well pumps appear to be in fair condition. Pump #1 shows minor signs of corrosion. Pump #2 is covered in mechanical insulation. Pump #3 contains a large amount of chemical residue. City staff reported that Pump #1 and Pump #2 have both been decommissioned.

Figure 4-9: Downtown Groundwater Well Pumps

4.2.5 Controls and Instrumentation

The elevated storage tank water level indicator can be monitored electronically; the manual indicator has been taken out of service. The tank level readings are relayed to the SCADA system. The controls are in good working condition and operate as designed and intended. The PACO pumps are equipped with a

splash proof switch (Micro Switch). A generator is present and in working condition; however the generated power is only large enough to run the SCADA system and two pumps in the pump station.

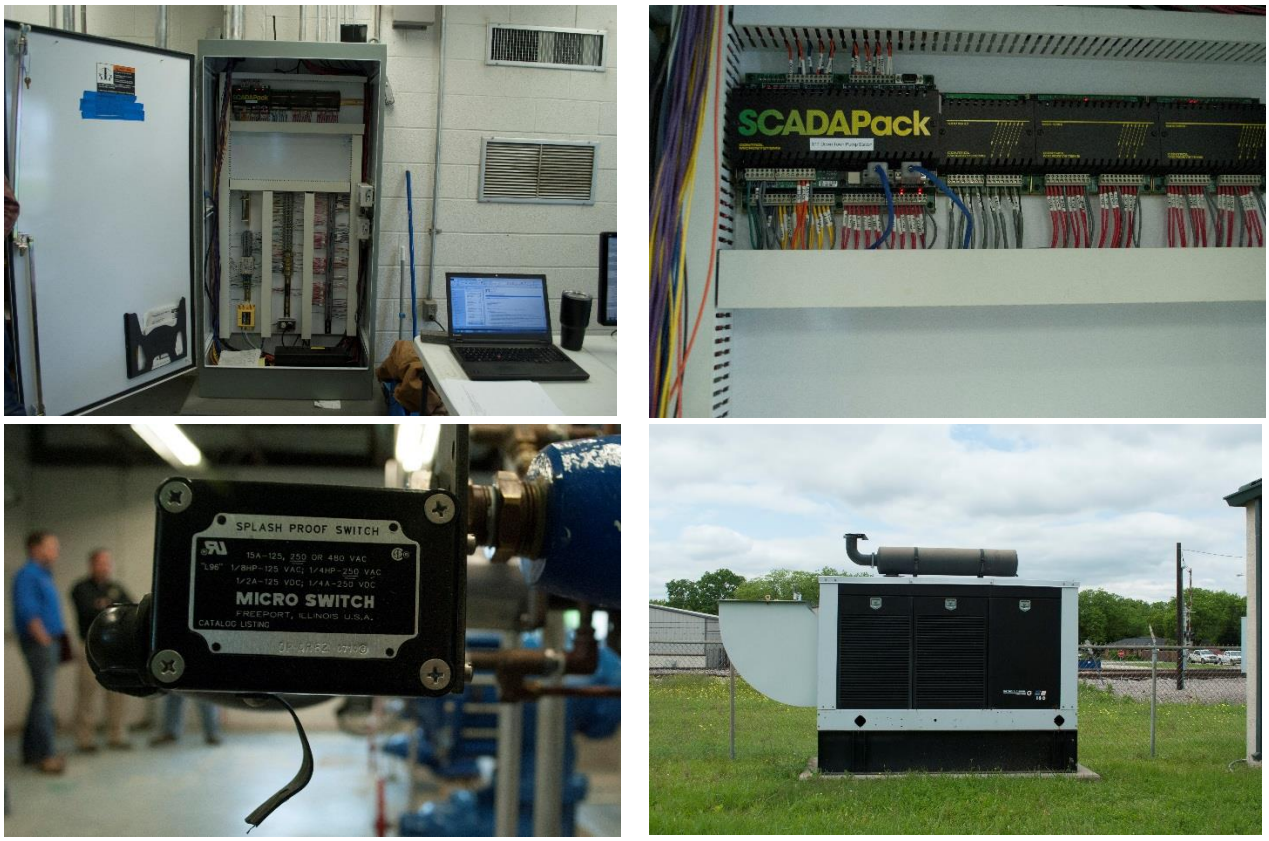


Figure 4-10: Downtown Controls and Instrumentation

4.2.6 Summary

Table 4-2 through Table 4-4 summarize the findings of the condition assessment based on ratings of good, fair and poor. A condition assessment rating of *good* indicates that no immediate attention is required. A rating of *fair* indicates that some initial repair or minor improvement is needed for the facility to remain in adequate working condition. A rating of *poor* indicates that improvements, replacement, or reconstruction are needed in the immediate future.

Table 4-2: Downtown EST Condition Assessment Ratings

Aspect	Rating
Security	Good
Civil	Fair
Access	Good
Mechanical	Good
Instrumentation and Controls	Fair

Table 4-3: Downtown GST Condition Assessment Ratings

Aspect	Rating
Security	Good
Civil	Fair
Access	Fair
Mechanical	Fair
Instrumentation and Controls	Fair

Table 4-4: Downtown Pump Station Condition Assessment Ratings

Aspect	Rating
Security	Good
Civil	Fair
Access	Fair
Mechanical	Fair
Instrumentation and Controls	Fair

4.3 Conclusions

The following conclusions were developed from the evaluation of the Downtown Facility:

General Site Facility

- Site security is in good condition as indicated by the perimeter fence with barb wire.
- Perimeter vegetation is overgrown and landscaping requires attention
- Drainage problems are evident as indicated by the pools of accumulated rain water
- Generator is in working condition, however it only runs SCADA system and two pumps
- Set up of chlorine feed is currently based on overall flow

Elevated Storage Tank

- Corrosion is evident on the tank's structure (external sidewall plates, external roof plates, internal sidewall plates, and tank supports)

Ground Storage Tank

- Corrosion is evident on the tank's structure (water access hatch, internal roof plates, internal sidewall plates, water access ladder, overflow fume, internal floor plates)
- Water level float is not in service; cables are not attached to the floor. This was corrected by City staff following the site assessment.
- 90% sediment coverage is present on internal floor plates (fair condition)

4.4 Recommendations

The following recommendations were developed based on the evaluation described herein:

Site Area

- Remove and/or trim perimeter vegetation to improve perimeter visibility and limit climbing access

Elevated Storage Tank

- Paint/repaint tank external structure
- Install intruder protection and slider fall protection for the roof access ladder
- Install a 'confined space entry' placard on the side manway access hatch and water access hatch
- Install slider protection and tighten the hardware on the ladder from catwalk to roof
- Install a lock assembly on the water access hatch

Ground Storage Tank

- Install intruder protection and slider fall protection for roof access ladder
- Install 'confined space entry' placard on side manway access hatch
- Install new seal to the overflow pipe
- Install slider fall protection on water access ladder and repair top two rungs
- Install water access hatch
- Remove accumulated sediment

General

- Install a residual-paced chloramine feed for well water, tied into SCADA
- Demolish original ground storage tank, still in place
- Demolish Well #1 and Well #2 per TCEQ requirements

4.5 OPCC

The following site improvements are estimated to cost $151,025. Table 4-5 below breaks down the itemized costs associated with each asset. Engineering costs are not included with these estimates.

Table 4-5: Downtown Capital Improvements

Asset	Description of Improvement	Quantity	OPPC
General	Install Residual-Paced Chloramine Feed	1	$ 25,000
	Demolish ground storage tank	1	$ 25,000
Elevated Storage Tank	Intruder protection door to roof access ladder	1	$ 995
	Slider Fall protection to roof access ladder	1	$ 1,700
	Signage, “Confined Space Entry”	2	$ 80
	Slider fall protection from the catwalk	1	$ 1,700
	Repair of the roof access ladder	1	$ 995
	Replacement of the lock assembly on the water access hatch	1	$ 995
	Installation of slider fall protection to the water access ladder	1	$ 1,700
	Pressure wash and paint tank external structure	1	$ 60,000
Ground Storage Tank	Installation of an intruder protection door to the roof access ladder	1	$ 995
	Installation of slider fall protection to the roof access ladder	1	$ 1,700
	Signage, “Confined Space Entry”	2	$ 80
	Installation of a new seal on the overflow pipe	1	$ 795
	Installation of a 30” OSHA standard water access hatch	1	$ 2,495
	Installation of slider fall protection to the water access ladder	1	$ 1,700
	Replacement of water access ladder	1	$ 2,495
	Removal of sediment up to 2 inches	1	$ 2,600
Groundwater Wells	Demolish/cap well #1 and #2	2	$ 20,000
Total			$ 151,025

5.0 Celina Road Facility

5.1 Facility History and Overview

The Celina Road Pump Station serves as the entry point for water purchased from Upper Trinity Regional Water District. The facility is located at 17099 Celina Road. Purchased water enters the pump station through the ground storage tank where the chlorine is then boosted to 3.0 mg/L. The water is then pumped to the city's water distribution system. The operations controls at the Celina Road Pump Station are based on operating water levels at the Downtown Elevated Storage Tank. The pump station has three booster pumps of the same size; each pump has a capacity of 1340 gpm. Detailed asset specifications are provided in Table 5-1.

Table 5-1: Celina Road Facility Design Data

Parameter	Value
Location	17099 Celina Road
Ground Storage Tank	
Type of Tank	Ground Storage
Construction	Metal, Welded
Year Constructed	2004
Builder	Tank Builders
Capacity (gal)	1,000,000
Height (ft)	42
Diameter (ft)	65
Foundation	Concrete
Pump Station	
Number of Pumps	3
Pump Capacity (gpm)	1340
Rated Total Dynamic Head (TDH) (ft)	225
Type of Pump	Horizontal centrifugal
Pump Manufacturer	PACO
Volts/Ph/Hz	240 or 460/3/60
Motor Manufacturer	Emerson Motor Company
Motor Type	NEMA Premium
Motor HP	125
RPM	3500

5.2 Condition Assessment

5.2.1 Security

The site is enclosed by an intruder resistant chain-link fence equipped with three strands of barb wire to prevent trespassing. The perimeter fence also contains proper signage delineating the facility name and emergency contact information. The site area is well-kept with no vegetative overgrowth. Additionally, the pump station and chlorine feed are enclosed by buildings in order to restrict access.

Figure 5-1: Celina Road Site Perimeter

5.2.2 Civil and Structural

The site area is mostly covered with grass. There was no indication of major drainage problems within the facility.

Figure 5-2: Celina Road Site Area

The ground storage tank appears to be in good condition. According to the 2015 inspection report, there are minimal signs of external corrosion. The internal structure shows minor signs of corrosion as indicated by the internal roof plates, internal sidewall plates, overflow flume, and water access ladder.

Figure 5-3: Celina Road Ground Storage Tank

The pump building appears to be in good condition with no significant cracking, weathering, or erosion. The walls do not show any signs of settlement or undulations. The interior of the pump building is also in good condition. The building is equipped with a bathroom, and the pumps are enclosed in a separate room to reduce overall noise.

Figure 5-4: Celina Road Pump Building

5.2.3 Access

Accessibility into the site area is excellent; the access gate can easily accommodate a vehicle as indicated below, and the gravel roadway leads directly from the gate to the pump building.

Figure 5-5: Celina Road Site Access

Accessibility to the ground storage tank is in good condition. As cited by the inspection report, 'confined space entry' placards require installation for the roof access ladder and water access hatch.

5.2.4 Pumping and Mechanical

The pump building consists of three PACO pumps as delineated above in Table 5-1. The interior of the pump building in in good condition. The pumps, valves, and piping appear to be in good condition with intact coatings and no signs of corrosion or leakage. However, City staff reported dust is a control problem. The impeller for Pump 1 has been replaced. Impellers are also required to be replaced for Pump 2 and Pump 3. Additionally, City staff reported one exhaust fan is having issues and requires repair/replacement.

Figure 5-6: Celina Road Pumps

Figure 5-7: Celina Road Exhaust Fan

The chlorine room appears to be in good condition. There are two Regal automatic switchover gas chlorinators and two Omni-Valve chlorinators. City staff reported chlorine manifold improvements are needed in order to provide a flow-paced system.

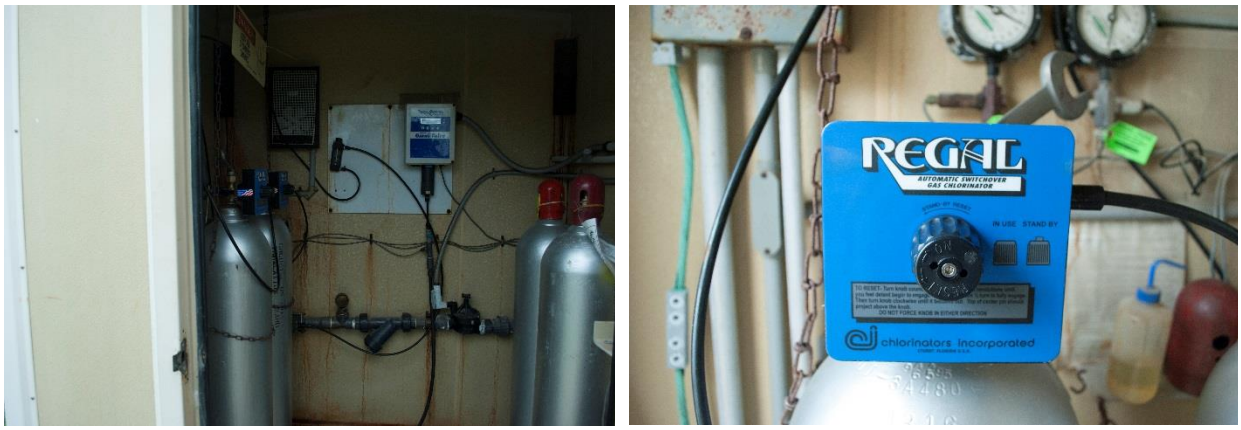


Figure 5-8: Celina Road Chlorine Feed

5.2.5 Controls and Instrumentation

The Celina Road facility has SCADA capabilities as shown in Figure 5-10.The ground storage tank contains an electronic (digital) water level indicator, and according to the 2015 inspection report, the probes are in place and operational. Figure 5-11 shows the controls for the exhaust fans.

Figure 5-9: Celina Road Control Panels

Figure 5-10: Celina Road SCADA System

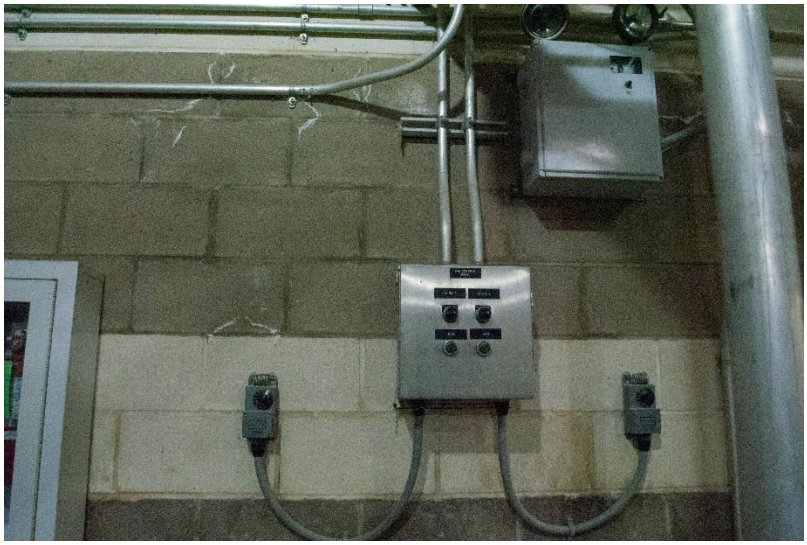


Figure 5-11: Celina Road Exhaust Fan Control Panel

5.2.6 Summary

Table 5-2 summarizes the findings of the condition assessment based on ratings of good, fair, and poor. A condition assessment rating of *good* indicates that no immediate attention is required. A rating of *fair* indicates that some initial repair or minor improvements are needed for the facility to remain in adequate working condition. A rating of *poor* indicates that improvements, replacement or reconstruction are needed in the immediate future.

Table 5-2: Celina Road Pump Station and GST Condition Assessment Ratings

Aspect	Rating
Security	Good
Civil	Good
Access	Good
Pumping and Mechanical	Good
Instrumentation and Controls	Good

5.3 Conclusions

The following conclusions were developed from the evaluation of the Celina Road Pump Station and GST:

- Site security is sufficient as indicated by the presence of chain-link fence, barb wire, proper signage, and padlocks to restrict access.
- Site accessibility meets all requirements as demonstrated by the width of the access gate and roadway.
- Slight drainage problems are evident
- Ground storage tank is in good condition with minor signs of internal corrosion

- The pump building is in good condition; however city staff reported dust problem due to nearby Celina Road being gravel
- Facility has existing SCADA capabilities

5.4 Recommendations

The following recommendations were developed based on the evaluation described herein:

- Install 'confined space entry' placards for the ground storage tank roof access ladder and water access hatch
- Replace impellers for Pump 2 and Pump 3
- Repair/replace exhaust fan
- Install residual-paced chloramination

5.5 OPCC

Site and facility improvements are expected to cost $283,656. This does not include engineering services.

Table 5-3: Celina Road Capital Improvements

Asset	Description of Improvement	Quantity	OPPC
1 MG Ground Storage Tank	Signage, "Confined Space Entry"	3	$ 120
	Pressure wash and paint tank structure	1	$ 250,000
	Install residual-paced chloramination	1	$ 25,000
Pump Station	PACO pump impeller replacement (8.67in)	2	$ 6,536
	Replace exhaust fan	1	$ 2,000
Total			$ 283,656

6.0 Light Farms Facility

6.1 Facility Overview

The Light Farms facility is located north of Light Farms Way. The site consists of one elevated storage tank with an associated pump. The elevated storage tank is supplied by the Celina Road Pump Station. According to the 2015 Master Plan, the EST is located at the end of an 18-inch line at Light Farms Way and North Dallas Parkway. The tank fills and empties based on demand in the downtown system. Additionally, it helps provide the pressure and supply of water for the lower pressure plane of the distribution system along with the Downtown elevated storage tank. Detailed asset specifications are provided in Table 6-1Table 5-1.

Table 6-1: Light Farms Elevated Storage Tank Design Data

Parameter	Value
Location	1803 Light Farms Way
Type of Tank	Hydropillar (Elevated)
Construction	Metal/Concrete, Welded
Year Constructed	Unknown
Builder	Unknown
Capacity (gal)	1,000,000
Height (ft)	201
Diameter (ft)	70
Foundation	Concrete

6.2 Condition Assessment

6.2.1 Security

The site is located near residential property with homes bordering to the east, separated by a brick wall. The site entrance is restricted by a black, prefabricated metal fence equipped with upward directed iron bars to prevent trespassing, and the perimeter is easily visible. The fence also has the required signage delineating facility name and emergency contact information and is padlocked to restrict access. The pump within the elevated storage tank is also separated by a chain-link fence to further ensure security.

Figure 6-1: Light Farms Site Security

Figure 6-2: Light Farms Pump Security

6.2.2 Civil and Structural

The site area is covered with grass which acts as a permeable surface. Landscaping is adequate as indicated above, and drainage problems are not evident.

Figure 6-3: Light Farms Site Area

The elevated storage tank exterior appears to be in good condition with no signs of corrosion or chipping paint. Inspection conducted in 2015 revealed the following observations. Light corrosion was noted on the internal roof plates, internal sidewall plates, water access ladder, and overflow flume. Additionally, 90% sedimentation coverage on internal floor plates was documented. Repair is recommended for one of the anode covers which is not centered over the hole leaving a 1” gap.

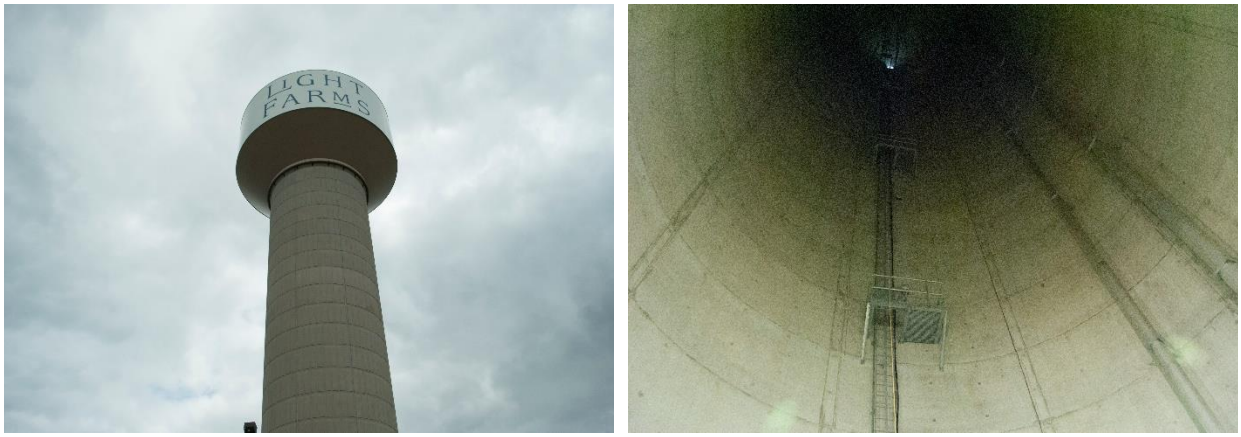


Figure 6-4: Light Farms Elevated Storage Tank

6.2.3 Access

Accessibility into the site area is adequate; the access gate can easily accommodate a vehicle. However, the gate rollers fall off at the end of the track. The concrete access roadway leads directly from the site entrance to the base of the elevated storage tank where a vehicle can then enter the storage tank through a motorized roller door. Within the elevated storage tank, a ladder is present with multiple landings allowing maintenance to be performed. The ladder appears to be in good condition with no signs of buckling and minimal corrosion. According to the inspection report, installation of a ‘confined space entry’ placard on the facility access door and side manway access hatch is recommended. The roof access hatch hinge is broken and does not fully close; replacement is recommended.

Figure 6-5: Light Farms Access

6.2.4 Pumping and Mechanical

The elevated storage tank is fed through a motorized valve. The City operates the EST by manually filling to capacity and then closing the influent valve. A valve to allow proper circulation is also present. The pump, valves, and piping appear to be in good condition with intact coatings and minimal signs of corrosion or leakage. City Staff report water age as a constant issue. Optimization of the motorized valves via integration with the SCADA system would provide greater automation of the process.

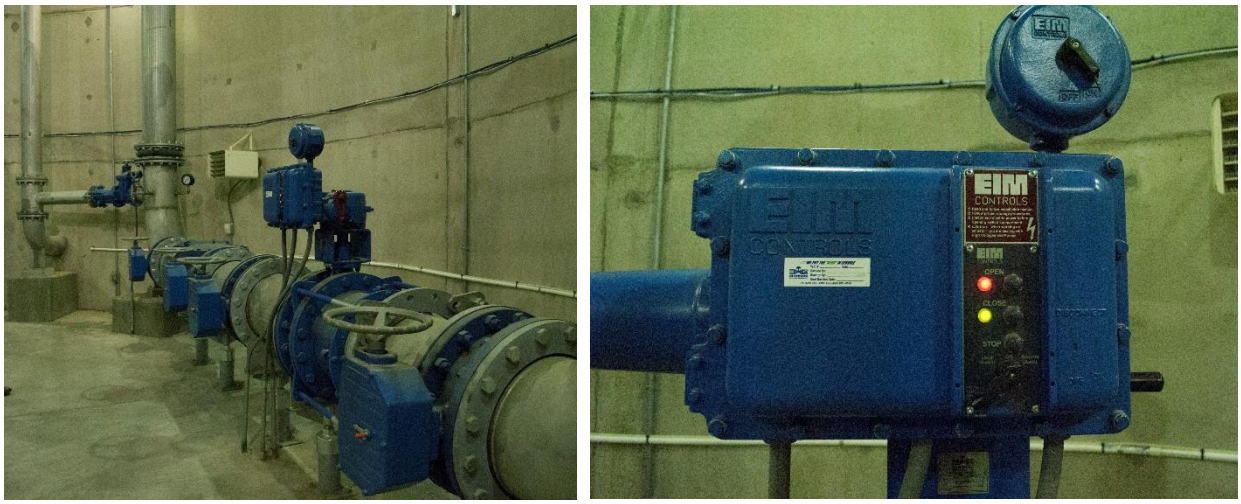


Figure 6-6: Light Farms Pump

6.2.5 Controls and Instrumentation

The elevated storage tank contains an operational electronic (digital) water level indicator and pressure gauge. The controls are in good working condition and operate as designed and intended. A McLean generator is present for backup power.

Figure 6-7: Light Farms Controls

6.2.6 Summary

Table 6-2 summarizes the findings of the condition assessment based on ratings of good, fair and poor. A condition assessment rating of *good* indicates that no immediate attention is required. A rating of *fair* indicates that some initial repair or minor improvement is needed for the facility to remain in adequate working condition. A rating of *poor* indicates that improvements, replacement or reconstruction are needed in the immediate future.

Table 6-2: Light Farms EST Condition Assessment Ratings

Aspect	Rating
Security	Good
Civil	Good
Access	Good
Pumping and Mechanical	Good
Controls and Instrumentation	Good

6.3 Conclusions

The following conclusions were developed from the evaluation of the Light Farms Facility:

- The site area has good security as demonstrated by the perimeter fencing, locked gates, and required signage. The site area also has adequate landscaping and no drainage problems are apparent.
- Accessibility is adequate; vehicles can easily enter the site perimeter and elevated storage tank via a concrete roadway. However, gate rollers fall off at the end of the track.
- The tank appears to be in good condition with minimal signs of corrosion.
- The pump, valves, and piping appear to be in good condition

6.4 Recommendations

The following recommendations were developed based on the evaluation described herein:

- Install keyed lock to water access hatch
- Install a 'confined space entry' placard on the elevated storage tank side manway access hatch and water access hatch
- Repair anode cover
- Remove accumulated sediment
- Replace roof access hatch hinge
- Install slider protection on the ladder from catwalk to roof
- Repaint tank
- Optimize SCADA control of motorized valves
- Repair gate rollers/track

6.5 OPCC

Site and facility improvements are estimated to cost $130,750 upon the recommendations shown in Table 6-3. These costs do not include engineering services.

Table 6-3: Light Farms Capital Improvements

Asset	Description of Improvement	Quantity	OPPC
1 MG Elevated Storage Tank	Installation of new keyed lock to water access hatch	1	$ 40
	Signage, "Confined Space Entry"	3	$ 120
	Repair anode cover	1	$ 395
	Removal of sediment up to 2 inches	1	$ 2,995
	Replace roof access hatch hinge	1	$ 500
	Installation of slider fall protection from the catwalk	1	$ 1,700
	Paint/repaint tank external structure	1	$ 100,000
General	Optimize SCADA control of motorized valves	1	$ 20,000
	Repair/replace gate rollers/track	1	$ 5,000
Total			$ 130,750

7.0 Morgan Lake Facility

7.1 Facility Overview

The facility is located directly north of County Road 9 and is situated in a rural area. It consists of one elevated storage tank, one decommissioned horizontal ground storage tank, one decommissioned standpipe, and one decommissioned City operated groundwater well. The standpipe and well pump have been taken out of service for operation simplicity and maintenance cost reduction. The elevated storage tank fills and empties based on demand in the system. The EST is supplied by the Downtown pump station. Additionally, a CLA valve can be opened during high demand allowing the Morgan Lake Facility to supply water to the high pressure planes. Detailed asset specifications are provided in Table 7-1.

Table 7-1: Morgan Lake Facility Assets

Parameter	Value
Location	1766 County Road 96
Elevated Storage Tank	
Type of Tank	Elevated Storage
Construction	Metal, Welded
Year Constructed	2000
Builder	Phoenix Fabrication
Capacity (gal)	540,000
Height (ft)	122
Diameter (ft)	45
Foundation	Concrete pads
Decommissioned Standpipe	
Type of Tank	Standpipe
Construction	Metal, Welded
Year Constructed	1987
Builder	Challenger Tank & MFG
Capacity (gal)	157,000
Height (ft)	100
Diameter (ft)	16
Foundation	Concrete Pads
Pump Station	
Number of Pumps	2
Pump Capacity (gpm)	Pump #1: 500 Pump #2: 420
Rated Total Dynamic Head (TDH) (ft)	Pump #1: 237 Pump #2: 282
Type of Pump	Horizontal Split Case
Pump Manufacturer	PACO
Motor Manufacturer	NA
Motor Type	NA
Motor HP	Pump #1: 30 Pump #2: 30
RPM	Pump #1: NA Pump #2: NA
Water Well # 4	
Aquifer	Trinity
Yield (GPM) / Drill Year	300 / 1987
Current Yield (GPM) / Year	168 / 2013

7.2 Condition Assessment

7.2.1 Security

The site is located south of County Road 96 and is enclosed by an intruder resistant chain-link perimeter fence equipped with three strands of barb wire to further prevent trespassing. The fence also has proper signage delineating facility information and emergency contact information as well as a 'No Trespassing' sign.

Figure 7-1: Morgan Lake Security

7.2.2 Civil and Structural

The site area is covered with grass. The land is not well-graded and drainage problems are apparent. Figure 7-1 and Figure 7-2 depict the pools of accumulated rain water and inconsistent grading.

Figure 7-2: Morgan Lake Site Area

The elevated storage tank exterior appears to be in fair condition with minor signs of corrosion and chipping paint. According to 2015 inspection reports, the center water rise foundation has an eroded base under the concrete pad. External roof plates indicate minor corrosion and thinning/chipping paint. From

internal inspection, it is evident the following also display light corrosion: internal roof plates, internal sidewall plates, water access ladder, overflow flume. Additionally, the internal floor plates show 100% sediment coverage.

Figure 7-3: Morgan Lake Elevated Storage Tank

The ground storage tank exterior appears to be in good condition. The ground storage tank has been taken out of service by the City. Further assessment will not be performed and demolition is recommended.

Figure 7-4: Morgan Lake Ground Storage Tank

The standpipe exterior appears to be in good condition. However, this has also been taken out of service by the City. Further assessment will not be performed and demolition is recommended.

Figure 7-5: Morgan Lake Standpipe

The well pump appears to be in fair condition. Signs of corrosion are apparent as well as chemical residue near the foot of the well (right side of Figure 7-6). This pump has been decommissioned as well. Therefore, further assessment will not be performed and demolition is recommended.

Figure 7-6: Morgan Lake Well Pump

7.2.3 Access

Accessibility into the site is fair. The access gate can easily accommodate a vehicle and a gravel access roadway is present within the site perimeter. The entrance gate has drainage issues that could indicate the potential for additional problems in the future. Additionally, the roadway does not extend to the base of the elevated storage tank. Extension of this roadway is recommended to improve accessibility.

Figure 7-7: Morgan Lake Site Access

Accessibility into the elevated storage tank is sufficient. The external access ladder shows no signs of buckling and minimal corrosion. According to inspection reports, installation of a 'confined space entry' placard is recommended for the side manway access hatch. Also, installation of slider protection is recommended for the ladder from catwalk to roof.

Figure 7-8: Morgan Lake EST Access Ladder

7.2.4 Pumping and Mechanical

The Morgan Lake Facility contains two pumps that transfer treated water from the standpipe to the EST.

The chlorine building appears to be in fair condition and contains six chlorine tanks with two Regal automatic switchover gas chlorinators. The chloramines are fed only when the well pump is active. City staff reported that a chlorine analyzer drain is needed, and chlorine leak alarms require replacement.

Figure 7-9: Morgan Lake Chlorine Feed

7.2.5 Controls and Instrumentation

The facility does not have SCADA capabilities; installation is recommended. Control panels are in fair condition; upgrades are recommended. The elevated storage tank water level indicator consists of an operational pressure gauge. The electrical room also serves as storage space as indicated below.

Figure 7-10: Morgan Lake Controls

7.2.6 Summary

Table 7-2 summarizes the findings of the condition assessment based on ratings of good, fair and poor. A condition assessment rating of *good* indicates that no immediate attention is required. A rating of *fair* indicates that some initial repair or minor improvement is needed for the facility to remain in adequate working condition. A rating of *poor* indicates that improvements, replacement or reconstruction are needed in the immediate future.

Table 7-2: Morgan Lake EST Condition Assessment Ratings

Aspect	Rating
Site Security	Good
Site Civil	Poor
Access	Fair
Mechanical	Fair
Instrumentation and Controls	Fair

7.3 Conclusions

The following conclusions were developed from the evaluation of the Morgan Lake Pump Station and EST:

- Site security is adequate as indicated by the chain-link perimeter fence equipped with barb wire and required signage
- Site area requires improvement; drainage problems are evident and landscaping is poor
- The elevated storage tank appears to be in fair condition with minor signs of corrosion and chipping paint
- The standpipe and well appear to be in fair condition; however, the well pump shows chemical deposits near the base
- Accessibility is fair; gate can accommodate a vehicle however the roadway does not extend to the elevated storage tank
- The facility does not have SCADA capabilities

7.4 Recommendations

The following recommendations were developed based on the evaluation described herein:

- Improve grading to solve drainage problems
- Install a ‘confined space entry’ placard on the elevated storage tank side manway access hatch and water access hatch
- Improve center water riser foundation
- Install slider protection on the ladder from catwalk to roof
- Repaint tank due to chipping paint and signs of corrosion
- Upgrade standpipe
- Cap well and demolish pump
- Extend access road to the base of the elevated storage tank
- Replace chlorine leak alarms; install chlorine analyzer drain
- Install residual-paced chloramine system
- Install SCADA capabilities; upgrade control panel
- Remove accumulated sediment
- Replace two bulbs in aircraft warning lights on the EST

7.5 OPCC

Site and facility improvements are expected to cost $471,885. Table 7-3 has a cost breakdown for improvements for each asset. These costs do not include engineering services.

Table 7-3: Morgan Lake Capital Improvements

Asset	Description of Improvement	Quantity	OPPC
Standpipe	Intruder protection door to roof access ladder	1	$ 995
	Signage, “Confined Space Entry”	3	$ 120
	Removal of sediment up to 2 inches	1	$ 2,995
	Paint/repaint tank external structure	1	$ 100,000
Elevated Storage Tank	Installation of slider fall protection from the catwalk	1	$ 1,700
	Signage, “Confined Space Entry”	2	$ 80
	Removal of sediment up to 2 inches	1	$ 2,600
	Installation of 2 bulbs to the aircraft warning lights	2	$ 395
	Paint/repaint tank external structure	1	$ 250,000
	Center water riser foundation	1	$ 5,000
Facility	Extend access road to the base of the EST	1	$ 5,000
	Cap well and demolish pump	1	$ 10,000
	Replace chlorine leak alarms	1	$ 2,000
	Install chlorine analyzer drain	1	$ 1,000
	Install residual-paced chloramine system	1	$ 25,000
	Install SCADA capabilities	1	$ 20,000
	Upgrade control panel	1	$ 20,000
	Grading and drainage improvements	1	$ 25,000
Total			$ 471,885

8.0 Summary

8.1 Recommended Improvements

Table 8-1 displays a summary of recommended improvement costs at each location. Engineering and professional services have not been included in this cost evaluation, as it is anticipated that these projects would be developed and executed by the City engineering staff.

Table 8-1: Summary of Recommended Improvements

Facility	OPCC
Downtown Subtotal	$ 151,025
Celina Road Subtotal	$ 283,656
Light Farms Subtotal	$ 130,750
Morgan Lake Subtotal	$ 471,885
Total	**$ 1,037,316**

Appendix B

Water/Wastewater System Improvements

Lift Stations Evaluation

Prepared For:

City of Celina

September 2017

GARVER

GarverUSA.com

Appendix B

Water & Wastewater System Improvements
Lift Stations Evaluation

City of Celina, Texas

Prepared by:

3010 Gaylord Parkway
Suite 190
Frisco, TX 75034

September 2017

Garver Project No.: 16088050

Engineer's Certification

I hereby certify that this Technical Memorandum for the Water and Wastewater System Improvements – Lift Stations Evaluation was prepared by Garver under my direct supervision for the City of Celina, Texas.

Lance P. Klement, PE
State of Texas PE License 113630

STATE OF TEXAS
LANCE P. KLEMENT
113630
LICENSED
PROFESSIONAL ENGINEER

Digitally Signed 9/18/2017

Table of Contents

Engineer's Certification 2
Table of Contents 3
List of Figures 8
List of Tables 10
1.0 Executive Summary 12
2.0 Introduction 13
2.1 Project Scope 13
2.2 Site Description 13
2.3 Existing Pumps 14
3.0 Assessment Process 16
3.1 Data Collection and Review 16
3.2 Field Review and Condition Assessment 16
3.3 Identification of Deficiencies 16
4.0 Winn Road Lift Station 18
4.1 Lift Station Overview 18
4.2 Condition Assessment 18
4.2.1 Security 18
4.2.2 Civil 18
4.2.3 Access 19
4.2.4 Pumping and Mechanical 19
4.2.5 Controls and Instrumentation 19
4.2.6 Condition Assessment 20
4.2.7 Lift Station Design Data 20
4.2.8 30 TAC Chapter 217 Requirements 21
4.3 Conclusions 21
4.4 Recommendations 21
4.5 OPCC 21
5.0 Parkside Lift Station 22
5.1 Lift Station Overview 22
5.2 Condition Assessment 22
5.2.1 Security 22

5.2.2 Civil 22
5.2.3 Access 23
5.2.4 Pumping and Mechanical 24
5.2.5 Controls and Instrumentation 24
5.2.6 Condition Assessment 25
5.2.7 Lift Station Design Data 26
5.2.8 30 TAC Chapter 217 Requirements 26
5.3 Conclusions 26
5.4 Recommendations 27
5.5 OPCC 27
6.0 Old Celina Park 28
6.1 Lift Station Overview 28
6.2 Condition Assessment 28
6.2.1 Security 28
6.2.2 Civil 28
6.2.3 Access 29
6.2.4 Pumping and Mechanical 29
6.2.5 Controls and Instrumentation 30
6.2.6 Condition Assessment 31
6.2.7 Lift Station Design Data 31
6.2.8 30 TAC Chapter 217 Requirements 31
6.3 Conclusions 32
6.4 Recommendations 32
6.5 OPCC 32
7.0 Lucy's Lift Station 33
7.1 Lift Station Overview 33
7.2 Condition Assessment 33
7.2.1 Security 33
7.2.2 Civil 33
7.2.3 Access 34
7.2.4 Pumping and Mechanical 34
7.2.5 Controls and Instrumentation 35
7.2.6 Condition Assessment 36

7.2.7 Lift Station Design Data 36
7.2.8 30 TAC Chapter 217 Subchapter C Requirements 36
7.3 Conclusions 37
7.4 Recommendations 37
7.5 OPCC 37
8.0 Business 298 #1 Lift Station 38
8.1 Lift Station Overview 38
8.2 Condition Assessment 38
8.2.1 Security 38
8.2.2 Civil 38
8.2.3 Access 39
8.2.4 Pumping and Mechanical 40
8.2.5 Controls and Instrumentation 40
8.2.6 Condition Assessment 41
8.2.7 Lift Station Design Data 41
8.2.8 30 TAC Chapter 217 Subchapter C Requirements 42
8.3 Conclusions 42
8.4 Recommendations 42
8.5 OPCC 42
9.0 Shawnee Trail #1 Lift Station 44
9.1 Lift Station Overview 44
9.2 Condition Assessment 44
9.2.1 Security 44
9.2.2 Civil 44
9.2.3 Access 45
9.2.4 Pumping and Mechanical 45
9.2.5 Controls and Instrumentation 46
9.2.6 Condition Assessment 46
9.2.7 Lift Station Design Data 47
9.2.8 30 TAC Chapter 217 Subchapter C Requirements 47
9.3 Conclusions 47
9.4 Recommendations 47
9.5 OPCC 48

10.0 Shawnee Trail #2 Lift Station 49
10.1 Lift Station Overview 49
10.2 Condition Assessment 49
10.2.1 Security 49
10.2.2 Civil 49
10.2.3 Access 50
10.2.4 Pumping and Mechanical 51
10.2.5 Controls and Instrumentation 52
10.2.6 Condition Assessment 52
10.2.7 Lift Station Design Data 53
10.2.8 30 TAC Chapter 217 Subchapter C Requirements 53
10.3 Conclusions 53
10.4 Recommendations 53
10.5 OPCC 54
11.0 High Point Lift Station 55
11.1 Lift Station Overview 55
11.2 Condition Assessment 55
11.2.1 Security 55
11.2.2 Civil 55
11.2.3 Access 56
11.2.4 Pumping and Mechanical 57
11.2.5 Controls and Instrumentation 57
11.2.6 Condition Assessment 58
11.2.7 Lift Station Design Data 58
11.2.8 30 TAC Chapter 217 Subchapter C Requirements 59
11.3 Conclusions 59
11.4 Recommendations 59
11.5 OPCC 59
12.0 Carter Ranch Phase II Lift Station 61
12.1 Lift Station Overview 61
12.2 Condition Assessment 61
12.2.1 Security 61
12.2.2 Civil 61

12.2.3 Access 62
12.2.4 Pumping and Mechanical 63
12.2.5 Controls and Instrumentation 64
12.2.6 Condition Assessment 65
12.2.7 Lift Station Design Data 65
12.2.8 30 TAC Chapter 217 Subchapter C Requirements 65
12.3 Conclusions 66
12.4 Recommendations 66
12.5 OPCC 66
13.0 Willock Hill Lift Station 67
13.1 Lift Station Overview 67
13.2 Condition Assessment 67
13.2.1 Security 67
13.2.2 Civil 68
13.2.3 Access 68
13.2.4 Pumping and Mechanical 69
13.2.5 Controls and Instrumentation 70
13.2.6 Condition Assessment 71
13.2.7 Lift Station Design Data 71
13.2.8 30 TAC Chapter 217 Subchapter C Requirements 71
13.3 Conclusions 72
13.4 Recommendations 72
13.5 OPCC 72
14.0 Tolleson 73
14.1 Lift Station Overview 73
14.2 Conclusion/Recommendation 73
14.3 OPCC 73
15.0 Summary of Condition 74
16.0 Summary of Recommendations 75

List of Figures

Figure 2-1: Lift Station Site Locations 14
Figure 4-1: Site Security at Winn Road LS 18
Figure 4-2: Site Area at Winn Road LS 19
Figure 4-3: Control Panel at Winn Road LS 20
Figure 5-1: Site Security at Parkside LS 22
Figure 5-2: Site Interior at Parkside LS 23
Figure 5-3: Access Road at Parkside LS 23
Figure 5-4: Wet Wells at Parkside LS 24
Figure 5-5: Valve Box at Parkside LS 24
Figure 5-6: Control Panel at Parkside LS 25
Figure 6-1: Site Security at Old Celina Park LS 28
Figure 6-2: Site Area at Old Celina Park LS 29
Figure 6-3: Site Access at Old Celina Park LS 29
Figure 6-4: Pump Controls at Old Celina Park LS 30
Figure 6-5: Control Panel at Old Celina Park LS 30
Figure 7-1: Site Perimeter at Lucy's LS 33
Figure 7-2: Site Area at Lucy's LS 34
Figure 7-3: Access Road at Lucy's LS 34
Figure 7-4: Wet Well at Lucy's LS 35
Figure 7-5: Control Panel at Lucy's LS 35
Figure 8-1: Site Perimeter at Business 298 LS 38
Figure 8-2: Concrete Pad at Business 298 LS 39
Figure 8-3: Site Interior at Business 298 LS 39
Figure 8-4: Site Access at Business 298 LS 40
Figure 8-5: Wet Well at Business 298 LS 40
Figure 8-6: Control Panel at Business 298 LS 41
Figure 9-1: Site Perimeter at Shawnee Trail #1 LS 44
Figure 9-2: Site Area at Shawnee Trail #1 LS 45
Figure 9-3: Wet Well at Shawnee Trail #1 LS 45
Figure 9-4: Control Panel Interior at Shawnee Trail #1 LS 46
Figure 10-1: Site Perimeter at Shawnee Trail #2 LS 49

Figure 10-2: Site Area at Shawnee Trail #2 LS 50
Figure 10-3: Access Road at Shawnee Trail #2 LS 50
Figure 10-4: Wet Well Exterior at Shawnee Trail #2 LS 51
Figure 10-5: Pump Controls at Shawnee Trail #2 LS 51
Figure 10-6: Control Panel at Shawnee Trail #2 LS 52
Figure 11-1: Site Security at High Point LS 55
Figure 11-2: Site Area at High Point LS 56
Figure 11-3: Access Road at High Point LS 56
Figure 11-4: Pump Controls at High Point LS 57
Figure 11-5: Control Panel at High Point LS 58
Figure 12-1: Site Perimeter at Carter Ranch LS 61
Figure 12-2: Access Gate at Carter Ranch LS 62
Figure 12-3: Site Interior at Carter Ranch LS 62
Figure 12-4: Site Access at Carter Ranch LS 63
Figure 12-5: Pump Controls at Carter Ranch LS 63
Figure 12-6: Valve Boxes at Carter Ranch LS 64
Figure 12-7: Control Panel at Carter Ranch LS 64
Figure 13-1: Site Perimeter at Willock Hill LS 67
Figure 13-2: Fencing at Willock Hill LS 68
Figure 13-3: Wet Well at Willock Hill LS 68
Figure 13-4: Site Access at Willock Hill LS 69
Figure 13-5: Pump Controls at Willock Hill LS 69
Figure 13-6: Valve Box at Willock Hill LS 70
Figure 13-7: Control Panel Interior at Willock Hill LS 70

List of Tables

Table 1-1: Lift Station Summary 12
Table 2-1: Lift Station Pumps 15
Table 3-1: 30 Texas Administrative Code (TAC) Requirements 17
Table 4-1: Winn Road Condition Assessment Ratings 20
Table 4-2: Winn Road Design Data 20
Table 4-3: Winn Road TAC Requirements 21
Table 4-4: Winn Road OPCC 21
Table 5-1: Parkside Condition Assessment Ratings 25
Table 5-2: Parkside Design Data 26
Table 5-3: Parkside TAC Requirements 26
Table 5-4: Parkside OPCC 27
Table 6-1: Old Celina Park Condition Assessment Ratings 31
Table 6-2: Old Celina Park Design Data 31
Table 6-3: Old Celina Park TAC Requirements 31
Table 6-4: Old Celina Park OPCC 32
Table 7-1: Lucy's Condition Assessment Ratings 36
Table 7-2: Lucy's Design Data 36
Table 7-3: Lucy's TAC Requirements 36
Table 7-4: Lucy's OPCC 37
Table 8-1: Business 298 #1 Condition Assessment Ratings 41
Table 8-2: Business 298 #1 Design Data 41
Table 8-3: Business 298 #1 TAC Requirements 42
Table 8-4: Business 298 #1 OPCC 43
Table 9-1: Shawnee Trail #1 Condition Assessment Ratings 46
Table 9-2: Shawnee Trail #1 Design Data 47
Table 9-3: Shawnee Trail #1 TAC Requirements 47
Table 9-4: Shawnee Trail #1 OPCC 48
Table 10-1: Shawnee Trail #2 Condition Assessment Ratings 52
Table 10-2: Shawnee Trail #2 Design Data 53
Table 10-3: Shawnee Trail #2 TAC Requirements 53
Table 10-4: Shawnee Trail #2 OPCC 54

Table 11-1: High Point Condition Assessment Ratings 58
Table 11-2: High Point Design Data 58
Table 11-3: High Point TAC Requirements 59
Table 11-4: High Point OPCC 60
Table 12-1: Carter Ranch Phase II Condition Assessment Ratings 65
Table 12-2: Carter Ranch Phase II Design Data 65
Table 12-3: Carter Ranch Phase II TAC Requirements 65
Table 12-4: Carter Ranch Phase II OPCC 66
Table 13-1: Willock Hill Condition Assessment Ratings 71
Table 13-2: Willock Hill Design Data 71
Table 13-3: Willock Hill TAC Requirements 71
Table 13-4: Willock Hill OPCC 72
Table 14-1: Tolleson OPCC 73
Table 15-1: Overall Condition Summary 74
Table 16-1: Summary of Recommendations 75
Table 16-2: Summary of Recommendations (Continued) 76

1.0 Executive Summary

The City of Celina (City) has retained Garver to perform an evaluation of its lift stations to determine compliance with the current Texas Commission on Environmental Quality's (TCEQ) 30 Texas Administrative Code (TAC) Chapter 217 regulations.

Ten lift stations were evaluated. A summary of each lift station including the number of pumps, associated horsepower, and the overall condition rating is provided below in Table 1-1.

Table 1-1: Lift Station Summary

Lift Station	# of Pumps	Manufacturer	Horsepower (HP)	Condition Rating
Winn Road	2	Flygt	3.8	Fair
Parkside	2	Flygt	10	Good
Old Celina Park	2	Hydromatic	2	Good
Lucy's	2	Hydromatic	2	Poor
Business 298 #1	2	Hydromatic	7.5	Fair
Shawnee #1	2	Dayton	2	Fair
Shawnee #2	2	Hydromatic	2	Fair
High Point	2	Hydromatic	7.5	Poor
Carter Ranch Phase II	2	Flygt	7.5	Good
	1	Flygt	10	
Willock Hills	1	Hydromatic	7.5	Fair

The following sections detail the evaluation metrics used and estimated costs in order to both meet TCEQ requirements and upgrade aging assets. Table 16-1 shows the cost of upgrading each lift station.

2.0 Introduction

2.1 Project Scope

The City of Celina's wastewater collection system is comprised of approximately 407,600 LF of sewer lines and 23,100 LF of force mains, 987 manholes, and eleven lift stations. The scope of service was to perform a field investigation of ten lift stations, which was accomplished by means of a site visit where an engineering team evaluated the overall facility, piping, pumps, instrumentation, and controls. The findings are documented in this technical memorandum, along with background data, field notes, recommendations for replacement and repair, and associated cost estimates to complete any recommendations.

Structural and electrical condition assessments were not performed, and the field investigations are based on visual observations and review of plans (where applicable) for the facilities in regards to general condition of the pumping facilities, security, drainage, and TCEQ compliance. The field investigation of the facilities is not a full condition assessment.

2.2 Site Description

The majority of the lift stations are clustered within the Celina City East zone (northern portion of the City of Celina CCN service area), with the exception of Carter Ranch Phase II and High Point Lift Stations located south and east of the main cluster respectively. The ten lift stations that were evaluated are as follows:

1. Winn Road
2. Parkside
3. Old Celina Park
4. Lucy's
5. Business 298 #1
6. Shawnee Trail #1
7. Shawnee Trail #2
8. High Point
9. Carter Ranch Phase II
10. Willock Hill

The Tolleson Drive lift station was not assessed at the City's request. Figure 2-1 delineates the location of the elevent lift stations.

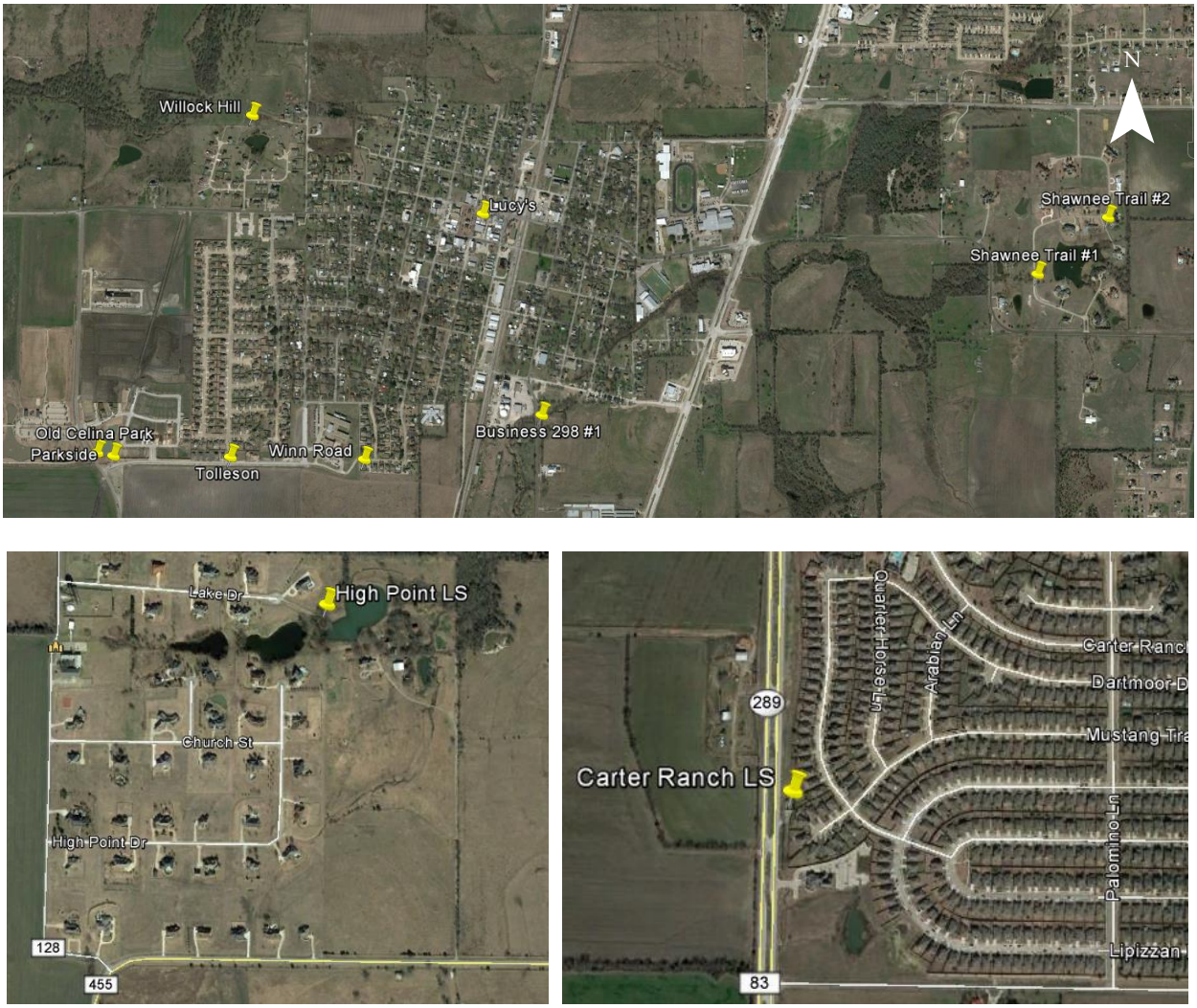


Figure 2-1: Lift Station Site Locations

2.3 Existing Pumps

The specifications for each lift station's pump(s) are shown in Table 2-1.

Table 2-1: Lift Station Pumps

Lift Station	# of Pumps	Manufacturer	Power (HP)	Voltage	Phase	Model #
Winn Road	2	Flygt	3.8	240	3	MP 3068
Parkside	2	Flygt	10	240	3	MP 3127
Old Celina Park	2	Hydromatic	2	240	1	HPG200 M3-2
Lucy's	2	Hydromatic	2	240	1	HPG200 M2-2
Business 298 #1	2	Hydromatic	7.5	240	1	HPGH750 M3-2
Shawnee #1	2	Dayton	2	240	1	3BB97
Shawnee #2	2	Hydromatic	2	240	1	HPG200 M3-2
High Point	2	Hydromatic	7.5	240	1	HPGH750 M3-2
Carter Ranch	2	Flygt	7.5	480	1	MP 3127
	1	Flygt	10	480	1	MP 3127
Willock Hills	2	Hydromatic	7.5	480	3	S4M750 M4-4

3.0 Assessment Process

To have an effective assessment of a lift station, it is important to understand the parameters, procedures, and outcomes desired before the assessment is completed. This serves as a quality control measure and ensures the end product meets high standards. The approach used in the assessment process is summarized below.

3.1 Data Collection and Review

This task included assembling and reviewing all available and relevant documents, which included the following:

1. Staff input through staff interviews
2. Line maintenance records (when available)
3. Existing water/wastewater base maps
4. Record drawings (when available)
5. Pump performance curves & controls (when available)
6. Past comprehensive master plans
7. TCEQ requirements for lift stations
8. Flow testing conducted by subcontractors

3.2 Field Review and Condition Assessment

The Garver team performed the field reviews and staff interviews on April 2, 2016. The field reviews included photographing equipment and appurtenances as well as visually observing fit and function. The staff interviews included documenting deficiencies as operator observations were provided at each lift station.

3.3 Identification of Deficiencies

Once the documentation review and site assessments were completed, the deficiencies in the system were identified and addressed. The following categories were compared against existing codes or other criteria applicable to each category.

- Accessibility
- Safety
- Mechanical
- Controls
- Instrumentation
- Environmental
- Performance

A detailed view of selected Texas Commission on Environmental Quality (TCEQ) requirements used in the evaluation is provided below in Table 3-1 for clarity. A condensed summary table delineating satisfaction of these requirements is included for each lift station in the subsequent sections.

Table 3-1: 30 Texas Administrative Code (TAC) Requirements

Parameter	Reference	Requirements
Site Requirements		
Site Access	§217.59 (a)	Road surface of minimum width 12 feet present.
Security	§217.59 (b)	Perimeter fence of minimum height of 6 feet provided. Three strands of barbed wire unless fence is at least 8 feet tall or contains outwardly directed iron bars spaced on four inch centers. Above-ground valves must be chained and locked unless fully enclosed in fence.
Flood Protection	§217.59 (c)	Designed to withstand/operate during a 100-year storm event.
Design Considerations		
Pump Controls	§217.60 (a)	Level control system provided.
Dry Well Access	§217.60 (c)	Ladder/stair provided.
Ventilation	§217.60 (d)	Ventilation (passive or mechanical) provided.
Pumps		
General Requirements	§217.61 (a)	Pump must have greater than 3 inch diameter suction and discharge openings.
Pumping Capacity	§217.61 (c)	At least two pumps present. Firm pumping capacity of a lift station must handle the peak flow.
Pipes		
Valves	§217.62 (b)	Discharge side must be followed by a full-closing isolation valve and check valve.
Emergency Provisions		
Signage	§217.63 (a)	Sign must dictate name of WWTF, 24-hour emergency contact information.
Alarm	§217.63 (c)	Audiovisual alarm system/SCADA provided.
Back-up Power	§217.63 (i)	Alternate power sources provided to prevent discharge of wastewater. System must operate for a duration at least equal to the longest power outage on record for the past 60 months or at least 20 minutes, whichever is longer.

4.0 Winn Road Lift Station

4.1 Lift Station Overview

The lift station consists of a control panel, two Flygt model MP 3068 pumps, and the physical lift station structure. The Lift Station has no perimeter containment. The lift station services the surrounding neighborhood.

4.2 Condition Assessment

4.2.1 Security

The site is located in a residential development directly on the northwest corner of the property lot. The site lacks exterior barriers in terms of perimeter fencing, gates, or signs to ensure security and prevent trespassing. However, the lift station access hatch and control panel are padlocked to restrict access and a remote alarm is in place.

Figure 4-1: Site Security at Winn Road LS

4.2.2 Civil

The lawn is relatively well graded, however the concrete area directly northwest of the lift station appears to have drainage problems as indicated by the pools of accumulated rain water. This is evident in Figure 4-1 above. The resident of 418 Winn Road takes care of landscaping and ensures the site area is well-kept. This is indicated by the trimmed hedges, ordered flower beds, and swept walkways. The control panel structure is positioned directly on the lawn without a concrete pad. The structure and associated supports appear to be in good condition with no deterioration or significant cracking.

Figure 4-2: Site Area at Winn Road LS

4.2.3 Access

The lift station is situated on the lawn edge, thereby allowing easy access from the residential driveway (north of the lift station) as well as the alley (west of the lift station). However, the lift station lacks security requirements of perimeter fencing.

The hatch access to the top of the wet well is an aluminum hatch. It is fastened to the top of the wet well with hinges, secured with a padlock, and provides adequate access to the pumps.

4.2.4 Pumping and Mechanical

The lift station is comprised of two Flygt model MP 3068 pumps each with a 3.8 HP motor. Staff reported no issues with the pumps, therefore, the wet well was not opened for further inspection.

4.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control panel has an automatic pump pilot interface present. Additionally, it has the following switches: master on/off, elapsed time meters, MiniCAS Relays, hand/off/auto. The control panel is not connected to SCADA, thus a SCADA interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition. Staff have reported that control panels at all lift stations have remote alarm indication through a Sensaphone, but operators are unable to determine cause of alarm or wet well status.

The controls are in good working condition and operate as designed and intended. The panel was recently replaced; it is secured with a padlock. A quick connect generator is in place.

Figure 4-3: Control Panel at Winn Road LS

4.2.6 Condition Assessment

Table 4-1: Winn Road Condition Assessment Ratings

Aspect	Rating
Site Security	Poor
Site Civil	Fair
Access	Good
Pumping and Mechanical	Good
Controls and Instrumentation	Good

Based on the summary above, the overall condition is determined to have an average rating of good.

4.2.7 Lift Station Design Data

Table 4-2: Winn Road Design Data

Lift Station	Winn Road
Address	418 Winn Road
Recent Improvements	Panel replacement, removal of security fence
Capacity one pump, gpm	52
Capacity two pumps, gpm	32
Rated Total Dynamic Head (TDH), ft	82
Type of Pump	Submersible Grinder
Manufacturer	Flygt
Model	MP 3068
Volts/Ph/Hz	240/3/60
Motor HP	3.8

4.2.8 30 TAC Chapter 217 Requirements

Table 4-3: Winn Road TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks perimeter fence; lacks barbed wire
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks signage

4.3 Conclusions

The following conclusions were developed from the evaluation of the Winn Road lift station:

- The station has been well maintained and is in fair condition
- Site security is poor as evidenced by the lack of perimeter fencing and gates. However, TCEQ fencing requirement was waived due to presence of padlocks.
- Staff reported no issues with pumps
- Minor drainage problems are apparent
- Control panel has been recently replaced
- Generator quick connect is in place
- Ventilation and signage are required

4.4 Recommendations

- Install perimeter fencing with barbed wire along with signage stating facility information and emergency contact information
- Install SCADA interface for alarms and run-status indicators
- Install ventilation pipe
- Install gravity flow bypass and upon completion of future CIP project, decommission lift station

4.5 OPCC

Site and facility improvements are expected to cost $45,500.

Table 4-4: Winn Road OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Winn Road				
SCADA	1	EA	$ 35,000	$ 35,000
Ventilation pipe	1	EA	$ 500	$ 500
Misc. (fence, barbed wire, signage)	1	LS	$ 10,000	$ 10,000
Total				$ 45,500

5.0 Parkside Lift Station

5.1 Lift Station Overview

The Parkside Lift Station consists of a control panel, two Flygt model MP 3127 pumps, and the physical lift station structure. The lift station services the surrounding neighborhood.

5.2 Condition Assessment

5.2.1 Security

The site is located off of Sunset Blvd near residential developments and has a brick perimeter wall. There is one access gate which can easily accommodate a vehicle. The gate is equipped with a padlock to restrict access, however the wall is not equipped with barbed wire. A remote alarm is in place.

Figure 5-1: Site Security at Parkside LS

5.2.2 Civil

The brick perimeter wall appears to be in good condition with no significant cracking, weathering, or erosion. The walls do not show any signs of settlement or undulations. Inside the perimeter wall, the facility is constructed with a concrete slab. The concrete slab appears to be in good shape; there does not appear to be any deterioration or significant cracking. There does not appear to be any drainage problems or areas that would pond water. This is indicated below in Figure 5-2.

Figure 5-2: Site Interior at Parkside LS

5.2.3 Access

The site has sufficient access for maintenance. However, the driveway leading from Sunset Blvd to the access gate consists of an initial sharp turn as indicated in Figure 5-3. A wider driveway will allow work trucks to reach the access gate with greater ease.

The two access hatches to the top of the wet wells are aluminum hatches. They are fastened to the top of the wet well with hinges, and provide adequate access to the pumps. The facility manager has expressed interest in installing a chain to pull pumps instead of the existing cable.

Figure 5-3: Access Road at Parkside LS

5.2.4 Pumping and Mechanical

The lift station is comprised of two Flygt model MP 3127 pumps each with a 10 HP motor. The piping and supports appear to be in good condition with no signs of rusting or leakage.

Figure 5-4: Wet Wells at Parkside LS

Figure 5-5: Valve Box at Parkside LS

5.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control box has the following switches present: a master on/off, status indicators (lead, lag, high level, run, and off), elapsed time meters, MiniCAS Relay, hand/off/auto, and push button resets. The control panel is not connected to SCADA, thus a SCADA

interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition.

The control panel was recently replaced; the controls are in good working condition and operate as designed and intended. It is also secured with a padlock.

Figure 5-6: Control Panel at Parkside LS

5.2.6 Condition Assessment

Table 5-1: Parkside Condition Assessment Ratings

Aspect	Rating
Site Security	Good
Site Civil	Good
Access	Fair
Pumping and Mechanical	Good
Controls and Instrumentation	Good

Based on the summary above, the overall condition is determined to have an average rating of good.

5.2.7 Lift Station Design Data

Table 5-2: Parkside Design Data

Lift Station	Parkside
Address	12100 W Sunset Blvd
Recent Improvements	Panel replacement
Capacity one pump, gpm	400
Capacity two pumps, gpm	440
Rated Total Dynamic Head (TDH), ft	55
Type of Pump	Submersible Grinder
Manufacturer	Flygt
Model	MP 3127
Volts/Ph/Hz	240/3/60
Motor HP	10

5.2.8 30 TAC Chapter 217 Requirements

Table 5-3: Parkside TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks barb wire
Design Considerations	§217.60	Yes
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks signage and back-up generator

5.3 Conclusions

The following conclusions were developed from the evaluation of Parkside lift station:

- The station has been well maintained and is in good condition
- Perimeter wall is in good condition with ample space inside. However, there is no barbed wire atop the wall.
- Narrow driveway to get into the site area is causing accessibility issues
- Grading of the site allows for proper drainage of the site without ponding or flooding
- The pumps are in good operating condition and have not posed any problems for the City staff
- Controls and instrumentation appear to be in good condition
- Site lacks back-up power capabilities
- Ventilation is present

5.4 Recommendations

- Install SCADA interface for alarms and run-status indicators
- Equip site with back-up power capabilities
- Install barbed wire on top of the perimeter wall, along with signage stating facility information and emergency contact information
- Widen driveway to improve accessibility
- Install chain to pull pumps instead of the existing cable

5.5 OPCC

The site and facility improvements are estimated to cost $54,600.

Table 5-4: Parkside OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Parkside				
SCADA	1	EA	$ 35,000	$ 35,000
Generator connection	1	EA	$ 2,000	$ 2,000
Pump chain	1	EA	$ 500	$ 500
Widen driveway	1	LS	$ 15,000	$ 15,000
Misc. (barbed wire, signage)	1	LS	$ 2,100	$ 2,100
Total				$ 54,600

6.0 Old Celina Park

6.1 Lift Station Overview

The Old Celina Park lift station consists of a control panel, two Hydromatic model HPG200 M3-2 pumps, and the physical lift station structure. The lift station services the surrounding neighborhood.

6.2 Condition Assessment

6.2.1 Security

The lift station is located off of West FM 428 and is enclosed by a black iron fence. The fence is not equipped with barbed wire, however it does contain outwardly directed iron bars, thereby satisfying TAC requirements. An access gate is present and is equipped with a padlock to restrict access. However, signage delineating contact information or name of the lift station/facility is not present. The lift station access hatch and control panel are padlocked to restrict access, and a remote alarm is in place.

Figure 6-1: Site Security at Old Celina Park LS

6.2.2 Civil

The perimeter fence appears to be in good condition. There does not appear to be drainage problems or areas that would pond water. The site area itself is relatively well-kept. However, overhung tree limbs are present near the control panel as indicated by Figure 6-2 below.

Figure 6-2: Site Area at Old Celina Park LS

6.2.3 Access

The site has good access for maintenance; it can easily accommodate a work truck and provide access to the wet well. The hatch access to the top of the wet well is an aluminum hatch. It is fastened to the top of the wet well with hinges, secured with a padlock, and provides adequate access to the pumps.

Figure 6-3: Site Access at Old Celina Park LS

6.2.4 Pumping and Mechanical

The lift station is comprised of two Hydromatic model HPG200 M3-2 pumps each with a 2 HP motor. The piping and associated supports appear to be in fair condition with minor signs of rust.

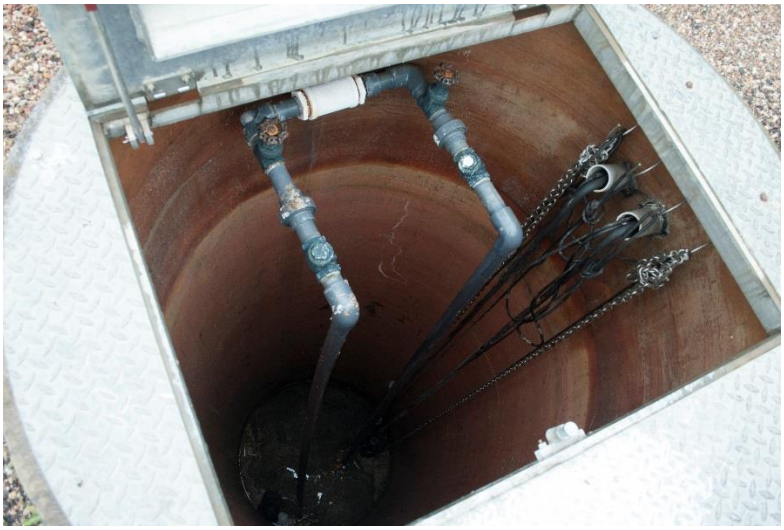


Figure 6-4: Pump Controls at Old Celina Park LS

6.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control box has the following switches present: a master on/off, run status indicators, hand/off/auto, seal fail indicators, elapsed time meters, and push button resets. The control panel is not connected to SCADA, thus a SCADA interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition.

According to staff input, the controls are in fair working condition and operate as designed and intended. The panel is secured with a padlock. The lift station however lacks generator capacity.

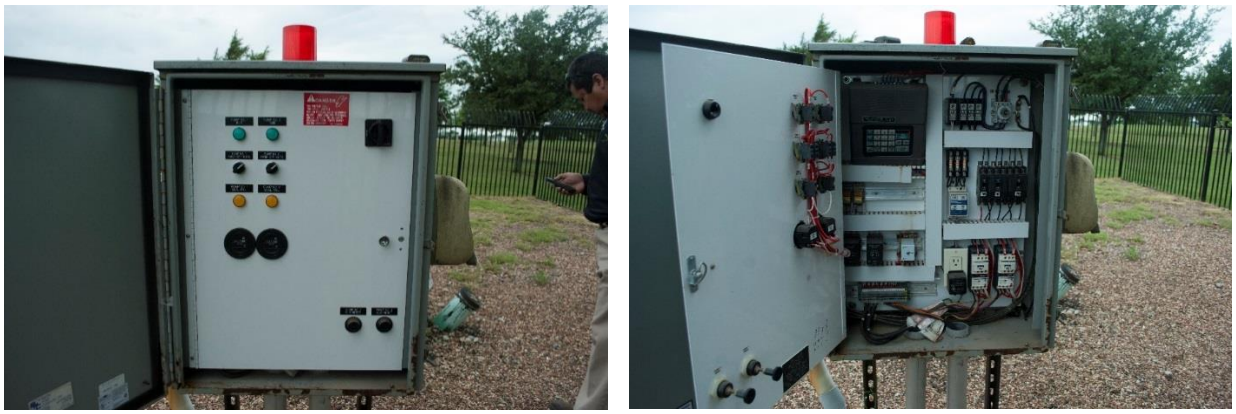


Figure 6-5: Control Panel at Old Celina Park LS

6.2.6 Condition Assessment

Table 6-1: Old Celina Park Condition Assessment Ratings

Aspect	Rating
Site Security	Good
Site Civil	Good
Access	Good
Pumping and Mechanical	Fair
Controls and Instrumentation	Fair

Based on the summary above, the overall condition is determined to have an average rating of good.

6.2.7 Lift Station Design Data

Table 6-2: Old Celina Park Design Data

Lift Station	Old Celina Park
Address	13000 W FM 428
Recent Improvements	NA
Capacity one pump, gpm	28
Capacity two pumps, gpm	55
Rated Total Dynamic Head (TDH), ft	82
Type of Pump	Submersible Grinder
Manufacturer	Hydromatic
Model	HPG200 M3-2
Volts/Ph/Hz	240/1/60
Motor HP	2

6.2.8 30 TAC Chapter 217 Requirements

Table 6-3: Old Celina Park TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	Yes
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks back-up generator

6.3 Conclusions

The following conclusions were developed from the evaluation of the Old Celina Park lift station.

- The station has been well maintained and is in overall good condition
- Security is sufficient as indicated by the perimeter fencing and padlocks
- Drainage problems are not evident
- Overhung tree limbs are present near the control panel
- Site accessibility is sufficient and easily accommodates work trucks
- Control panel appears to be in fair working condition
- Site lacks back-up power capabilities
- Ventilation is required

6.4 Recommendations

- Install SCADA interface for alarms and run-status indicators
- Equip site with back-up generator capabilities
- Install ventilation pipe
- Trim back overhanging tree limbs for security purposes and to prevent damage to the control panel
- Install signage delineating facility information and emergency contact details

6.5 OPCC

The site and facility improvements are estimated to cost $42,600.

Table 6-4: Old Celina Park OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Old Celina Park				
SCADA	1	EA	$ 35,000	$ 35,000
Generator connection	1	EA	$ 2,000	$ 2,000
Ventilation pipe	1	EA	$ 500	$ 500
Misc. (signage, landscaping)	1	LS	$ 5,100	$ 5,100
Total				$ 42,600

7.0 Lucy's Lift Station

7.1 Lift Station Overview

The Lucy's lift station consists of a control panel, two Hydromatic model HPG200 M2-2 pumps, and the physical lift station structure. The lift station has no perimeter containment. The lift station services the surrounding commercial area, which includes the downtown area restaurants.

7.2 Condition Assessment

7.2.1 Security

The site is located at 127 N Ohio Street near the Lucy's restaurant. The site lacks exterior barriers in terms of perimeter fencing, access gates, or signs to prevent trespassing. There is no lock on the lift station access hatch, however the control panel is secured with a padlock, and a remote alarm is in place.

Figure 7-1: Site Perimeter at Lucy's LS

7.2.2 Civil

The lift station site is not enclosed by perimeter fencing and is located in the middle of an alley. The asphalt roadway appears to be in poor condition. The area is not well-kept as indicated by the presence of overgrown grass in Figure 7-2 below. There also appears to be slight drainage problems as indicated above in Figure 7-1.

Figure 7-2: Site Area at Lucy's LS

7.2.3 Access

The roadway can accommodate a work truck and provide access to the wet well, however a wider roadway is desired to provide improved access. The lift station also lacks security requirements of perimeter fencing. The hatch access to the top of the wet well is a manhole cover and requires an upgrade.

Figure 7-3: Access Road at Lucy's LS

7.2.4 Pumping and Mechanical

The lift station is comprised of two Hydromatic model HPG200 M2-2 pumps each with a 2 HP motor. City staff reported that maintenance is an issue with the lift station.

Figure 7-4: Wet Well at Lucy's LS

7.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control panel is not connected to SCADA, thus a SCADA interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition, and the panel itself is secured with a padlock.

The control box is in poor condition and requires an upgrade due to its age. The site lacks an on-site generator.

Figure 7-5: Control Panel at Lucy's LS

7.2.6 Condition Assessment

Table 7-1: Lucy's Condition Assessment Ratings

Aspect	Rating
Site Security	Poor
Site Civil	Fair
Access	Fair
Pumping and Mechanical	Poor
Controls and Instrumentation	Poor

Based on the summary above, the overall condition is determined to have an average rating of poor.

7.2.7 Lift Station Design Data

Table 7-2: Lucy's Design Data

Lift Station	Lucy's
Address	127 N Ohio Street
Recent Improvements	NA
Capacity one pump, gpm	35
Capacity two pumps, gpm	88
Rated Total Dynamic Head (TDH), ft	82
Type of Pump	Submersible Grinder
Manufacturer	Hydromatic
Model	HPG200 M2-2
Volts/Ph/Hz	240/1/60
Motor HP	2

7.2.8 30 TAC Chapter 217 Subchapter C Requirements

Table 7-3: Lucy's TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks perimeter fence/barbed wire
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks back-up generator

7.3 Conclusions

The following conclusions were developed from the evaluation of the Lucy's lift station:

- Security is poor due to a lack of perimeter fencing, barb wire, and signage
- Site area is not well-kept as is evident by the overgrown grass, pools of accumulated rainwater, and poor condition of the road
- The pumps are in poor operating condition and maintenance issues have been reported by the City staff
- Manhole cover is used in place of wet well access hatch
- Site lacks back-up power capabilities
- Ventilation is required

7.4 Recommendations

- Install SCADA interface for alarms and run-status indicators
- Upgrade control panel
- Equip site with back-up power capabilities
- Install perimeter fence with barbed wire, along with signage stating facility information and emergency contact information
- Improve roadway accessibility
- Replace existing manhole cover with wet well access hatch to maintain consistency with other lift stations
- Install ventilation pipe
- Consider abandoning lift station due to the condition of the site area and location of the lift station
- Install gravity flow bypass and upon completion of future CIP project, decommission lift station

7.5 OPCC

The site and facility improvements are estimated to cost $82,100.

Table 7-4: Lucy's OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Lucy's				
SCADA	1	EA	$ 35,000	$ 35,000
Upgrade control panel	1	EA	$ 30,000	$ 30,000
Generator connection	1	EA	$ 2,000	$ 2,000
Access road	1	LS	$ 2,500	$ 2,500
Wet well hatch	1	EA	$ 5,000	$ 5,000
Ventilation pipe	1	EA	$ 500	$ 500
Misc. (fence, barb wire, signage)	1	LS	$ 7,100	$ 7,100
Total				$ 82,100

8.0 Business 298 #1 Lift Station

8.1 Lift Station Overview

The Business 298 lift station consists of a control panel, two Hydromatic model HPGH750 pumps, and the physical lift station structure. The lift station services the surrounding neighborhood.

8.2 Condition Assessment

8.2.1 Security

The site is located off of Business 298 and is enclosed by a chain-link fence. The perimeter contains three strands of barbed wire as well as a 'Keep Out' sign to ensure security and prevent trespassing. The access gate and control panel are equipped with padlocks to restrict access, and a remote alarm is in place.

Figure 8-1: Site Perimeter at Business 298 LS

8.2.2 Civil

The perimeter fence appears to be in fair condition with minor signs of rusting and corrosion as indicated above. Inside the perimeter fence, the facility is constructed with a concrete slab. This allows for easier maintenance. The concrete pad appears to be in poor condition as denoted by the significant cracking and gaping hole underneath the access gate. This is shown in Figure 8-2. Site erosion issues are evident in Figure 8-3 below, and the area is not well-kept as indicated by the overgrown grass.

Figure 8-2: Concrete Pad at Business 298 LS

Figure 8-3: Site Interior at Business 298 LS

8.2.3 Access

The site has poor access as indicated by the lack of access roadway, width of access gate, and condition of concrete pad. This is evident in Figure 8-4.

Figure 8-4: Site Access at Business 298 LS

8.2.4 Pumping and Mechanical

The lift station is comprised of two Hydromatic model HPGH750 M3-2 pumps each with a 7.5 HP motor. The general age of the lift station components indicate the pumps and mechanical components are in fair condition.

Figure 8-5: Wet Well at Business 298 LS

8.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control panel has the following switches present: status indicators (off, lead, lag, high level alarm, run), elapsed time meters, and hand/off/auto. The control panel is not connected to SCADA, thus a SCADA interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition.

The controls are in fair working condition and signs of corrosion are evident. An upgraded control panel is required. The panel is secured with a padlock. There is no generator potential at this site.

Figure 8-6: Control Panel at Business 298 LS

8.2.6 Condition Assessment

Table 8-1: Business 298 #1 Condition Assessment Ratings

Aspect	Rating
Site Security	Good
Site Civil	Poor
Access	Poor
Pumping and Mechanical	Fair
Controls and Instrumentation	Poor

Based on the summary above, the overall condition is determined to have an average rating of fair.

8.2.7 Lift Station Design Data

Table 8-2: Business 298 #1 Design Data

Lift Station	Business 298 #1
Address	516 S Oklahoma Street
Recent Improvements	NA
Capacity one pump, gpm	91
Capacity two pumps, gpm	Electrical problem prevented additional testing
Rated Total Dynamic Head (TDH), ft	148
Type of Pump	Submersible Grinder
Manufacturer	Hydromatic
Model	HPGH750 M3-2
Volts/Ph/Hz	240/1/60
Motor HP	7.5

8.2.8 30 TAC Chapter 217 Subchapter C Requirements

Table 8-3: Business 298 #1 TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks access road
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks back-up generator

8.3 Conclusions

The following conclusions were developed from the evaluation of the Business 298 lift station:

- The station is in overall fair condition
- Security fencing with barb wire is provided
- Site civil area is in poor condition; significant cracking and deterioration is evident
- The area itself is not well-kept as indicated by the overgrown grass
- Site erosion issues are evident
- Access road is not present
- The wet well is relatively deep; takes a long time for alarm to kick in
- Site lacks back-up power capabilities
- Ventilation is required

8.4 Recommendations

- Install SCADA interface for alarms and run-status indicators
- Upgrade control panel
- Equip site with back-up generator capability
- Construct access roadway
- Rehabilitate concrete slab and general landscaping is recommended
- Include signage delineating facility information and emergency contact details on fencing
- Install ventilation pipe

8.5 OPCC

The site and facility improvements are estimated to cost $75,300.

Table 8-4: Business 298 #1 OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Business 298 #1				
SCADA	1	EA	$ 35,000	$ 35,000
Upgrade control panel	1	EA	$ 30,000	$ 30,000
Generator connection	1	EA	$ 2,000	$ 2,000
Access road	1	EA	$ 1,500	$ 1,500
Concrete slab	4	CY	$ 300	$ 1,200
Ventilation pipe	1	LS	$ 500	$ 500
Misc. (signage, landscaping)	1	LS	$ 5,100	$ 5,100
Total				$ 75,300

9.0 Shawnee Trail #1 Lift Station

9.1 Lift Station Overview

The Shawnee Trail #1 Lift Station consists of a control panel, two Dayton model 3BB97 pumps, and the physical lift station structure. The lift station services the surrounding neighborhood.

9.2 Condition Assessment

9.2.1 Security

The site is located off of Shawnee Trail and is enclosed by a chain-link fence. The fence is equipped with proper signage disclosing emergency contact information, the gate is secured with a padlock to restrict access, and a remote alarm is present. However, barbed wire is not provided to further ensure security.

Figure 9-1: Site Perimeter at Shawnee Trail #1 LS

9.2.2 Civil

The perimeter fence appears to be in fair condition with minor signs of corrosion. Inside the perimeter fence, the facility is constructed with a concrete slab. This allows for easier maintenance. The concrete pad appears to be in fair shape with minor signs of deterioration. There does not appear to be drainage problems or areas that would pond water.

Figure 9-2: Site Area at Shawnee Trail #1 LS

9.2.3 Access

The lift station is adjacent to the residential road, Shawnee Trail. However, there is little space for vehicles to approach the wet well. The access pad is also small with little space to position an A-frame and perform maintenance. Therefore, the access was rated as fair.

9.2.4 Pumping and Mechanical

The lift station is comprised of two Dayton model 3BB97 pumps each with a 2 HP motor. The piping and associated supports appear to be in fair condition.

Figure 9-3: Wet Well at Shawnee Trail #1 LS

9.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The duplex control panel has the following switches present: a master on/off and hand/off/auto. The control panel is not connected to SCADA, thus a SCADA interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition.

The panel is in fair working condition and is secured with a padlock. A new control panel is expected to arrive in the next couple of weeks. However, there is no generator capacity.

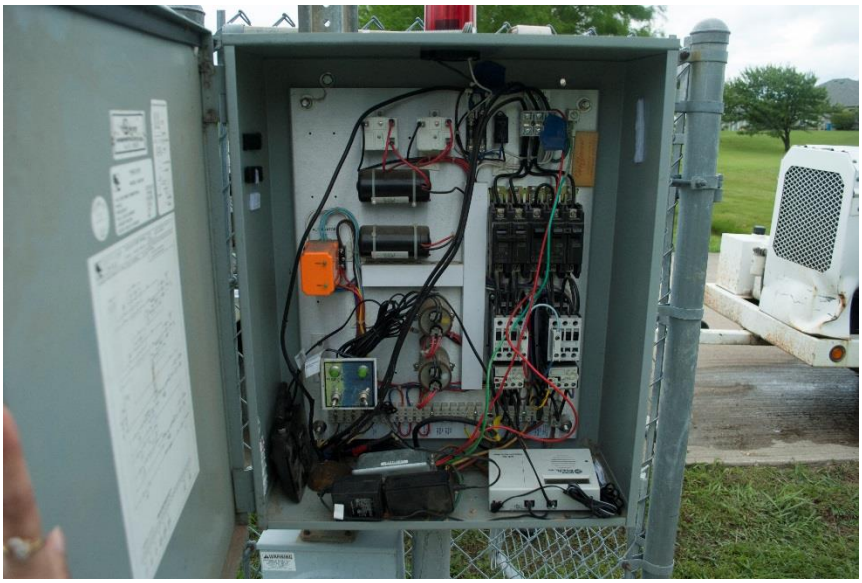


Figure 9-4: Control Panel Interior at Shawnee Trail #1 LS

9.2.6 Condition Assessment

Table 9-1: Shawnee Trail #1 Condition Assessment Ratings

Aspect	Rating
Site Security	Fair
Site Civil	Fair
Access	Fair
Pumping and Mechanical	Fair
Controls and Instrumentation	Fair

Based on the summary above, the overall condition is determined to have an average rating of fair.

9.2.7 Lift Station Design Data

Table 9-2: Shawnee Trail #1 Design Data

Lift Station	Shawnee Trail #1
Address	105 Shawnee Trail
Recent Improvements	NA
Capacity one pump, gpm	39
Capacity two pumps, gpm	78
Rated Total Dynamic Head (TDH), ft	80
Type of Pump	Submersible Grinder
Manufacturer	Dayton
Model	3BB97
Volts/Ph/Hz	240/1/60
Motor HP	2

9.2.8 30 TAC Chapter 217 Subchapter C Requirements

Table 9-3: Shawnee Trail #1 TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks access roadway, no barbed wire
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks back-up generator

9.3 Conclusions

The following conclusions were developed from the evaluation of the Shawnee Trail #1 lift station:

- The station is well maintained and in fair condition
- Security fencing with proper signage is present
- Fencing lacks barbed wire
- Pumps are in good operating condition and have not posed any problems for the City staff
- The grading of the site allows for proper drainage without ponding or flooding
- New control panel will be arriving in a few weeks
- Site lacks back-up power capabilities
- Ventilation is required

9.4 Recommendations

- Install SCADA interface for alarms and run-status indicators
- Equip site with back-up generator capabilities
- Add barbed wire on top of the perimeter fence

- Install ventilation pipe

9.5 OPCC

The site and facility improvements are estimated to cost $39,500.

Table 9-4: Shawnee Trail #1 OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Shawnee Trail #1				
SCADA	1	EA	$ 35,000	$ 35,000
Generator connection	1	EA	$ 2,000	$ 2,000
Ventilation pipe	1	EA	$ 500	$ 500
Misc. (barbed wire)	1	LS	$ 2,000	$ 2,000
Total				$ 39,500

10.0 Shawnee Trail #2 Lift Station

10.1 Lift Station Overview

The Shawnee Trail #2 lift station consists of a control panel, two Hydromatic model HPG200 M3-2 pumps, and the physical lift station structure. The lift station services two houses.

10.2 Condition Assessment

10.2.1 Security

The site is located off of Shawnee Trail in a residential development. Security consists of a chain-link perimeter fence equipped with proper signage denoting emergency contact information. The fence does not contain barbed wire or signs to prevent trespassing. The access gate and control panel are secured with padlocks to restrict access, however the wet well access hatch is not locked. A remote alarm is present.

Figure 10-1: Site Perimeter at Shawnee Trail #2 LS

10.2.2 Civil

The perimeter fence appears to be in fair condition with no significant corrosion. Inside the perimeter fence, the facility was constructed with a concrete slab. The concrete pad appears to be in poor condition; signs of cracking and erosion are evident. Additionally, slab supports are required. The site area is not well-kept as indicated by the overgrown grass, presence of vines, and overhanging tree limbs.

Figure 10-2: Site Area at Shawnee Trail #2 LS

10.2.3 Access

The site has poor access for maintenance due to its lack of access roadway leading directly to the lift station. The access gate is not of sufficient size to accommodate a work truck and neither is the site area itself. Additionally, the concrete roadway next to the site area is in poor condition as indicated below in Figure 10-3. The hatch access to the top of the wet well is a concrete slab. It is not fastened with hinges and is not secured with a padlock. It does provide adequate access to the pumps.

Figure 10-3: Access Road at Shawnee Trail #2 LS

Figure 10-4: Wet Well Exterior at Shawnee Trail #2 LS

10.2.4 Pumping and Mechanical

The lift station is comprised of two Hydromatic model HPG200 M3-2 pumps each with a 2 HP motor. The site is experiencing I&I issues, and the influent line is visible. The piping and associated supports appear to be in fair condition with minor signs of corrosion. The pumps cycle frequently due to the shallow depth of the wet well. However, the City staff stated the pumps and mechanical components are in fair condition.

Figure 10-5: Pump Controls at Shawnee Trail #2 LS

10.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control panel is not connected to SCADA, thus a SCADA interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition.

The control panel is in fair condition. It is secured with a padlock. The site does not contain back-up generator potential.

Figure 10-6: Control Panel at Shawnee Trail #2 LS

10.2.6 Condition Assessment

Table 10-1: Shawnee Trail #2 Condition Assessment Ratings

Aspect	Rating
Site Security	Fair
Site Civil	Poor
Access	Fair
Pumping and Mechanical	Fair
Controls and Instrumentation	Fair

Based on the summary above, the overall condition is determined to have an average rating of fair.

10.2.7 Lift Station Design Data

Table 10-2: Shawnee Trail #2 Design Data

Lift Station	Shawnee Trail #2
Address	125 Shawnee Trail
Recent Improvements	NA
Capacity one pump, gpm	58
Capacity two pumps, gpm	87
Rated Total Dynamic Head (TDH), ft	82
Type of Pump	Submerged Grinder
Manufacturer	Hydromatic
Model	HPG-200 M3-2
Volts/Ph/Hz	240/1/60
Motor HP	2

10.2.8 30 TAC Chapter 217 Subchapter C Requirements

Table 10-3: Shawnee Trail #2 TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks access roadway, no barbed wire
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks back-up generator

10.3 Conclusions

The following conclusions were developed from the evaluation of the Shawnee Trail #2 lift station:

- Station is in overall fair condition
- Security fencing is present with proper signage. However, barbed wire is not present.
- Concrete pad is in poor condition; signs of cracking and erosion are evident
- Site area is not well-kept; presence of overgrown grass, vines, overhung tree limbs
- Accessibility is not adequate due to lack of access roadway leading directly to the wet well
- Wet well access hatch is not fastened with hinges or secured with padlock
- Site is experiencing I&I issues
- Site lacks back-up power capabilities
- Ventilation is required

10.4 Recommendations

- Install SCADA interface for alarms and run-status indicators
- Equip site with back-up power capability
- Rehabilitate concrete pad and install slab supports
- Extend access roadway to improve accessibility

- Add hinges and padlock to wet well access hatch to improve security
- Add barbed wire on top of perimeter fencing
- Landscaping is recommended to clean up area
- Install ventilation pipe

10.5 OPCC

The site and facility improvements are estimated to cost $46,400.

Table 10-4: Shawnee Trail #2 OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Shawnee Trail #2				
SCADA	1	EA	$ 35,000	$ 35,000
Generator connection	1	EA	$ 2,000	$ 2,000
Slab supports	1	LS	$ 2,000	$ 2,000
Concrete pad rehab	1	CY	$ 500	$ 500
Extend access road	1	LS	$ 800	$ 800
Access hatch hinge	1	EA	$ 500	$ 500
Ventilation pipe	1	EA	$ 500	$ 500
Misc. (barbed wire, landscaping)	1	LS	$ 5,100	$ 5,100
Total				$ 46,400

11.0 High Point Lift Station

11.1 Lift Station Overview

The High Point lift station consists of a control panel, two Hydromatic model HPGH750 M3-2 pumps, and the physical lift station structure. The lift station has no perimeter containment. The lift station services the surrounding neighborhood, which includes approximately 43 houses.

11.2 Condition Assessment

11.2.1 Security

The site is located off of Lake Drive in a residential development. The site lacks exterior barriers in terms of perimeter fencing, gates, or signs to prevent trespassing. However, the control panel and wet well access hatch are secured with a padlock to restrict access, and a remote alarm is in place.

Figure 11-1: Site Security at High Point LS

11.2.2 Civil

There appears to be drainage problems, and the site area is not well-kept as indicated by the overgrown grass and debris.

Figure 11-2: Site Area at High Point LS

11.2.3 Access

The site has poor access for maintenance due to the lack of access roadway for the lift station. However there is adequate space to accommodate a work truck and provide access to the wet well. The hatch access to the top of the wet well is an aluminum hatch. It is fastened to the top of the well with hinges and is secured with a padlock. It provides adequate access to the pumps.

Figure 11-3: Access Road at High Point LS

11.2.4 Pumping and Mechanical

The lift station is comprised of two Hydromatic model HPGH750 M3-2 pumps each with a 7.5 HP motor. From staff interviews, it is apparent that groundwater infiltration is present in the wet well. The piping and associated supports appear to be in fair condition with no significant signs of corrosion or leakage.

Figure 11-4: Pump Controls at High Point LS

11.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control panel has the following switches present: a master on/off, run status indicators, hand/off/auto, seal fail indicators, elapsed time meters, and push button resets. The control panel is not connected to SCADA, thus a SCADA interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition.

The control panel is in poor condition and requires an upgrade. An order for a new control panel has been placed. The existing panel is secured with a padlock. The site lacks a back-up generator.

Figure 11-5: Control Panel at High Point LS

11.2.6 Condition Assessment

Table 11-1: High Point Condition Assessment Ratings

Aspect	Rating
Site Security	Poor
Site Civil	Poor
Access	Poor
Pumping and Mechanical	Fair
Controls and Instrumentation	Poor

Based on the summary above, the overall condition is determined to have an average rating of poor.

11.2.7 Lift Station Design Data

Table 11-2: High Point Design Data

Lift Station	High Point
Address	4800 Lake Drive
Recent Improvements	NA
Capacity one pump, gpm	43
Capacity two pumps, gpm	42
Rated Total Dynamic Head (TDH), ft	147.5
Type of Pump	Submersible Grinder
Manufacturer	Hydromatic
Model	HPGH750 M3-2
Volts/Ph/Hz	240/1/60
Motor HP	7.5

11.2.8 30 TAC Chapter 217 Subchapter C Requirements

Table 11-3: High Point TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks access roadway, no perimeter fence
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks back-up generator, no signage

11.3 Conclusions

The following conclusions were developed from the evaluation of the High Point lift station:

- The station has poor security as indicated by the lack of perimeter fencing, gates, and signage.
- Site area itself it not well-kept; overgrown grass is evident
- There is no access roadway
- Drainage problems are evident from the pools of accumulated rainwater
- Groundwater infiltration is present in the wet well as reported by City staff
- Upgraded control panel will be installed in the coming weeks
- Site lacks back-up power capabilities
- Ventilation is required

11.4 Recommendations

- Install SCADA interface for alarms and run-status indicators
- Equip site with back-up power capability
- Construct access roadway
- Install perimeter fencing along with associated barbed wire and signage
- Landscaping is recommended to improve site area
- Install ventilation pipe

11.5 OPCC

The site and facility improvements are estimated to cost $56,900.

Table 11-4: High Point OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
High Point				
SCADA	1	EA	$ 35,000	$ 35,000
Generator connection	1	EA	$ 2,000	$ 2,000
Access roadway	1	LS	$ 7,300	$ 7,300
Ventilation pipe	1	EA	$ 500	$ 500
Misc. (fence, barbed wire, signage, landscaping)	1	LS	$ 12,100	$ 12,100
Total				$ 56,900

12.0 Carter Ranch Phase II Lift Station

12.1 Lift Station Overview

The Carter Ranch Phase II Lift Station was constructed in 2004 and consists of a control panel, three Flygt model MP 3127 pumps, and the physical lift station structure. This lift station will be placed offline in the near future with a CIP project. The lift station services the surrounding neighborhood, which includes approximately 930 houses. It pumps to the Upper Trinity Regional Water District Doe Branch Interceptor.

12.2 Condition Assessment

12.2.1 Security

The site is located off of Preston Road and is enclosed by a chain-link perimeter fence. The fence does not contain barbed wire nor does it have signs to prevent trespassing. The access gate is secured with a padlock to restrict access and can easily accommodate a vehicle. The control panel is also secured with a padlock and a remote alarm.

Figure 12-1: Site Perimeter at Carter Ranch LS

12.2.2 Civil

The perimeter fence appears to be good condition with no signs of corrosion. The access roadway is constructed with concrete and appears to have drainage problems. This is indicated in Figure 12-2. Inside the perimeter fence, the ground is covered with grass and large aggregate. There appears to be drainage problems as indicated by the pools of rainwater and algae near the access gate.

Figure 12-2: Access Gate at Carter Ranch LS

Figure 12-3: Site Interior at Carter Ranch LS

12.2.3 Access

The site has sufficient access for maintenance as indicated by the concrete roadway, large width of the access gate, and ample space within the perimeter fence. It can easily accommodate a work truck and provide access to the wet wells. The hatch access to the top of the wet well is an aluminum hatch. It is fastened to the top of the wet well with hinges, providing adequate access to the pumps.

Figure 12-4: Site Access at Carter Ranch LS

12.2.4 Pumping and Mechanical

The lift station is comprised of three Flygt model MP 3127 pumps, two with 7.5 HP motors and one with a 10 HP motor. The piping and associated supports appear to be in good condition with no major signs of rust or leakage.

Figure 12-5: Pump Controls at Carter Ranch LS

Figure 12-6: Valve Boxes at Carter Ranch LS

12.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control panel has the following switches present: a master on/off, run status indicators, elapsed time meters, and hand/off/auto. The control panel is not connected to SCADA, thus a SCADA interface is required for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition.

The controls are in good working condition and operate as designed and intended. The panel is secured with a padlock to ensure security. The site lacks back-up generator capabilities.

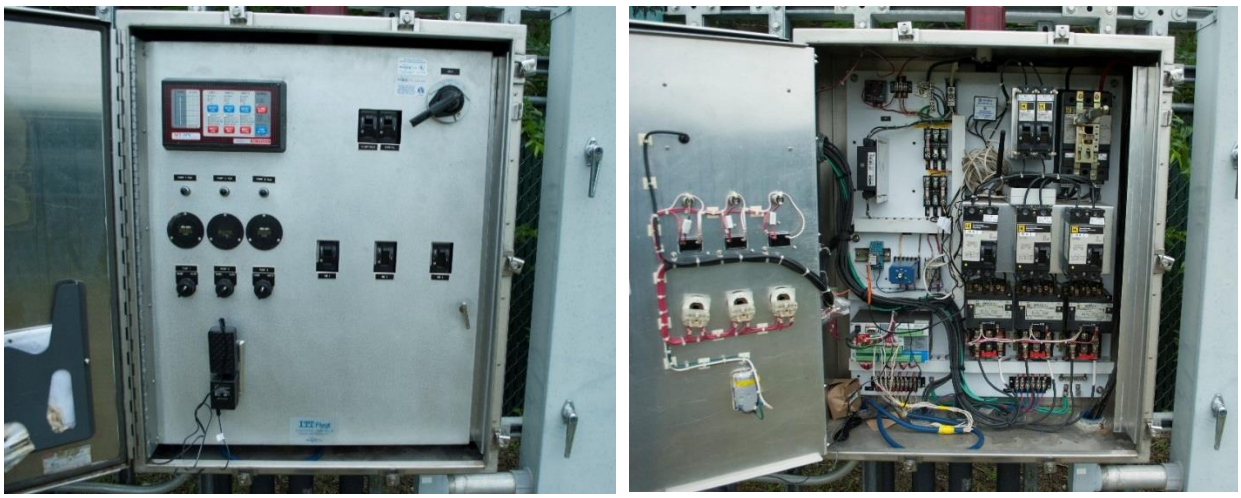


Figure 12-7: Control Panel at Carter Ranch LS

12.2.6 Condition Assessment

Table 12-1: Carter Ranch Phase II Condition Assessment Ratings

Aspect	Rating
Site Security	Fair
Site Civil	Fair
Access	Good
Pumping and Mechanical	Good
Controls and Instrumentation	Good

Based on the summary above, the overall condition is determined to have an average rating of good.

12.2.7 Lift Station Design Data

Table 12-2: Carter Ranch Phase II Design Data

Lift Station	Carter Ranch Phase II
Address	4100 S Preston Road
Year Constructed	2004
Recent Improvements	NA
Capacity one pump, gpm	133
Capacity two pumps, gpm	200 (est)
Rated Total Dynamic Head (TDH), ft	NA
Type of Pump	Submersible
Manufacturer	Flygt
Model	MP 3127
Volts/Ph/Hz	480/3/60
Motor HP	7.5 (two); 10 (one)

12.2.8 30 TAC Chapter 217 Subchapter C Requirements

Table 12-3: Carter Ranch Phase II TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks barbed wire
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	No: lacks back-up generator, lacks signage

12.3 Conclusions

The following conclusions were developed from the evaluation of the Carter Ranch Phase II lift station:

- The station is relatively well maintained
- Perimeter fencing is present; however lacks barbed wire
- Access gate can easily accommodate work truck and provide access to wet well
- Drainage problems are evident due to pools of rainwater and algae
- Control panel is in good operating condition and has not posed any problems for the City staff
- Site lacks back-up power capabilities
- Site lacks ventilation

12.4 Recommendations

- Install gravity bypass and upon completion of future CIP project, decommission lift station
- Demolish lift station

12.5 OPCC

Demolition is estimated to cost $25,000.

Table 12-4: Carter Ranch Phase II OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Carter Ranch Phase II				
Demolition	1	LS	$ 25,000	$ 25,000
Total				$ 25,000

13.0 Willock Hill Lift Station

13.1 Lift Station Overview

The Willock Hill lift station consists of a control panel, two Hydromatic model S4M750 M4-4 pumps, and the physical lift station structure. The lift station services the surrounding neighborhood.

13.2 Condition Assessment

13.2.1 Security

The site is located off of South Hillside Street. The lift station is enclosed by a chain-link perimeter fence with three strands of barbed wire. It also includes signage with emergency contact information. The access gate is secured with a padlock, but cannot accommodate a vehicle within the perimeter area. The wet well access hatch does not fully close, thereby rendering the security lock useless. This is indicated in Figure 13-3. The control panel is secured with a padlock and is equipped with a remote alarm.

Figure 13-1: Site Perimeter at Willock Hill LS

Figure 13-2: Fencing at Willock Hill LS

13.2.2 Civil

The perimeter fence appears to be in good condition with minor signs of corrosion. However, the site area itself is in poor condition as indicated by the overgrown grass, overhung vines, and lack of landscaping. The lift station rests on a concrete pad that appears to be in fair condition. Additionally, the site area is not particularly well graded.

Figure 13-3: Wet Well at Willock Hill LS

13.2.3 Access

The site has poor access due to the lack of paved roadway leading to the lift station. The site area itself can accommodate a work truck and provided access to the wet well. However, the work truck cannot enter past the perimeter fence, and as previously mentioned, an access roadway is not present. This is indicated in Figure 13-4. The access hatch to top of the wet wall is an aluminum hatch and is elevated approximately 4 feet on a concrete pad. It is fastened to the top of the wet well with hinges and remains partially open at all times. It provides adequate access to the pumps. However, the access hatch is in poor condition as it remains partially open, thereby allowing rainfall, debris, and wildlife to enter the wet well.

Figure 13-4: Site Access at Willock Hill LS

13.2.4 Pumping and Mechanical

The lift station is comprised of two Hydromatic model S4M750 M4-4 pumps each with a 7.5 HP motor. During the inspection, one of the pumps was not in service. A valve box cover is not provided. The piping and associated supports appear to be in fair condition as indicated by Figure 13-3 and Figure 13-5.

Figure 13-5: Pump Controls at Willock Hill LS

Figure 13-6: Valve Box at Willock Hill LS

13.2.5 Controls and Instrumentation

The lift station pumps are controlled by a series of mercury floats that pump the lift station wet well down according to set elevations. The floats terminate into the control panel where they activate a motor contactor to start and stop the pumps. The control panel is not connected to SCADA, thus a SCADA interface is preferred for alarms and run-status indicators. A red alarm beacon is present, providing a 360 degree visual check of alarm condition.

The controls are in fair condition. The panel is secured with a padlock to restrict access. However, there is no standby generator capability.

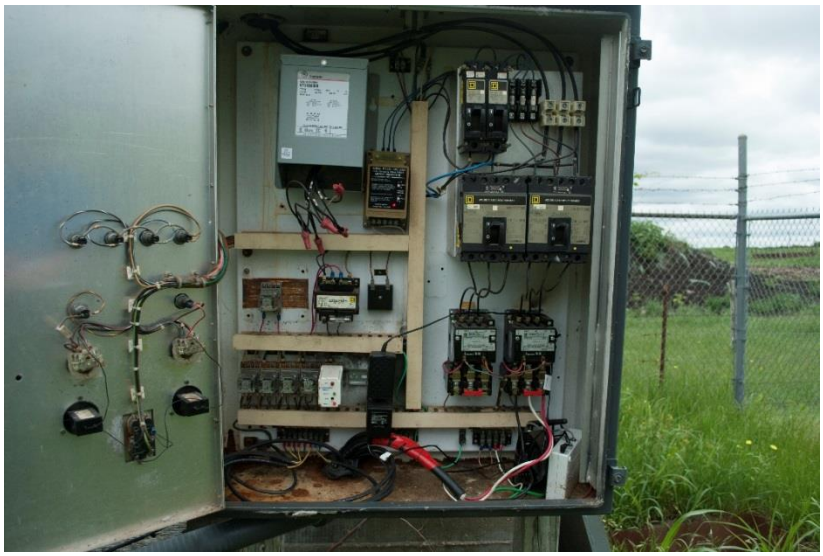


Figure 13-7: Control Panel Interior at Willock Hill LS

13.2.6 Condition Assessment

Table 13-1: Willock Hill Condition Assessment Ratings

Aspect	Rating
Site Security	Good
Site Civil	Poor
Access	Poor
Pumping and Mechanical	Good
Controls and Instrumentation	Good

Based on the summary above, the overall condition is determined to have an average rating of fair.

13.2.7 Lift Station Design Data

Table 13-2: Willock Hill Design Data

Lift Station	Willock Hill
Address	131 S Hillside Street
Recent Improvements	Upgraded control panel; generator connection; replaced pumps and valves
Capacity one pump, gpm	156
Capacity two pumps, gpm	NA
Rated Total Dynamic Head (TDH), ft	31
Type of Pump	Submersible
Manufacturer	Hydromatic
Model	S4M750 M4-4
Volts/Ph/Hz	480/3/60
Motor HP	7.5

13.2.8 30 TAC Chapter 217 Subchapter C Requirements

Table 13-3: Willock Hill TAC Requirements

Requirement	Reference	Satisfied (Yes/No)
Site Requirements	§217.59	No: lacks access roadway
Design Considerations	§217.60	No: lacks ventilation
Pumps	§217.61	Yes
Pipes	§217.62	Yes
Emergency Provisions	§217.63	Yes

13.3 Conclusions

The following conclusions were developed from the evaluation of the Willock Hill lift station:

- The station is in fair condition
- Perimeter fencing is present along with barbed wire and proper signage
- The site area is not well-kept as indicated by the overgrown grass
- Access roadway is not present
- The wet well access hatch remains partially open at all times
- There is no cover on the valve box
- Ventilation is required

13.4 Recommendations

- Install SCADA interface for alarms and run-status indicators
- Improve gravel roadway
- Rehabilitate wet well access hatch
- Improve site area landscaping
- Install ventilation pipe
- Install gravity flow bypass and upon completion of future interceptor, decommission lift station

13.5 OPCC

The site and facility improvements are estimated to cost $53,000.

Table 13-4: Willock Hill OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Willock Hill				
SCADA	1	EA	$ 35,000	$ 35,000
Gravel roadway	1	LS	$ 7,500	$ 7,500
Rehab access hatch	1	LS	$ 5,000	$ 5,000
Ventilation pipe	1	EA	$ 500	$ 500
Misc. (landscaping)	1	LS	$ 5,000	$ 5,000
Total				$ 53,000

14.0 Tolleson

14.1 Lift Station Overview

The Tolleson lift station consists of a control panel, pumps, and the physical lift station structure. The lift station services the surrounding neighborhood. City staff reported the lift station would be decommissioned in the near future. Therefore, a detailed site assessment was not conducted.

14.2 Conclusion/Recommendation

A field inspection for this site was not conducted. However, based on staff input, it is recommended to demolish the Tolleson lift station.

14.3 OPCC

Demolition is estimated to cost $25,000.

Table 14-1: Tolleson OPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Tolleson				
Demolition	1	LS	$ 25,000	$ 25,000
Total				$ 25,000

15.0 Summary of Condition

Table 15-1 presents a summary of the description, size, and overall condition of the ten lift stations that were assessed.

Table 15-1: Overall Condition Summary

Lift Station	Description and Size	Overall Condition
Winn Road	Flygt (two) MP 3068 with 3.8 HP motors	Fair
Parkside	Flygt (two) MP 3068 with 10 HP motors	Good
Old Celina Park	Hydromatic (two) HPG-200 with 2 HP motors	Good
Lucy's	Hydromatic (two) HPG-200 with 2 HP motors	Poor
Business 298 #1	Hydromatic (two) HPGH-750 PC with 7.5 HP motors	Fair
Shawnee Trail #1	Dayton (two) with 2 HP motors	Fair
Shawnee Trail #2	Hydromatic (two) with 2 HP motors	Fair
High Point	Hydromatic (two) with 7.5 HP motors	Poor
Carter Ranch Phase II	Flygt Pumps (three) with 7.5 (two) and 10 (one) HP motors	Good
Willock Hill	Flygt Pump (two) with 7.5 HP motors	Fair
Tolleson	NA (Tolleson was not inspected)	NA
General Physical Condition Rating Guidelines: Good: no immediate attention required. Fair: requires some initial repair to remain in adequate working condition. Poor: requires replacement or reconstruction in the immediate future.		

16.0 Summary of Recommendations

Table 16-1 and Table 16-2 present the recommendations and cost for each of the lift stations.

Table 16-1: Summary of Recommendations

Lift Station	Recommendations	Cost
Winn Road	• Install SCADA interface • Install perimeter fencing with barbed wire and signage • Install ventilation pipe • Install gravity flow bypass and upon completion of future CIP project, decommission lift station	$45,500
Parkside	• Install SCADA interface • Equip site with back-up power capabilities • Install barbed wire and signage on perimeter wall • Widen driveway • Install chain to pull pumps	$54,600
Old Celina Park	• Install SCADA interface • Equip site with back-up generator capabilities • Install ventilation pipe • Install signage • Trim back overhanging tree limbs away from control panel	$42,600
Lucy's	• Install SCADA interface • Upgrade control panel • Equip site with back-up power capabilities • Install perimeter fence with barbed wire and signage • Improve roadway accessibility • Replace existing manhole cover with wet well access hatch • Install ventilation pipe • Consider abandoning lift station due to the condition of the site area and location of the lift station • Install gravity flow bypass and upon completion of future CIP project, decommission lift station	$82,100
Business 298 #1	• Install SCADA interface • Upgrade control panel • Equip site with back-up generator capability • Construct access roadway • Rehabilitate concrete slab and general landscaping • Install signage • Install ventilation pipe	$75,300
Shawnee Trail #1	• Install SCADA interface • Equip site with back-up generator capabilities • Install barbed wire on perimeter fence • Install ventilation pipe	$39,500

(Continued on following page)

Table 16-2: Summary of Recommendations (Continued)

Lift Station	Recommendations	Cost
Shawnee Trail #2	• Install SCADA interface • Equip site with back-up power capability • Rehabilitate concrete pad and install slab supports • Extend access roadway • Add hinges to wet well access hatch • Install barbed wire on perimeter fence • Install ventilation pipe • Landscaping to clean up area	$46,400
High Point	• Install SCADA interface • Equip site with back-up power capability • Construct access roadway • Install perimeter fencing with barbed wire and signage • Install ventilation pipe • Landscaping to improve site area	$56,900
Carter Ranch II	• Install gravity flow bypass and upon completion of future CIP project, decommission lift station • Demolish lift station	$25,000
Willock Hill	• Install SCADA interface • Construct access roadway • Rehabilitate wet well access hatch • Install ventilation pipe • Landscaping • Install gravity flow bypass and upon completion of future interceptor, decommission lift station	$53,000
Tolleson	• Demolish lift station	$25,000
Total		$545,900

Appendix C

Water & Wastewater System Improvements
Water Capital Improvements Plan

City of Celina, Texas

Prepared by:

3010 Gaylord Parkway
Suite 190
Frisco, TX 75034

September 2017

Garver Project No.: 16088050

1.0 Executive Summary

This Water Capital Improvements Plan utilizes the model criteria and simulations detailed in the Water and Wastewater Modeling Improvements to develop proposed projects from the recommended improvements. These improvements are identified for a 5-year planning horizon (2017 – 2022 fiscal years).

A summary of all proposed project costs and schedules is displayed on Page 4, while a proposed schedule is located on Page 5. Project descriptions are in order based on priority ranking following this summary.

1.1 Identification and Ranking

Each project will be initiated based on regulatory, capacity, fire flow, condition, City-directed, or operational triggers. As these triggers activated a project, alphabetical project groupings were developed in localized areas to address that need. These were then ranked numerically based on the criticality of the project and service area impacted. Project triggers are described below:

1.1.1 Capacity

This trigger is activated if a section or area of the system is unable to provide modeled flow or elevated storage needed for all meters within that portion of the system.

1.1.2 Regulatory

This trigger is activated if TCEQ regulations (e.g., minimum residual pressure, storage capacity per connection, etc.) would not be met.

1.1.3 Fire Flow

This trigger is activated if a portion of the system is unable to meet minimum required flow rates during the fire flow modeling scenario.

1.1.4 Condition

This trigger would be activated based on deteriorating conditions of existing infrastructure, as identified during field investigations.

1.1.5 City-Directed

This trigger is activated when City staff have indicated that items will be replaced, are required as part of upcoming policy changes, or are needed to manage growth.

1.1.6 Operational

This trigger is activated when an improvement will provide an operational benefit. An example would be looping and dead end requirements that would improve water quality and minimize flushing.

1.2 Timeline

This priority was then applied to an overall timeline, in order to meet a 5-year planning horizon. Each project has also been assigned a flexibility rating of low, medium, or high. Projects with higher flexibility can be extended later in the planning horizon, depending on the City's available funding or changing system conditions which may impact the need for the project (such as unexpected delays in development that delay the need for capacity improvements).

The project priority and the City's expected timeline for development dictates the trigger date. Projects with higher priority will trigger sooner than those with lower priority. The trigger date is then utilized to capture anticipated costs for the life of the project, by escalating the total estimated 2017 costs at a rate of 3% to the trigger date for the engineering and construction items.

The trigger date can also be expressed as a number of residential lots constructed. In the event that development occurs at rate faster or slower than anticipated, the City can track number of lots constructed relative to the estimated number of constructed lots as of May 2017 (4,879). For example, projects triggered in October 2018 could also be triggered by construction on 1,526 new residential lots, for a total of 6,405 constructed lots. Projects triggered in October 2019 would be triggered by construction on 3,233 residential lots (8,112 lots total).

1.3 Cost Development

Costs estimates were prepared for each individual project, based on industry standards and the 2017 bidding environment. These costs are an estimate, and should be re-evaluated as each project nears the trigger date. Each project has the following costs associated with the total OPCC:

1.3.1 Construction Costs

This cost is the estimated cost once the project has been designed and is ready for the bid phase to begin. It represents a combination of the estimated total construction costs, and includes a 20% contingency.

Costs for tanks and pumps were developed from manufacturer and contractor quotations. Pipeline installation costs were developed from a combination of recent neighboring city water and sewer project bid tabulations. Individual bid items are described as follows.

1.3.2 Engineering

The engineering estimate includes all professional services needed to bid each project, including survey, deed research (as needed), preliminary, and final design of all improvements. This cost is 20% of the estimated construction costs, including contingency. This does not include construction observation or start-up services.

1.3.3 Bid Item Descriptions:

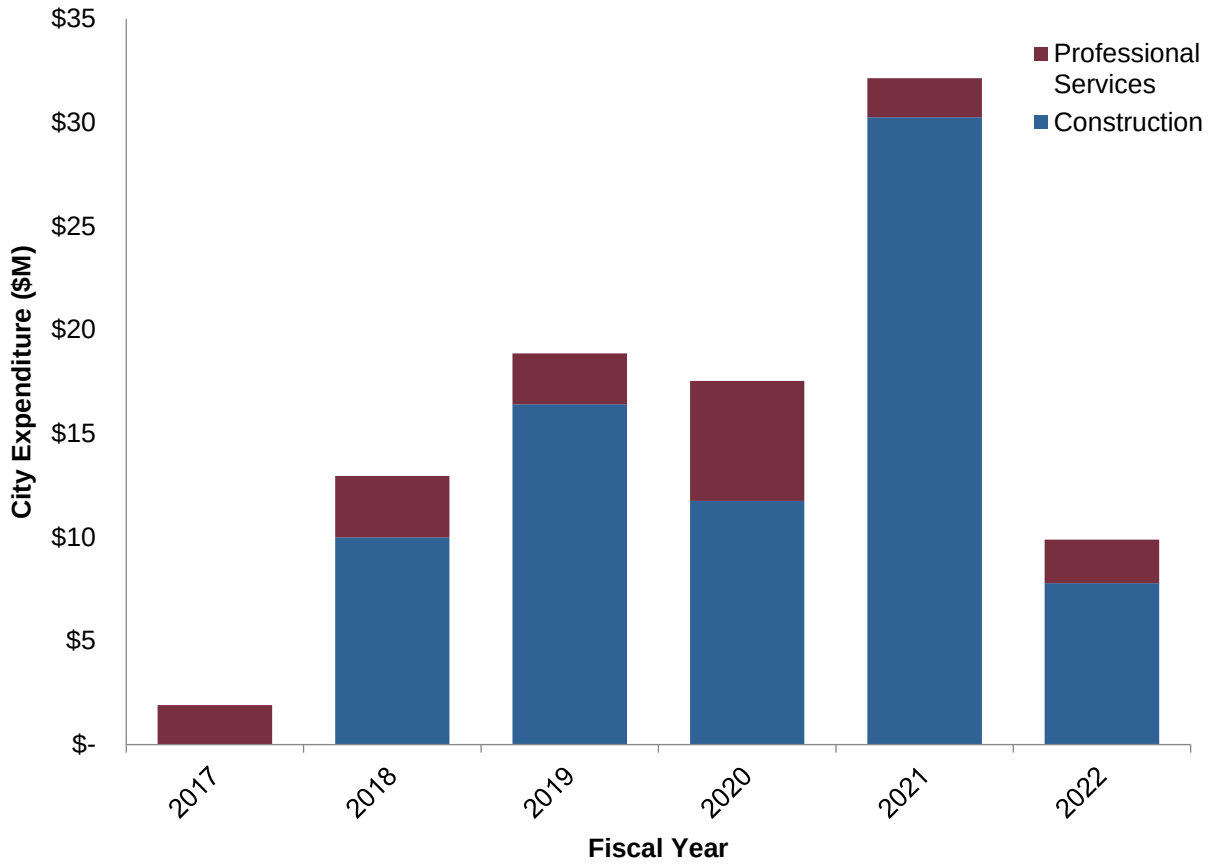
General Improvements: Anticipated sitework, backfill, erosion control, rehabilitation of existing structures, testing, easements, and contractor overhead costs.

Pipe Installation: Material and labor costs associated with pipe installation by open cut on a linear footage basis, depending on line size.

Bored Pipe Installation: Anticipated material, labor, sitework, backfill, erosion control, testing, easements, and contractor overhead costs associated with bored pipe installation on a lump sum basis. These costs are dependent on line size, length of boring, and location of boring.

Valves and Fittings: Cost for anticipated service connections and connections to existing pipes, including isolation valves.

A proposed spending schedule follows. Further refinement of this spending schedule and associated project trigger dates is available, depending upon City funding timeframes.



Proposed Spending Schedule for Water CIP

1.4 Project Descriptions

A summary of water CIP items, schedule, and individual project descriptions are provided in the following pages.

Table 1: Water CIP Summary

Project Identification					Schedule								2017 Costs ($1,000)	Forecasted Cost ($1,000)		
Project	Grouping	Description	Location	Flexibility	Primary Trigger	Secondary Trigger	Trigger Lots	Trigger Date	Project Complete	Engineering /Design	Bid/ Construction	Total Project Duration	OPCC	Construction	Professional Services	OPCC
1	B	Downtown EST shutdown and SCADA switchover	Low Plane	Low	Regulatory	Capacity	0	Feb-17	Mar-17	0	1	1	$0	$0	$0	$0
2	A	Capacity upgrades to CRPS and installation of 4 new pumps	CRPS	Low	Capacity	Regulatory	0	Feb-17	Jul-18	8	9	17	$6,305	$5,412	$1,051	$6,463
3	H	Capacity upgrades to DTPS and installation of 3 new pumps	DTPS	Low	Capacity	Operational	0	Feb-17	Jul-18	8	9	17	$5,173	$4,440	$862	$5,302
4	E	12" line and valves to switch LPP to HPP	Low to High Plane	Low	Regulatory	Fire Flow	0	Oct-17	Oct-18	6	6	12	$171	$147	$29	$176
5	F	18", 30" and 36" line along Celina Road from CRPS	CRPS; Low Plane	Low	Capacity	Regulatory	0	Oct-17	Oct-19	12	12	24	$7,939	$7,019	$1,363	$8,382
6	G	24" and 30" lines to Downtown GST	Low Plane	Low	Capacity	Regulatory	0	Oct-17	Oct-19	12	12	24	$5,588	$4,940	$959	$5,899
7	J	24" and 30" discharge lines from DTPS	High Plane	Low	Capacity	Regulatory	0	Oct-17	Oct-19	12	12	24	$3,490	$3,086	$599	$3,685
8	D	18" and 24" line to Morgan Lake area	High Plane	Medium	Regulatory	Capacity	1,526	Oct-18	Jul-20	9	12	21	$4,730	$4,307	$836	$5,143
9	C	18" line east of Light Farm EST along Cypress Creek Way	Low Plane	Medium	Capacity	Regulatory	1,526	Oct-18	May-19	3	4	7	$312	$276	$54	$329
10	L	Additional capacity upgrades to CRPS	CRPS; Low Plane	Low	Capacity	Regulatory	1,526	Oct-18	Oct-19	6	6	12	$536	$474	$95	$568
11	Z	New 6 MG GST at CRPS	Low Plane	Medium	Operational	Capacity	1,526	Oct-18	Jul-20	9	12	21	$7,619	$6,938	$1,347	$8,285
12	R	Additional capacity upgrades to DTPS	DTPS	Low	Capacity	Regulatory	2,370	Oct-18	Oct-19	6	6	12	$556	$491	$98	$589
13	K	Decommision Morgan Lake facilities	High Plane	Medium	Operational	Capacity	2,226	Mar-19	Aug-19	2	3	5	$145	$127	$27	$154
14	AB	SCADA improvements	System Wide	High	Operational	None	3,233	Oct-19	Apr-21	9	9	18	$312	$262	$79	$341
15	AA	8" line upgrades in Downtown area	System Wide	Medium	Operational	City-directed	3,233	Oct-19	Oct-21	12	12	24	$22,390	$21,000	$4,078	$25,078
16	M	12" line along Settlers Ridge	Low Plane	Medium	Capacity	Regulatory	3,233	Oct-19	Oct-21	12	12	24	$3,308	$3,102	$602	$3,705
17	Q	Additional capacity upgrades to CRPS	CRPS	Low	Capacity	Regulatory	3,233	Oct-19	Oct-20	6	6	12	$556	$506	$101	$607
18	AC	2020 5-year Master Plan	System Wide	Medium	Operational	City-directed	4,894	Oct-20	Oct-21	12	0	12	$200	$0	$225	$225
19	P	8", 12", and 18" line from Morgan Lake to DC Ranch	High Plane	Medium	Capacity	Regulatory	3,233	Oct-19	Jul-21	9	12	21	$5,119	$4,802	$932	$5,734
20	O	24" line to increase capacity in the Low Pressure Plane	Low Plane	Medium	Capacity	Regulatory	4,894	Oct-20	Jul-22	9	12	21	$5,340	$5,158	$1,002	$6,160
21	T	18" and 24" lines along Hwy. 455	High Plane	High	Fire flow	Operational	4,894	Oct-20	Jul-22	9	12	21	$2,387	$2,306	$448	$2,754
22	S	18" and 24" lines along Legacy Drive	Low Plane	High	Operational	Capacity	6,504	Oct-21	Jul-23	9	12	21	$3,353	$3,336	$648	$3,984
23	X	8" and 24" lines to connect Preston Lakes to Preston Road Corridor	Low Plane	High	Fire flow	Operational	6,504	Oct-21	Jul-23	9	12	21	$4,175	$4,154	$807	$4,961
24	W	8" and 12" line along E. Malone St. and Preston Road	High Plane	High	Fire flow	Operational	4,894	Oct-20	Oct-21	6	6	12	$612	$574	$115	$689
25	V	8" lines in the Low Pressure Plane	Low Plane	High	Fire flow	Operational	4,894	Oct-20	Oct-21	6	6	12	$547	$513	$103	$616
26	Y	18" line from the Parks at Wilson Creek to Lakes at Mustang Ranch	Low Plane	High	Fire flow	Operational	6,504	Oct-21	Jul-23	9	12	21	$2,939	$2,924	$568	$3,492
27	U	12" line from Preston Road to Morgan Lake Estates	High Plane	High	Fire flow	Operational	6,504	Oct-21	Oct-22	6	6	12	$342	$330	$66	$396

Total 2017 OPCC:	**$94,141,277**	**Total Forecasted OPCC:**	**$103,716,670**

Table 2: Development Driven Projects

Project Identification					Schedule								2017 Costs ($1,000)	Forecasted Cost ($1,000)		
Project	Grouping	Description	Location	Flexibility	Primary Trigger	Secondary Trigger	Trigger Lots	Trigger Date	Project Complete	Engineering /Design	Bid/ Construction	Total Project Duration	OPCC	Construction	Professional Services	OPCC
1	B	Downtown EST shutdown and SCADA switchover	Low Plane	Low	Regulatory	Capacity	0	Feb-17	Mar-17	0	1	1	0	$0	$0	$0
2	A	Capacity upgrades to CRPS and installation of 4 new pumps	CRPS	Low	Capacity	Regulatory	0	Feb-17	Jul-18	8	9	17	$6,305	$5,412	$1,051	$6,463
3	H	Capacity upgrades to DTPS and installation of 3 new pumps	DTPS	Low	Capacity	Operational	0	Feb-17	Jul-18	8	9	17	$5,173	$4,440	$862	$5,302
4	E	12" line and valves to switch LPP to HPP	Low to High Plane	Low	Regulatory	Fire Flow	0	Oct-17	Oct-18	6	6	12	$171	$147	$29	$176
5	F	18", 30" and 36" line along Celina Road from CRPS	CRPS; Low Plane	Low	Capacity	Regulatory	0	Oct-17	Oct-19	12	12	24	$7,939	$7,019	$1,363	$8,382
6	G	24" and 30" lines to Downtown GST	Low Plane	Low	Capacity	Regulatory	0	Oct-17	Oct-19	12	12	24	$5,588	$4,940	$959	$5,899
7	J	24" and 30" discharge lines from DTPS	High Plane	Low	Capacity	Regulatory	0	Oct-17	Oct-19	12	12	24	$3,490	$3,086	$599	$3,685
8	D	18" and 24" line to Morgan Lake area	High Plane	Medium	Regulatory	Capacity	1,526	Oct-18	Jul-20	9	12	21	$4,730	$4,307	$836	$5,143
9	C	18" line east of Light Farm EST along Cypress Creek Way	Low Plane	Medium	Capacity	Regulatory	1,526	Oct-18	May-19	3	4	7	$312	$276	$54	$329
10	L	Additional capacity upgrades to CRPS	CRPS; Low Plane	Low	Capacity	Regulatory	1,526	Oct-18	Oct-19	6	6	12	$536	$474	$95	$568
11	Z	New 6 MG GST at CRPS	Low Plane	Medium	Operational	Capacity	1,526	Oct-18	Jul-20	9	12	21	$7,619	$6,938	$1,347	$8,285
12	R	Additional capacity upgrades to DTPS	DTPS	Low	Capacity	Regulatory	2,370	Oct-18	Oct-19	6	6	12	$556	$491	$98	$589
16	M	12" line along Settlers Ridge	Low Plane	Medium	Capacity	Regulatory	3,233	Oct-19	Oct-21	12	12	24	$3,308	$3,102	$602	$3,705
17	Q	Additional capacity upgrades to CRPS	CRPS	Low	Capacity	Regulatory	3,233	Oct-19	Oct-20	6	6	12	$556	$506	$101	$607
18	AC	2020 5-year Master Plan	System Wide	Medium	Operational	City-directed	4,894	Oct-20	Oct-21	12	0	12	$200	$0	$225	$225
19	P	8", 12", and 18" line from Morgan Lake to DC Ranch	High Plane	Medium	Capacity	Regulatory	3,233	Oct-19	Jul-21	9	12	21	$5,119	$4,802	$932	$5,734
20	O	24" line to increase capacity in the Low Pressure Plane	Low Plane	Medium	Capacity	Regulatory	4,894	Oct-20	Jul-22	9	12	21	$5,340	$5,158	$1,002	$6,160

Total 2017 OPCC: $56,940,272 **Total Forecasted OPCC: $61,253,106**

Table 3: Operational Projects

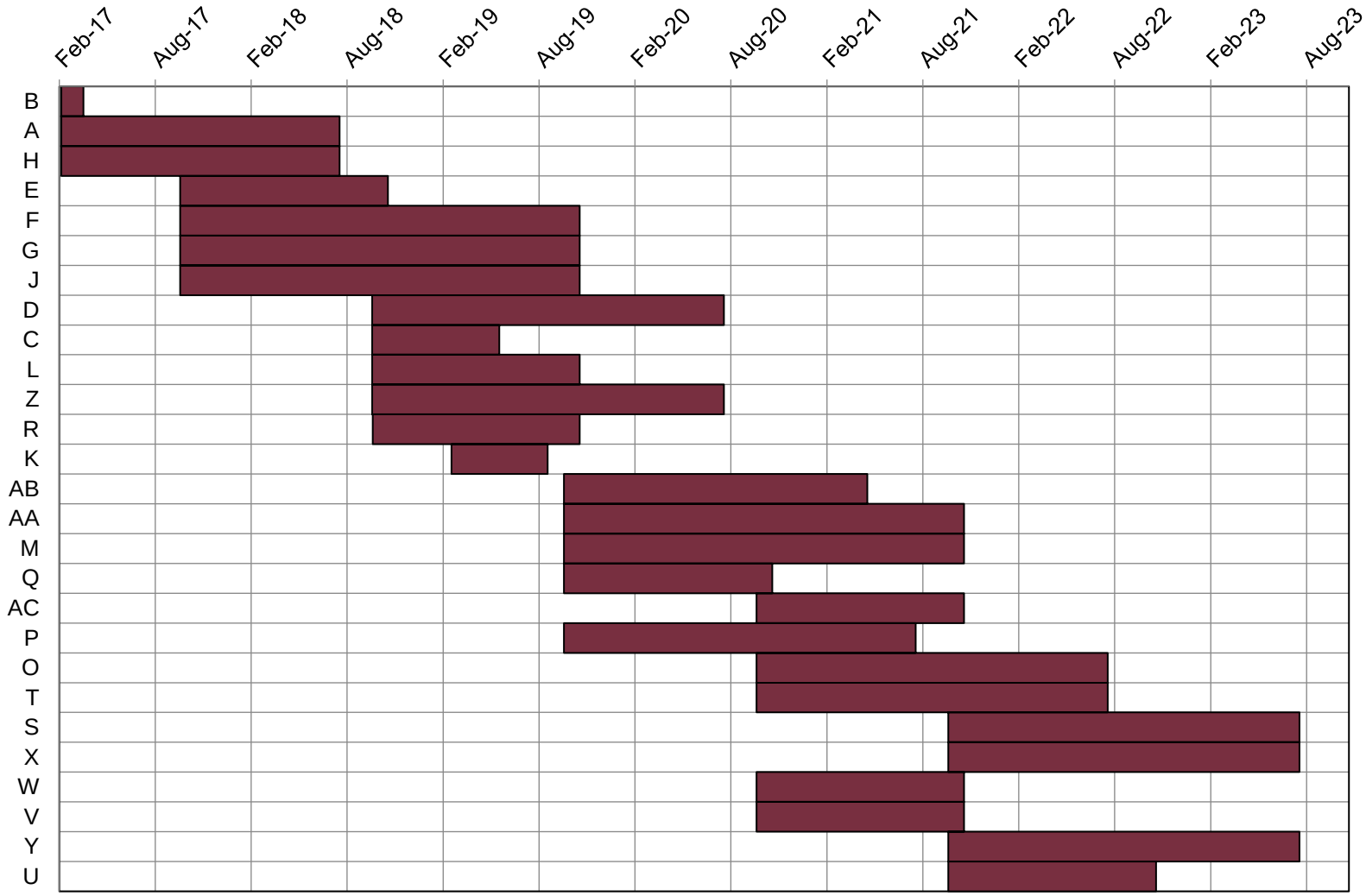
Project Identification					Schedule								2017 Costs ($1,000)	Forecasted Cost ($1,000)		
Project	Grouping	Description	Location	Flexibility	Primary Trigger	Secondary Trigger	Trigger Lots	Trigger Date	Project Complete	Engineering /Design	Bid/ Construction	Total Project Duration	OPCC	Construction	Professional Services	OPCC
13	K	Decommision Morgan Lake facilities	High Plane	Medium	Operational	Capacity	2,226	Mar-19	Aug-19	2	3	5	$145	$127	$27	$154
14	AB	SCADA improvements	System Wide	High	Operational	None	3,233	Oct-19	Apr-21	9	9	18	$312	$262,254	$79	$341
15	AA	8" line upgrades in Downtown area	System Wide	Medium	Operational	City-directed	3,233	Oct-19	Oct-21	12	12	24	$22,390	$21,000	$4,078	$25,078
22	S	18" and 24" lines along Legacy Drive	Low Plane	High	Operational	Capacity	6,504	Oct-21	Jul-23	9	12	21	$3,353	$3,336	$648	$3,984

Total 2017 OPCC: $26,199,874 **Total Forecasted OPCC: $29,556,640**

Table 4: Fire Flow Projects

Project Identification					Schedule								2017 Costs ($1,000)	Forecasted Cost ($1,000)		
Project	Grouping	Description	Location	Flexibility	Primary Trigger	Secondary Trigger	Trigger Lots	Trigger Date	Project Complete	Engineering /Design	Bid/ Construction	Total Project Duration	OPCC	Construction	Professional Services	OPCC
21	T	18" and 24" lines along Hwy. 455	High Plane	High	Fire flow	Operational	4,894	Oct-20	Jul-22	9	12	21	$2,387	$2,306	$448	$2,754
23	X	8" and 24" lines to connect Preston Lakes to Preston Road Corridor	Low Plane	High	Fire flow	Operational	6,504	Oct-21	Jul-23	9	12	21	$4,175	$4,154	$807	$4,961
24	W	8" and 12" line along E. Malone St. and Preston Road	High Plane	High	Fire flow	Operational	4,894	Oct-20	Oct-21	6	6	12	$612	$574	$115	$689
25	V	8" lines in the Low Pressure Plane	Low Plane	High	Fire flow	Operational	4,894	Oct-20	Oct-21	6	6	12	$547	$512,928	$103	$616
26	Y	18" line from the Parks at Wilson Creek to Lakes at Mustang Ranch	Low Plane	High	Fire flow	Operational	6,504	Oct-21	Jul-23	9	12	21	$2,939	$2,924	$568	$3,492
27	U	12" line from Preston Road to Morgan Lake Estates	High Plane	High	Fire flow	Operational	6,504	Oct-21	Oct-22	6	6	12	$342	$330	$66	$396
												Total 2017 OPCC:	**$11,001,131**	**Total Forecasted OPCC:**		**$12,906,925**

Proposed 5 Year Water CIP Schedule



Project 1: Water Group B Capital Improvements

Project Identification	
Number:	1
Location:	Low Plane
Flexibility:	Low
Schedule	
Primary Trigger:	Regulatory
Secondary Trigger:	Capacity
Trigger # of Lots Constructed:	0
Trigger Date:	Feb-2017
Project Complete:	Mar-2017
Project Implementation (Months)	
Engineering/Design:	0
Bid/Construction:	1
Total Project Duration:	1

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.00	$0.00
Professional Services	$0.00	$0.00
Total Project Cost	**$0.00**	**$0.00**

Project Description
This project includes decommissioning the DT EST and switching SCADA control of the CRPS from the DT EST Level to the Light Farms EST Level. No decommissioning costs are included with this project.

Justification
The DT EST has reached the end of its useful life and is in need of rehabilitation. In addition, the increasing water demand through the system is resulting in rapid turnover times within the DT EST. However, the Light Farms EST does not turn over because the CRPS is controlled off of the DT EST level. Decommissioning the DT EST and controlling the CRPS using the Light Farms EST level will allow the hydraulic grade line in the Light Farms EST to be raised to 835 ft, increasing pressures in the Low Pressure Plane and providing more stable system operation.

Unintended Consequences
Water quality will be improved in the Light Farm EST due to increased turnover. The Low Pressure Plane will have slightly less total storage, but will gain operational elevated storage due to the ability to increase the HGL in the Light Farms EST.

Special Considerations
It will be important to confirm that SCADA control has successfully been switched to control the CRPS based on the Light Farms EST level.

Potential Alternatives
The DT EST can be demolished or removed at the City's discretion. If the City prefers to maintain the use of the DT EST, extensive rehabilitation and an elevation control valve would be required.

Group B			
Description	**Unit**	**Quantity**	**Cost**
Downtown EST shutdown and SCADA switchover	LS	1	$ -
		Subtotal Test	$ -
		Contingency (20%)	$ -
		Appurtenances (electrical, SCADA, etc.)	$ -
		Professional Services	$ -
		OPCC	$ -

Project 1 – Photographs

Figure 1-1: Existing DT EST, to be decommissioned

Project 2: Water Group A Capital Improvements

Project Identification	
Number:	2
Location:	CRPS
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed:	0
Trigger Date:	Feb-2017
Project Complete:	Jul-2018
Project Implementation (Months)	
Engineering/Design:	8
Bid/Construction:	9
Total Project Duration:	17

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$5.25	$5.41
Professional Services	$1.05	$1.05
Total Project Cost	**$6.31**	**$6.46**

Project Description

This project consists of capacity upgrades to the CRPS, including installation of four new pumps and the associated piping. Preliminary sizing indicates that each pump should be sized to provide 3,800 gpm at 240 ft of head. Variable frequency drives will be provided for the new pumps to allow efficient operation during periods of lower demands. Three existing spare pump spaces will be utilized, and one existing pump will be demolished during this project so that the existing CRPS footprint will not have to be expanded. Design of the CRPS improvements will also include evaluation of existing chemical storage and feed equipment. Recommendations for these improvements will be made during final design, but placeholder costs have been included below. Design of backup power up to firm capacity to increase the reliability of the City's primary drinking water source will be included. However, this item may be bid as an additive alternative.

Justification

Figure 1-2 shows the expected pumping capacity needed for the CRPS through 2022. The current system's firm capacity would require approximately 2,700 gpm of additional pumping capacity by the midpoint of 2017, which would increase to approximately 6,900 gpm by 2019 if no new pumps were added. These improvements will provide pumping capacity of 1.3 times the maximum day demand until late 2019, allowing equalization of diurnal peaks without completely draining the elevated storage tanks.

Unintended Consequences

The increased horsepower of the pumps and associated electrical gear may require specialized electrical maintenance providers. In addition, maintenance will increase due to the addition of new pumps and increased pump sizing.

Special Considerations

Due to rapid growth in Celina and the limited capacity of the existing elevated storage tanks and pumps, design should start in 2017 so that these improvements can be in place as soon as possible.

Potential Alternatives

None Identified.

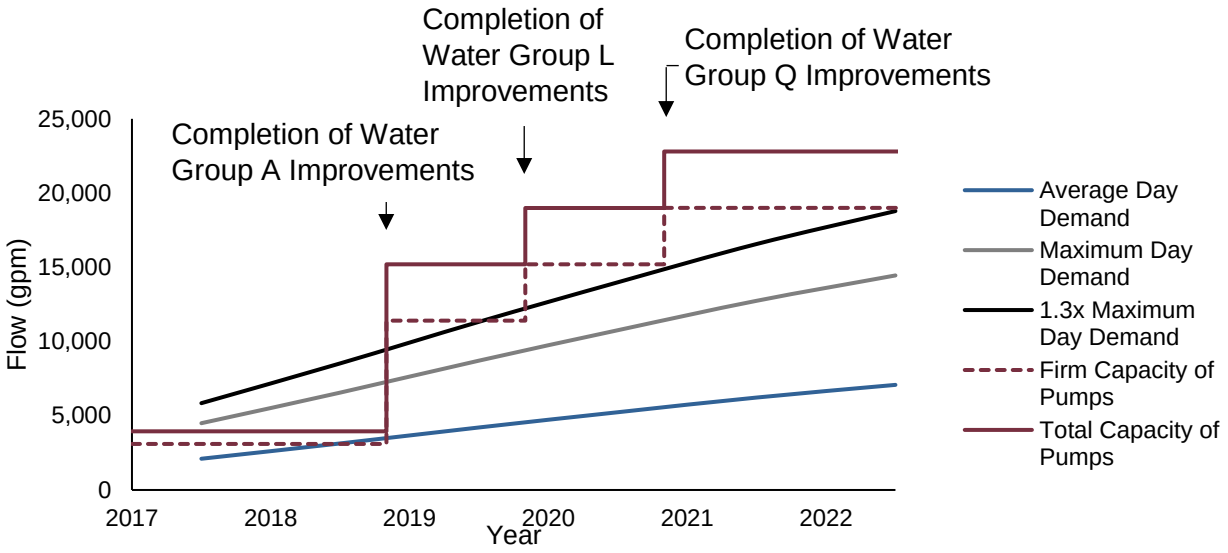


Figure 1-2: Comparison of Proposed CRPS Capacity and Demand

Group A			
Description	**Unit**	**Quantity**	**Cost**
Demo existing pump	LS	1	$ 10,000
Pump with motor	EA	4	$ 450,000
Electrical	LS	1	$ 100,000
VFDs	EA	4	$ 320,000
Valves and fittings	LS	1	$ 100,000
Interconnecting pipes	LS	1	$ 75,000
Chemical feed improvements	LS	1	$ 750,000
Firm capacity backup power	LS	1	$ 1,305,085
Diameter (in.)	**Unit Cost ($/LF)**	**Length (ft)**	**Cost**
36	683	110	$ 75,174
		Subtotal	$ 3,185,259
		Contractor's OH&P (18%)	$ 573,347
		Miscellaneous (SCADA, etc., 20%)	$ 620,017
		Contingency (20%)	$ 875,725
		Professional Services	$ 1,050,869
		OPCC	$ 6,305,217

Project 2 Schematic

Project 3: Water Group H Capital Improvements

Project Identification	
Number:	3
Location:	DTPS
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Operational
Trigger # of Lots Constructed:	0
Trigger Date:	Feb-2017
Project Complete:	Jul-2018
Project Implementation (Months)	
Engineering/Design:	8
Bid/Construction:	9
Total Project Duration:	17

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$4.31	$4.44
Professional Services	$0.86	$0.86
Total Project Cost	**$5.17**	**$5.30**

Project Description

This project consists of capacity upgrades to the DTPS, including installation of three new pumps and the associated piping. The three smallest existing pumps will be demolished during this project so that the existing DTPS footprint will not have to be expanded. Design of the DTPS improvements will also include evaluation of existing chemical storage and feed equipment. Recommendations for these improvements will be made during final design, but placeholder costs have been included below. Design of backup power up to firm capacity to increase the reliability of the High Pressure Plane's primary drinking water source will be included. However, this item may be bid as an additive alternative.

This project also includes installation of new fill and draw lines for the GST. The new fill line will include a level control valve, which will allow automatic filling of the GST. It is preferred to maintain the existing 12-inch fill and draw lines for redundancy. The existing clearwell is unused and will be demolished during this project.

Justification

Figure 1-3 shows the expected pumping capacity needed for the DTPS through 2022. The current system's firm capacity would require approximately 1,400 gpm of additional pumping capacity by the midpoint of 2017, which would increase to approximately 3,600 gpm by 2019 if no new pumps were added. These improvements will provide pumping capacity of 1.3 times the High Pressure Plane's maximum day demand until late 2019, allowing equalization of diurnal peaks without completely draining the elevated storage tanks.

Unintended Consequences

The increased horsepower of the pumps and associated electrical gear may require specialized electrical maintenance providers. In addition, maintenance will increase due to the addition of new pumps and increased pump sizing.

Special Considerations

Due to rapid growth in Celina and the limited capacity of the existing elevated storage tanks and pumps, design should start in 2017 so that these improvements can be in place as soon as possible.

Potential Alternatives

None identified.

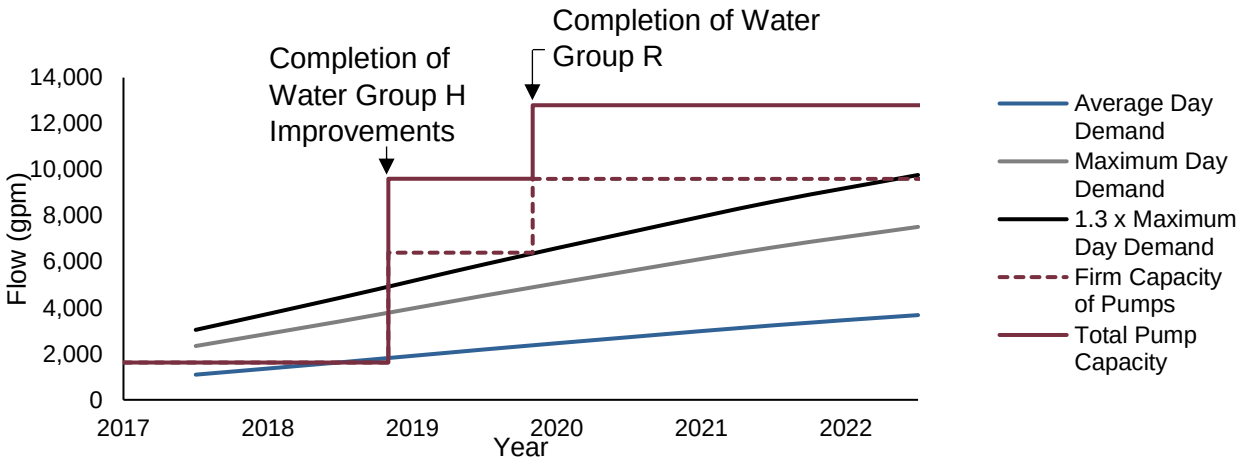
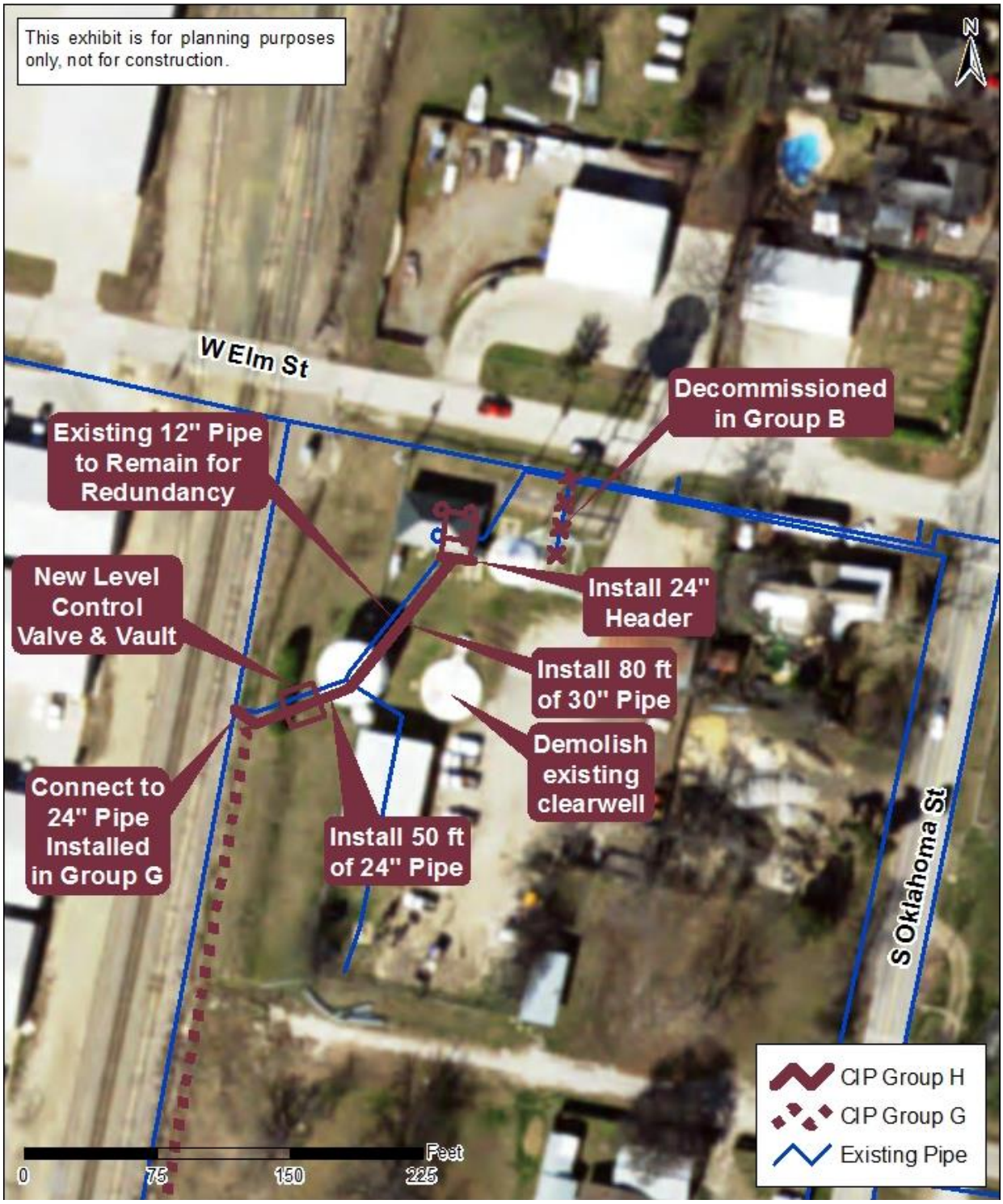


Figure 1-3: Comparison of High Pressure Plane Demands and Proposed Pump Capacity

Group H			
Description	**Unit**	**Quantity**	**Cost**
Demo existing pumps	LS	1	$ 25,000
Demo existing clearwell	LS	1	$ 50,000
New pumps with motors	EA	3	$ 337,500
Electrical	LS	1	$ 100,000
VFDs	EA	3	$ 240,000
Valves and fittings	LS	1	$ 100,000
Interconnecting pipes	LS	1	$ 150,000
Level control valve with vault	LS	1	$ 35,000
Chemical feed improvements	LS	1	$ 750,000
Firm capacity backup power	LS	1	$ 815,700
		Subtotal	$ 2,603,200
		Contractor's OH&P (18%)	$ 468,576
		Miscellaneous (SCADA, etc., 20%)	$ 520,640
		Contingency (20%)	$ 718,483
		Professional Services	$ 862,180
		OPCC	$ 5,173,079

Project 3 Schematic:



Project 4: Group E Facilities Improvements

Project Description
This project includes distribution system modifications to switch portions of downtown from the Low Pressure Plane to the High Pressure Plane. Changes include opening and closing existing isolation valves as well as installing a pressure reducing valve.

Justification
Low pressure areas have been identified in this portion of downtown. These improvements will result in adequate pressures and fire flows in the area, by utilizing the higher pressures available in the High Pressure Plane. The new pressure reducing valves will allow controlled increase in pressures to limit any adverse impacts of the new system pressure on the existing infrastructure.

Unintended Consequences
None identified.

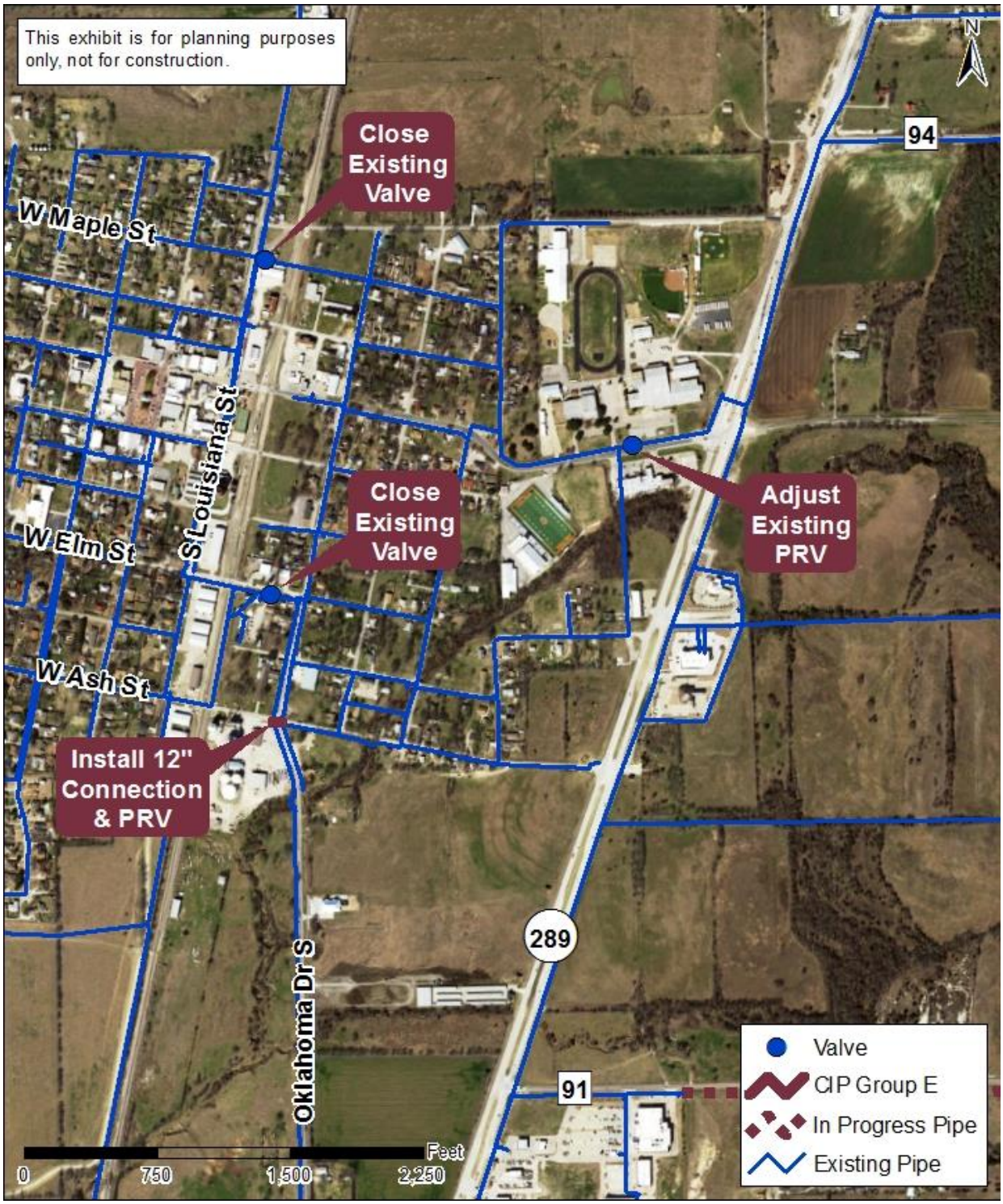
Special Considerations
This change should occur after the DTPS improvements to minimize adjustments to the new pressure reducing valves.

Potential Alternatives
None identified.

Project Identification		
Number:	4	
Location:	Low to High Plane	
Flexibility:	Low	
Schedule		
Primary Trigger:	Regulatory	
Secondary Trigger:	Fire Flow	
Trigger # of Lots Constructed:	0	
Trigger Date:	Oct-2017	
Project Complete:	Oct-2018	
Project Implementation (Months)		
Engineering/Design:	6	
Bid/Construction:	6	
Total Project Duration:	12	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$0.14	$0.15
Professional Services	$0.03	$0.03
Total Project Cost	**$0.17**	**$0.18**

Group E				
Description		**Unit**	**Quantity**	**Cost**
Pressure reducing valve with vault		LS	1	$ 25,000
Bored pipe installation		LS	1	$ 50,000
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
12	Pipe installation	180	100	$ 18,000
	General improvements	75		$ 7,500
			Subtotal	$ 100,500
			Contractor's OH&P (18%)	$ 18,090
			Contingency (20%)	$ 23,718
			Professional Services	$ 28,462
			OPCC	$ 170,770

Project 4 Schematic



Project 5: Water Group F Capital Improvements

Project Identification	
Number:	5
Location:	CRPS; Low Plane
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed:	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2019
Project Implementation (Months)	
Engineering/Design:	12
Bid/Construction:	12
Total Project Duration:	24

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$6.62	$7.02
Professional Services	$1.32	$1.36
Total Project Cost	**$7.94**	**$8.38**

Project Description

This project includes installation of a new discharge main along Celina Road from the CRPS to connect to an existing 12-inch line running along the railroad tracks, and a future 30-inch line which will be installed as part of Water Group G Improvements. The new 30-inch discharge main will parallel an existing 18-inch line, which will stay in service.

Justification

This project will reduce system discharge head for the CRPS pumps, resulting in improved pump capacities. This also improves system hydraulics in the downtown area. This pipeline is needed to supply projected flows during this five-year planning period.

Unintended Consequences

None identified.

Special Considerations

TxDOT coordination and right-of-way/easement acquisition will likely be necessary for this pipeline. Portions of the alignment from Celina Road to CR 55 may need to be revised during detailed design based on right-of-way and roadway alignments.

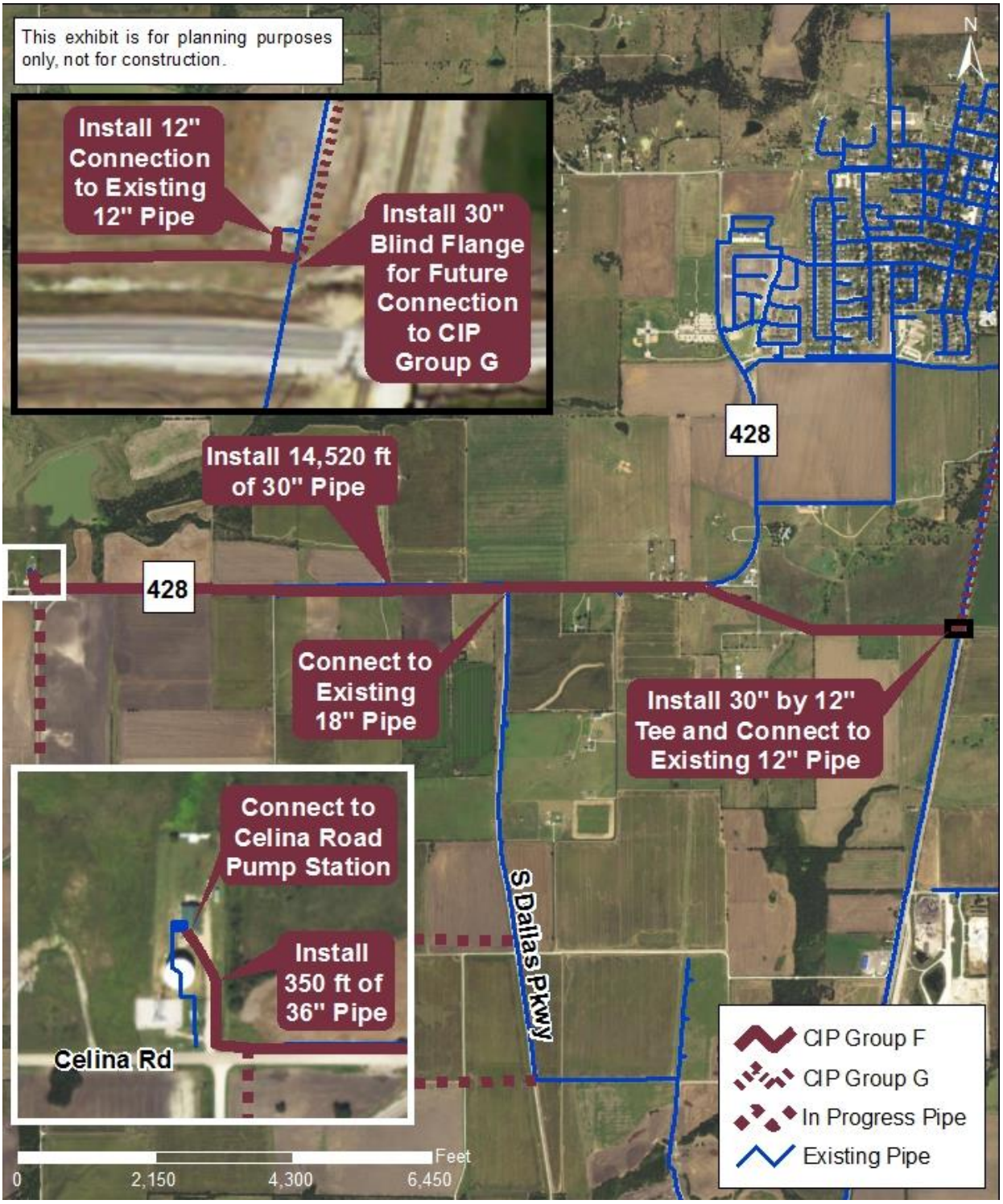
Although a 12” line is being installed for the Glen Crossing subdivision, the entire length of the new pipeline must be 30” to keep pipe velocities within the acceptable range.

Potential Alternatives

The existing 18-inch line could be decommissioned, which would require the proposed 30-inch discharge main to be upsized.

Group F				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
30	Pipe installation	300	14,520	$ 4,356,000
	General improvements	50		$ 726,000
18	Pipe installation	225	75	$ 16,875
	General improvements	40		$ 3,000
36	Pipe installation	375	350	$ 131,250
	General improvements	50		$ 17,500
			Subtotal	$ 5,250,625
			Valves and Fittings (5%)	$ 262,531
			Contingency (20%)	$ 1,102,631
			Professional Services	$ 1,323,158
			OPCC	$ 7,938,945

Project 5 Schematic



Project 6: Water Group G Capital Improvements

Project Description
This project includes addition of a new pipeline running north northeast from the connection point of Water Group F to the DT GST location.

Justification
This pipeline will result in increased capacity and adequate pressures in the distribution system, specifically for the DTPS area. This project is necessary to provide adequate flows to the High Pressure Plane.

Unintended Consequences
None identified.

Special Considerations
The alignment follows the existing 12-inch alignment along the railroad tracks; therefore, additional easements may be necessary to accommodate this pipe. In addition, a bored pipe installation will be needed to cross the railroad tracks near Ash Street.

Potential Alternatives
None identified.

Project Identification		
Number:	6	
Location:	Low Plane	
Flexibility:	Low	
Schedule		
Primary Trigger:	Capacity	
Secondary Trigger:	Regulatory	
Trigger # of Lots Constructed:	0	
Trigger Date:	Oct-2017	
Project Complete:	Oct-2019	
Project Implementation (Months)		
Engineering/Design:	12	
Bid/Construction:	12	
Total Project Duration:	24	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$4.66	$4.94
Professional Services	$0.93	$0.96
Total Project Cost	**$5.59**	**$5.90**

Group G				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
30	Pipe installation	300	5,509	$ 3,162,166
	General improvements	50		$ 275,450
24	Pipe installation	275	523	$ 143,825
	General improvements	75		$ 39,225
Description		**Unit**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 75,000
			Subtotal	$ 3,695,666
			Valves and Fittings (5%)	$ 184,783
			Contingency (20%)	$ 776,090
			Professional Services	$ 931,308
			OPCC	$ 5,587,847

Project 6 Schematic

Project 7: Water Group J Capital Improvements

Project Description
This project consists of installation of new 24- and 30-inch discharge lines from the DTPS connecting to the existing 12-inch line running parallel to Preston Road.

Justification
This project will provide pipeline capacity needed for projected flows to the High Pressure Plane.

Unintended Consequences
No unintended consequences are foreseen by the implementation of this project.

Special Considerations
TxDOT coordination and right-of-way/easement acquisition will likely be necessary for this pipeline. In addition, a bored pipe installation will be needed to cross Preston Road.

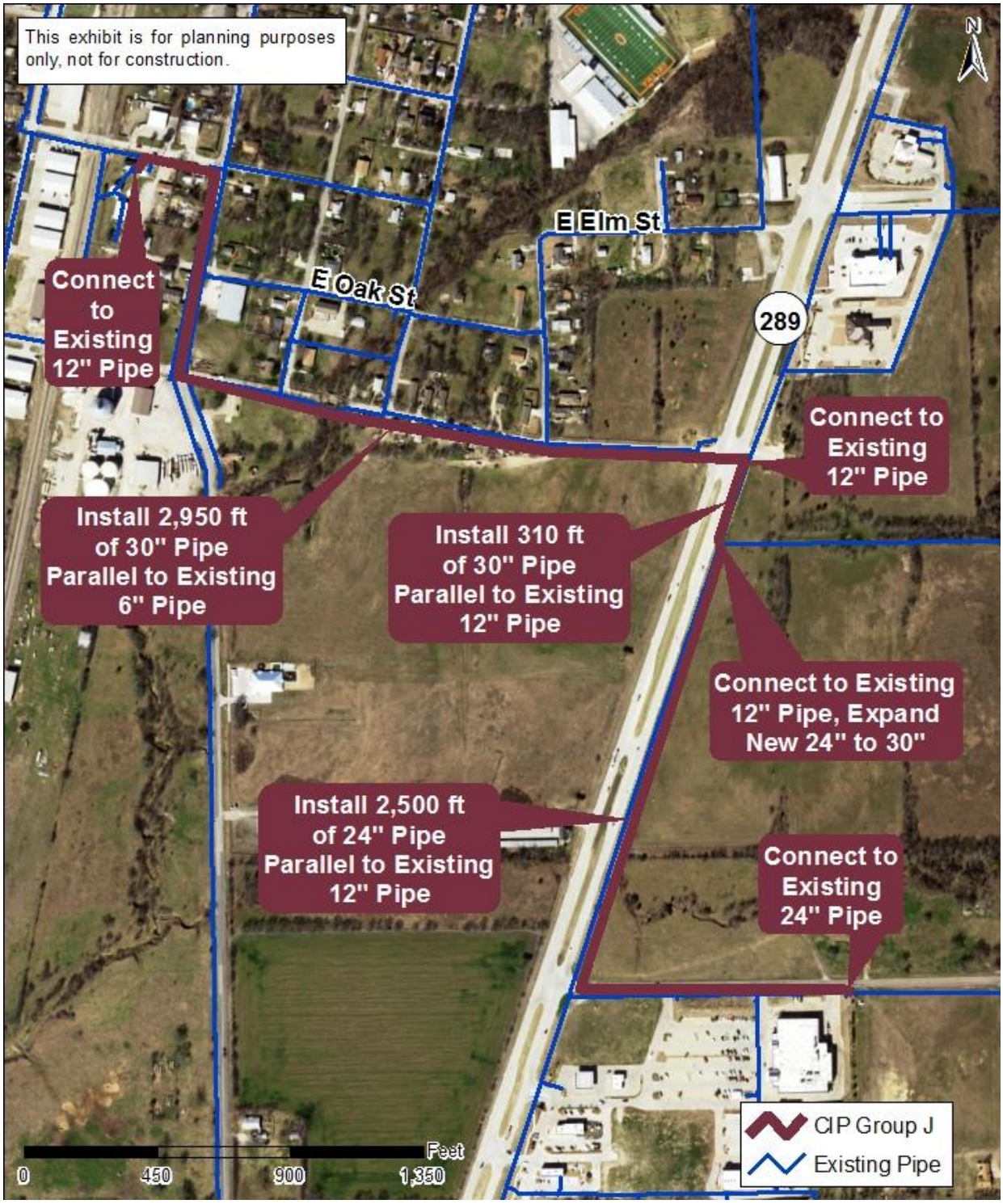
Potential Alternatives
None identified.

Project Identification	
Number:	7
Location:	High Plane
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed:	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2019
Project Implementation (Months)	
Engineering/Design:	12
Bid/Construction:	12
Total Project Duration:	24

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$2.91	$3.09
Professional Services	$0.58	$0.60
Total Project Cost	**$3.49**	**$3.68**

Group J				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
24	Pipe installation	275	2,501	$ 687,775
	General improvements	50		$ 125,050
30	Pipe installation	300	3,259	$ 977,700
	General improvements	50		$ 162,950
Description		**Unit**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 250,000
			Subtotal	$ 2,203,475
			Valves and Fittings (10%)	$ 220,348
			Contingency (20%)	$ 484,765
			Professional Services	$ 581,717
			OPCC	$ 3,490,304

Project 7 Schematic



Project 8: Water Group D Capital Improvements

Project Description
This project includes installation of new pipelines from north of the SE EST to the Morgan Lake area and within the Morgan Lake area.

Justification
This project provides necessary looping from the SE EST area to the northern portion of the distribution system. The looping is needed to meet projected flow demands for the area to ensure minimum pressures are met.

Unintended Consequences
None identified.

Special Considerations
TxDOT coordination may be required for alignments along CR 94 and CR 97. Appropriate placement of the water line along CR 97 (i.e., east vs. west of the roadway) will be determined during detailed design.

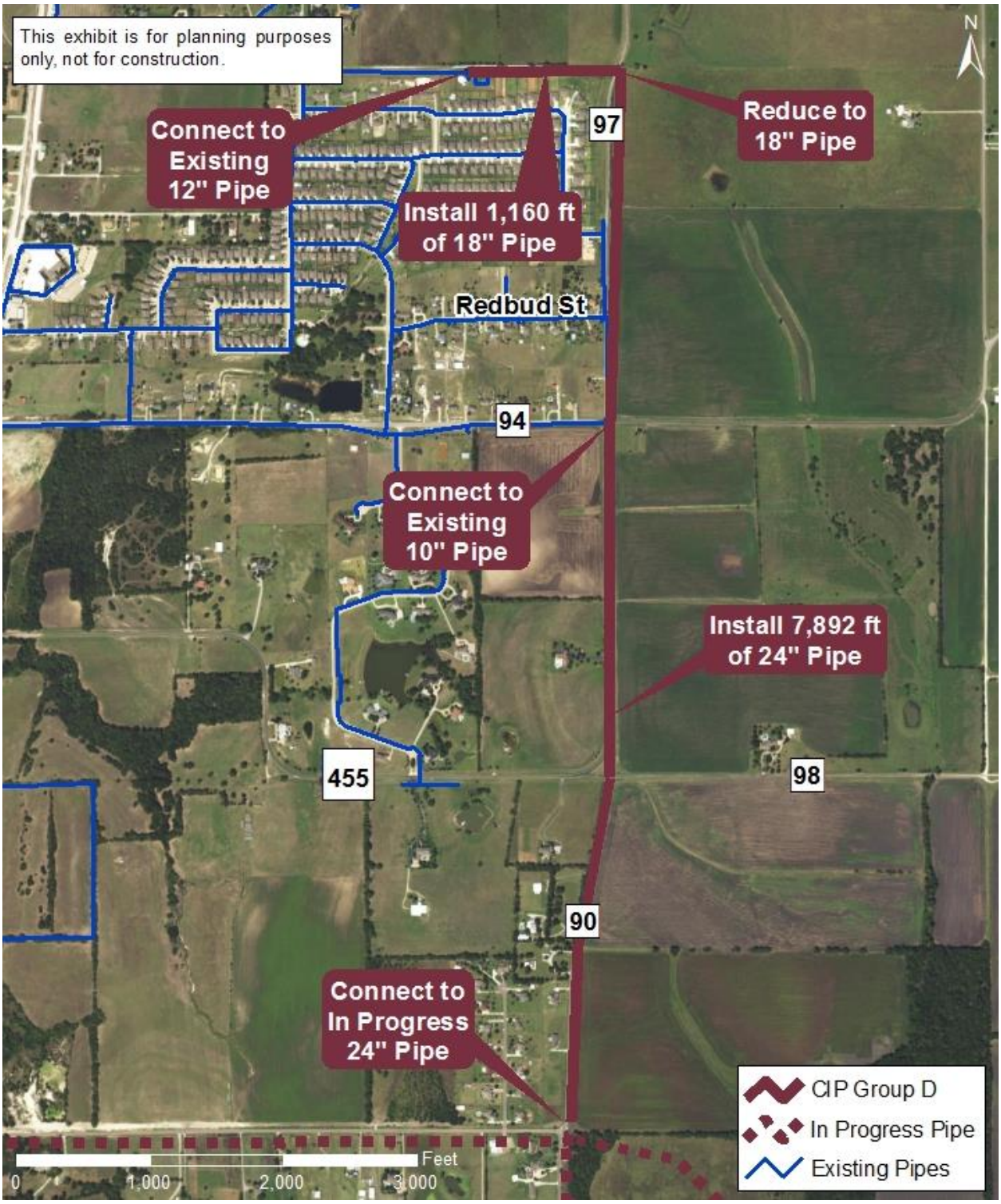
Potential Alternatives
None identified.

Project Identification	
Number:	8
Location:	High Plane
Flexibility:	Medium
Schedule	
Primary Trigger:	Regulatory
Secondary Trigger:	Capacity
Trigger # of Lots Constructed:	1,526
Trigger Date:	Oct-2018
Project Complete:	Jul-2020
Project Implementation (Months)	
Engineering/Design:	9
Bid/Construction:	12
Total Project Duration:	21

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$3.94	$4.31
Professional Services	$0.79	$0.84
Total Project Cost	**$4.73**	**$5.14**

Group D				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
24	Pipe installation	275	7,892	$ 2,170,300
	General improvements	50		$ 394,600
18	Pipe installation	225	1,182	$ 265,950
	General improvements	40		$ 47,280
Description		**Unit**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 250,000
			Subtotal	$ 3,128,130
			Valves and Fittings (5%)	$ 156,407
			Contingency (20%)	$ 656,907
			Professional Services	$ 788,289
			OPCC	$ 4,729,733

Project 8 Schematic



Project 9: Water Group C Capital Improvements

Project Description
This project includes installation of a new 18-inch pipeline east of the Light Farms EST. This will connect to larger pipelines in the area.

Justification
This line will be installed parallel to an existing 8-inch line that currently acts as a bottleneck, resulting in increased capacity and maintenance of adequate system pressures throughout this area.

Unintended Consequences
None identified.

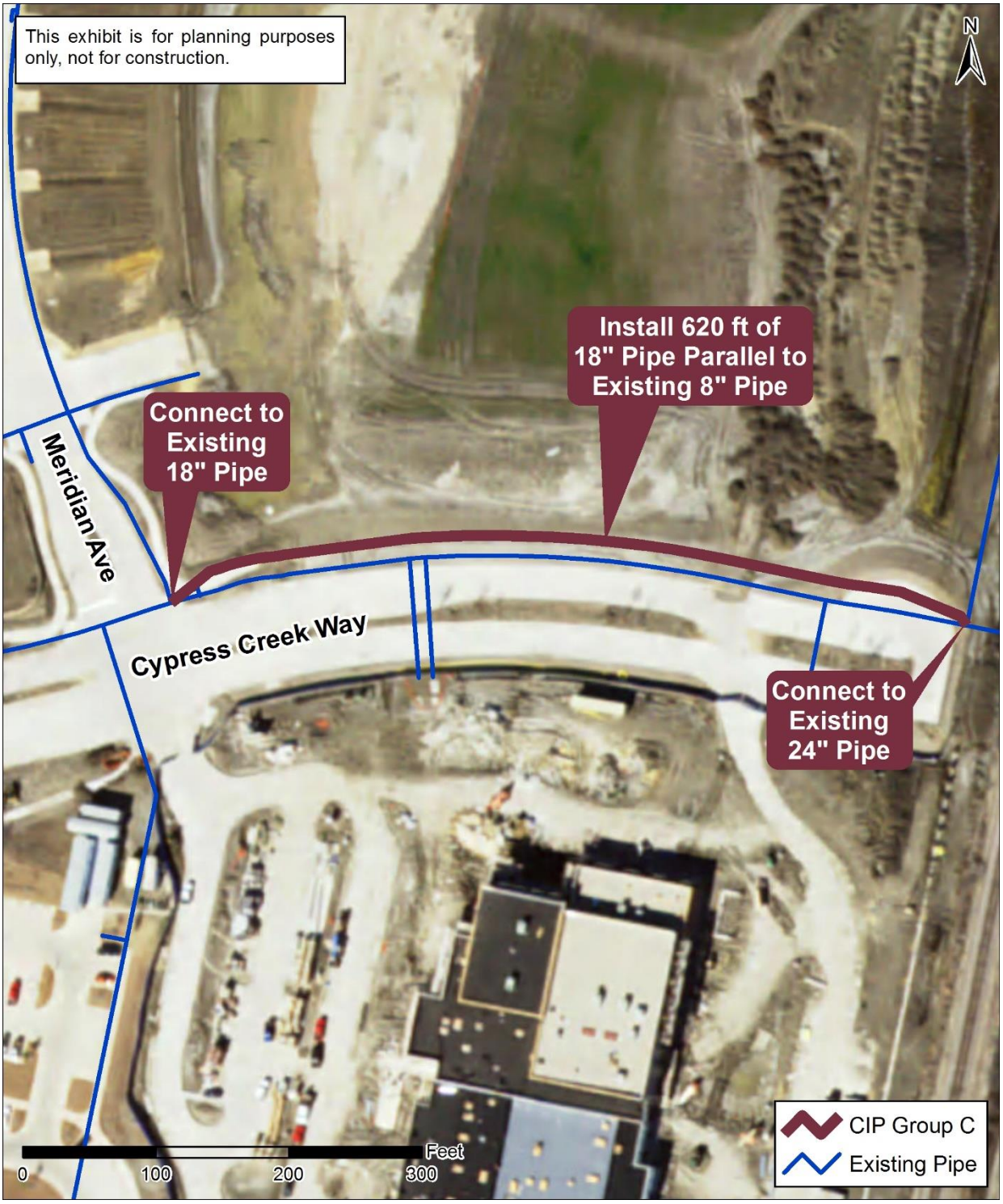
Special Considerations
Detailed design should incorporate ongoing development in the proposed alignment.

Potential Alternatives
None identified.

Project Identification		
Number:	9	
Location:	Low Plane	
Flexibility:	Medium	
Schedule		
Primary Trigger:	Capacity	
Secondary Trigger:	Regulatory	
Trigger # of Lots Constructed:	1,526	
Trigger Date:	Oct-2018	
Project Complete:	May-2019	
Project Implementation (Months)		
Engineering/Design:	3	
Bid/Construction:	4	
Total Project Duration:	7	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$0.26	$0.28
Professional Services	$0.05	$0.05
Total Project Cost	**$0.31**	**$0.33**

Group C				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
18	Pipe installation	225	606	$ 136,350
	General improvements	100		$ 60,600
			Subtotal	$ 196,950
			Valves and Fittings (10%)	$ 19,695
			Contingency (20%)	$ 43,329
			Professional Services	$ 51,995
			OPCC	$ 311,969

Project 9 Schematic



Project 10: Water Group L Capital Improvements

Project Identification	
Number:	10
Location:	CRPS; Low Plane
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed:	1,526
Trigger Date:	Oct-2018
Project Complete:	Oct-2019
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.45	$0.47
Professional Services	$0.09	$0.09
Total Project Cost	**$0.54**	**$0.57**

Project Description

This project includes installation of a new pump and a new 36-inch common suction line for the CRPS. Preliminary sizing indicates that the new pump should be sized to provide 3,800 gpm at 240 ft of head. A variable frequency drive will be provided for the new pump to allow efficient operation during periods of lower demands. One existing pump will be demolished during this project so that the existing CRPS footprint will not have to be expanded.

Justification

Figure 1-4 shows the expected pumping capacity needed for the CRPS through 2022. Demand will surpass the added firm capacity provided by the Group A improvements in 2019, leading to a deficiency in firm pumping capacity of approximately 1,100 gpm by 2020. The new pump would be installed in late 2019 and would provide pumping capacity of 1.3 times the maximum day demand through 2020, allowing equalization of diurnal peaks without completely draining the elevated storage tanks.

Unintended Consequences

Although this project will not change the number of pumps in the CRPS, maintenance cost will increase due to the increased pump sizing.

Special Considerations

Based on projected growth, this project must begin in 2018 so that the new pump can be installed in late 2019.

Potential Alternatives

None identified.

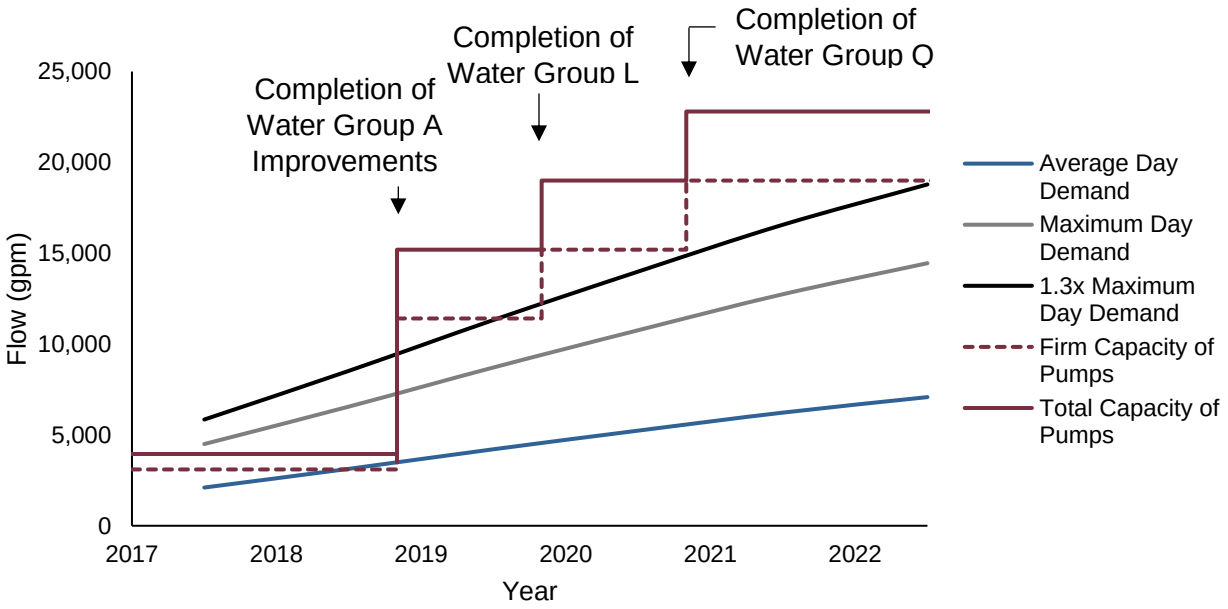
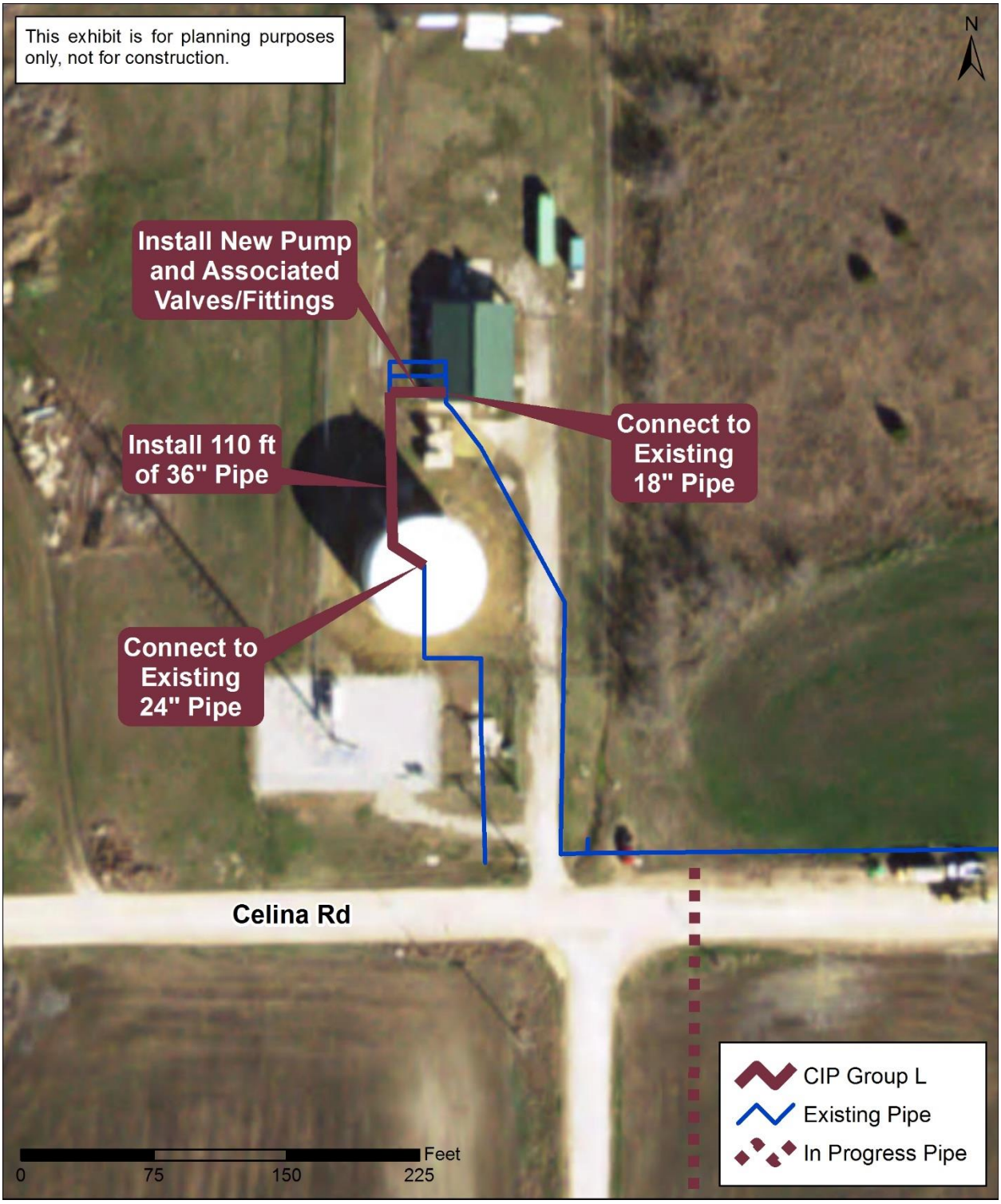


Figure 1-4: Comparison of Proposed CRPS Capacity and Demand

Group L			
Description	**Unit**	**Quantity**	**Cost**
Demo existing pump	LS	1	$ 10,000
Pump with motor	EA	1	$ 112,500
Electrical	LS	1	$ 20,000
VFDs	EA	1	$ 80,000
Valves and fittings	LS	1	$ 35,000
Interconnecting pipes	LS	1	$ 25,000
		Subtotal	$ 282,500
		Contractor's OH&P (18%)	$ 50,850
		Miscellaneous (SCADA, etc., 20%)	$ 56,500
		Contingency (20%)	$ 56,500
		Professional Services	$ 89,270
		OPCC	$ 535,620

Project 10 Schematic



Project 11: Water Group Z Capital Improvements

Project Identification		
Number:	11	
Location:	Low Plane	
Flexibility:	Medium	
Schedule		
Primary Trigger:	Operational	
Secondary Trigger:	Capacity	
Trigger # of Lots Constructed:	1,526	
Trigger Date:	Oct-2018	
Project Complete:	Jul-2020	
Project Implementation (Months)		
Engineering/Design:	9	
Bid/Construction:	12	
Total Project Duration:	21	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$6.35	$6.94
Professional Services	$1.27	$1.35
Total Project Cost	**$7.62**	**$8.29**

Project Description

This project consists of installation of a new, 6 MG ground storage tank and associated site improvements at the CRPS. Associated site improvements include bypass piping, SCADA level sensor, and security fencing.

Justification

Ground storage at this location provides a buffer against interruptions in Upper Trinity Regional Water District (UTRWD) water supply. Current demand projections identify a significant reduction in the amount of detention time provided by the existing GST, as shown in Figure 1-5Figure 1-4. This project will provide 16 hours of emergency storage at average day conditions in 2022 in the event of temporary water supply interruptions from UTRWD and provide additional system storage to meet TCEQ requirements. The new tank will provide steady operation of the high service pumps at the UTRWD, and will allow bypass of the existing GST during maintenance activities.

Unintended Consequences

This tank could lead to increased water age if flow demands do not increase as projected; however, this can be mitigated by controlling the level in the tank.

Special Considerations

This project will require geotechnical evaluation of the site prior to tank design. Coordination with UTRWD will be needed for tank level SCADA integration.

Potential Alternatives

A smaller GST could be constructed; however, a smaller tank would result in increased unit costs and would reduce the amount of time the system could operate without the UTRWD supply.

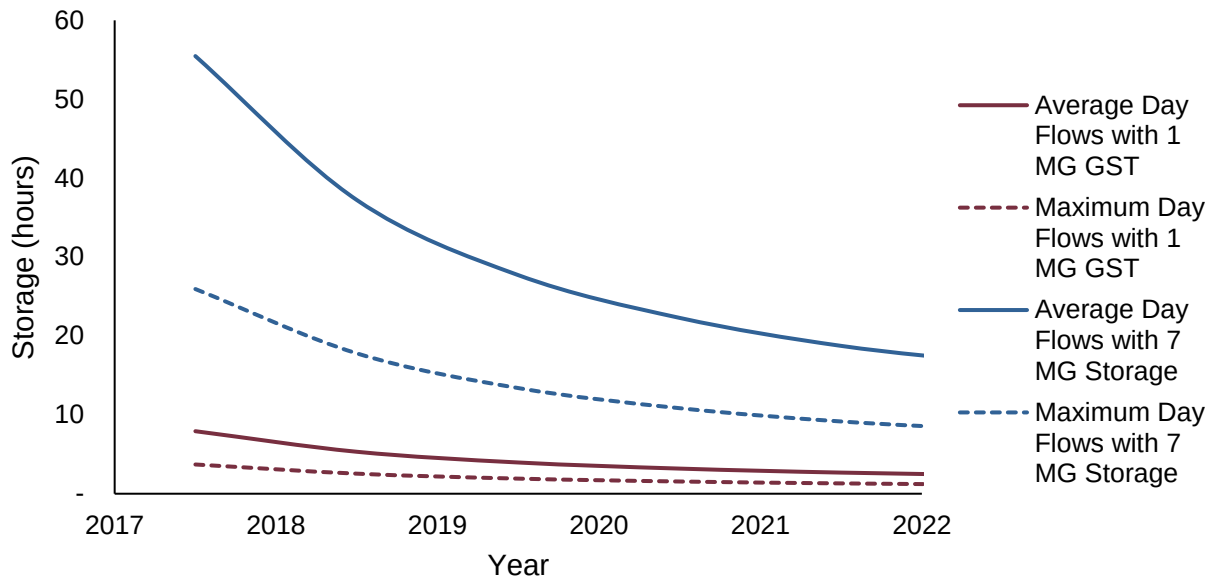


Figure 1-5: Comparison of Available Ground Storage at the CRPS with and without the 6 MG GST

Group Z			
Description	**Unit**	**Quantity**	**Cost**
New 6 MG GST	LS	1	$ 2,668,750
Piping and appurtenances	LS	1	$ 150,000
Work area and subgrade preparation	LS	1	$ 900,000
City standard brick fencing	LS	1	$ 450,000
		Subtotal	$ 4,168,750
		Contractor's OH&P (18%)	$ 750,375
		Miscellaneous (SCADA, etc., 10%)	$ 371,875
		Contingency (20%)	$ 1,058,200
		Professional Services	$ 1,269,840
		OPCC	$ 7,619,040

Project 11 Schematic

Project 12: Water Group R Capital Improvements

Project Identification	
Number:	12
Location:	DTPS
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed:	2,370
Trigger Date:	Oct-2018
Project Complete:	Oct-2019
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.46	$0.49
Professional Services	$0.09	$0.10
Total Project Cost	**$0.56**	**$0.59**

Project Description

This project will include installation of a new pump and associated piping at the DTPS. Preliminary sizing indicates that the new pump should be sized to provide 3,200 gpm at 240 ft of head. A variable frequency drive will be provided for the new pump to allow efficient operation during periods of lower demands. The existing Pump 4 will be demolished during this project so that the existing DTPS footprint will not have to be expanded.

Justification

Figure 1-6 shows the expected pumping capacity needed for the DTPS through 2022. Demand will surpass the added firm capacity provided by the Group H improvements in 2019, leading to a deficiency in firm pumping capacity of approximately 2,800 gpm by 2022. The new pump would be installed in late 2019 and would provide pumping capacity of 1.3 times the High Pressure Plane's maximum day demand through 2022, allowing equalization of diurnal peaks without completely draining the elevated storage tanks.

Unintended Consequences

None identified.

Special Considerations

This project must begin in 2018 and be in place by June 2020.

Potential Alternatives

None identified.

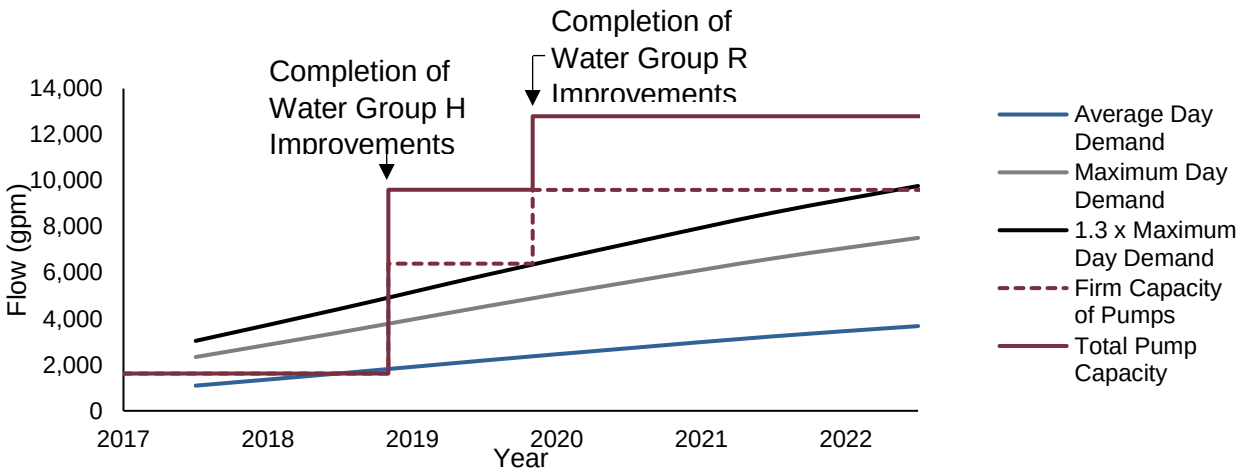


Figure 1-6: Comparison of High Pressure Plane Demands and Proposed Pump Capacity

Group R			
Description	**Unit**	**Quantity**	**Cost**
Pump with motor	EA	1	$ 112,500
Electrical	LS	1	$ 20,000
VFDs	EA	1	$ 80,000
Valves and fittings	LS	1	$ 35,000
Interconnecting pipes	LS	1	$ 25,000
		Subtotal	$ 272,500
		Contractor's OH&P (18%)	$ 49,050
		Miscellaneous (SCADA, etc., 20%)	$ 64,310
		Contingency (20%)	$ 77,172
		Professional Services	$ 92,606
		OPCC	$ 555,638

Project 13: Water Group K Capital Improvements

Project Identification	
Number:	13
Location:	High Plane
Flexibility:	Medium
Schedule	
Primary Trigger:	Operational
Secondary Trigger:	Capacity
Trigger # of Lots Constructed:	2,226
Trigger Date:	Mar-2019
Project Complete:	Aug-2019
Project Implementation (Months)	
Engineering/Design:	2
Bid/Construction:	3
Total Project Duration:	5

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.12	$0.13
Professional Services	$0.03	$0.03
Total Project Cost	**$0.15**	**$0.15**

Project Description
This project includes decommissioning of the Morgan Lake facilities and an engineering study to evaluate the condition and future use of existing groundwater supply facilities.

Justification
Construction of the new SE EST will raise the High Pressure Plane HGL by 15 ft, which will render the Morgan Lake facilities inoperable.

Unintended Consequences
None identified.

Special Considerations
The new SE EST must be online prior to decommissioning Morgan Lake facilities. If the groundwater well is to remain online, additional rehabilitation may be required for the well and chemical disinfection facilities.

Potential Alternatives
These facilities could remain in use if an elevation control valve was installed; however, this would result in high water age in the existing tank. Additional alternatives for groundwater facilities will be evaluated as part of the engineering study.

Group K			
Description	**Unit**	**Quantity**	**Cost**
Tank decommissioning and demo	LS	1	$ 100,000
		Subtotal	$ 100,000
		Contingency (20%)	$ 20,000
		Engineering Study	$ 25,000
		OPCC	$ 145,000

Project 13 Photographs

Figure 1-7: Existing Morgan Lake facilities, to be decommissioned

Project 14: Water Group AB Capital Improvements

Project Description
This project will consist of SCADA improvements identified in the SCADA Master Plan.

Justification
This project will implement the improvements identified in the SCADA Master Plan and will improve consistency, reliability, and automation of operations.

Unintended Consequences
None identified.

Special Considerations
None identified.

Potential Alternatives
Alternatives will be identified during development of the SCADA Master Plan.

Project Identification	
Number:	14
Location:	System Wide
Flexibility:	High
Schedule	
Primary Trigger:	Operational
Secondary Trigger:	None
Trigger # of Lots Constructed:	3,233
Trigger Date:	Oct-2019
Project Complete:	Apr-2021
Project Implementation (Months)	
Engineering/Design:	9
Bid/Construction:	9
Total Project Duration:	18

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.24	$0.26
Professional Services	$0.07	$0.08
Total Project Cost	**$0.31**	**$0.34**

Group AB			
Description	**Unit**	**Quantity**	**Cost**
SCADA improvements - water & wastewater	1	LS	$ 200,000
		Subtotal	$ 200,000
		Contingency (20%)	$ 40,000
		Engineering/Integration	$ 72,000
		OPCC	$ 312,000

Project 15: Water Group AA Capital Improvements

Project Description
This project consists of upsizing all existing lines less than 8-inch in diameter in the Downtown area, in both the High and Low Pressure Planes.

Justification
These improvements will minimize head loss in the system and prepare the older portion of the system for growth.

Unintended Consequences
None identified.

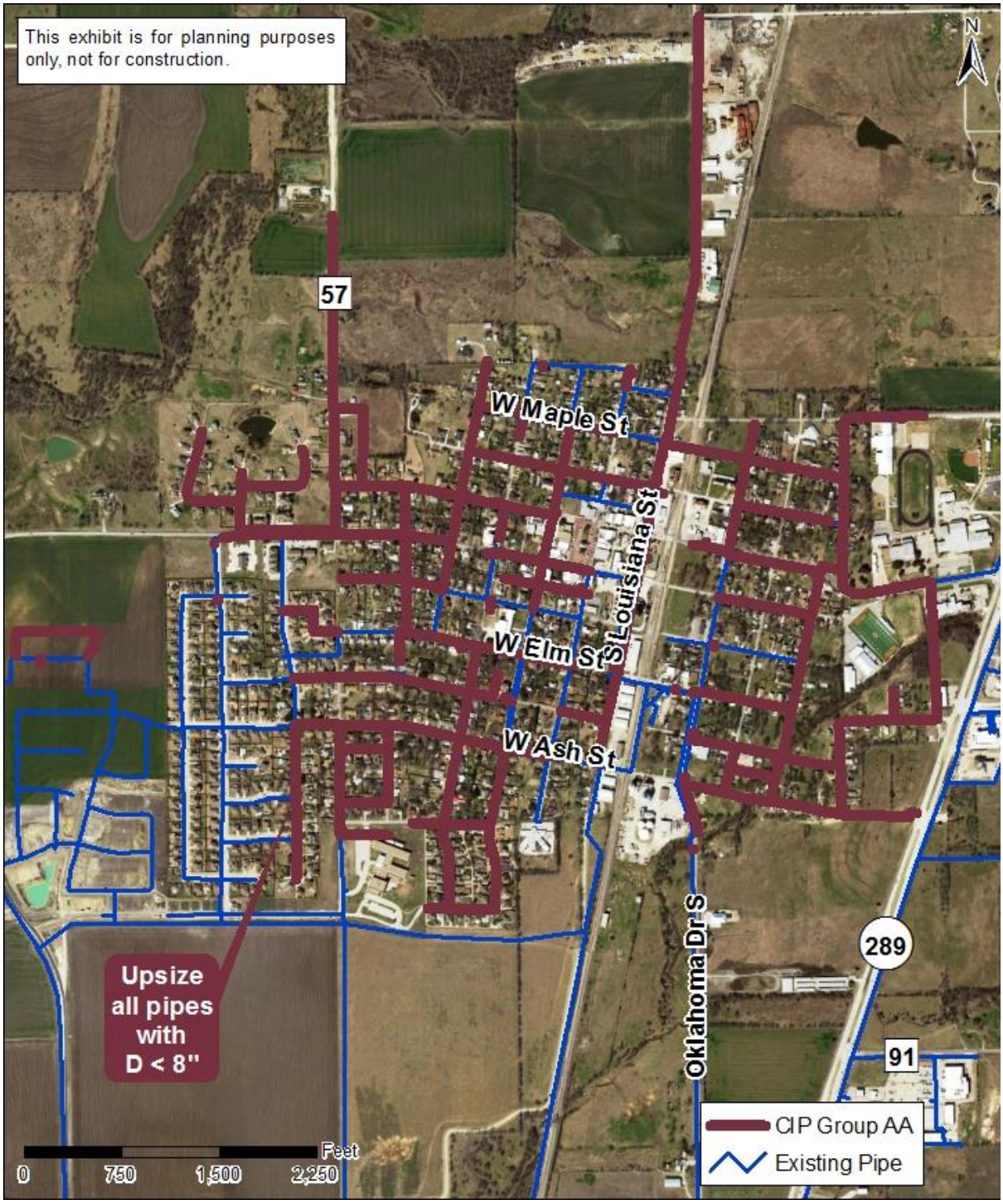
Special Considerations
This project will take place in a developed area. As such, bored pipe installations and significant pavement, sidewalk, and landscaping repairs may be required.

Potential Alternatives
These lines may be replaced during concurrent street rehabilitation projects, which will significantly reduce the overall general improvements cost.

Project Identification		
Number:	15	
Location:	System Wide	
Flexibility:	Medium	
Schedule		
Primary Trigger:	Operational	
Secondary Trigger:	City-directed	
Trigger # of Lots Constructed:	3,233	
Trigger Date:	Oct-2019	
Project Complete:	Oct-2021	
Project Implementation (Months)		
Engineering/Design:	12	
Bid/Construction:	12	
Total Project Duration:	24	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$18.66	$21.00
Professional Services	$3.73	$4.08
Total Project Cost	**$22.39**	**$25.08**

Group AA				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
8	Pipe installation	150	58,933	$ 8,839,950
	General improvements	100		$ 5,893,300
Details		**Unit Cost**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 75,000
			Subtotal	$ 14,808,250
			Valves and Fittings (5%)	$ 740,413
			Contingency (20%)	$ 3,109,733
			Professional Services	$ 3,731,679
			OPCC	$ 22,390,074

Project 15 Schematic



Project 16: Water Group M Capital Improvements

Project Description
This project includes installation of a 12-inch pipeline around the northwest side of downtown.

Justification
This project will alleviate low pressures in the areas of the Low Pressure Plane and will result in increased capacity.

Unintended Consequences
None identified.

Special Considerations
The proposed pipeline will run alongside a future thoroughfare, and coordination of easements will be required. Also, two bored piping installations will be required.

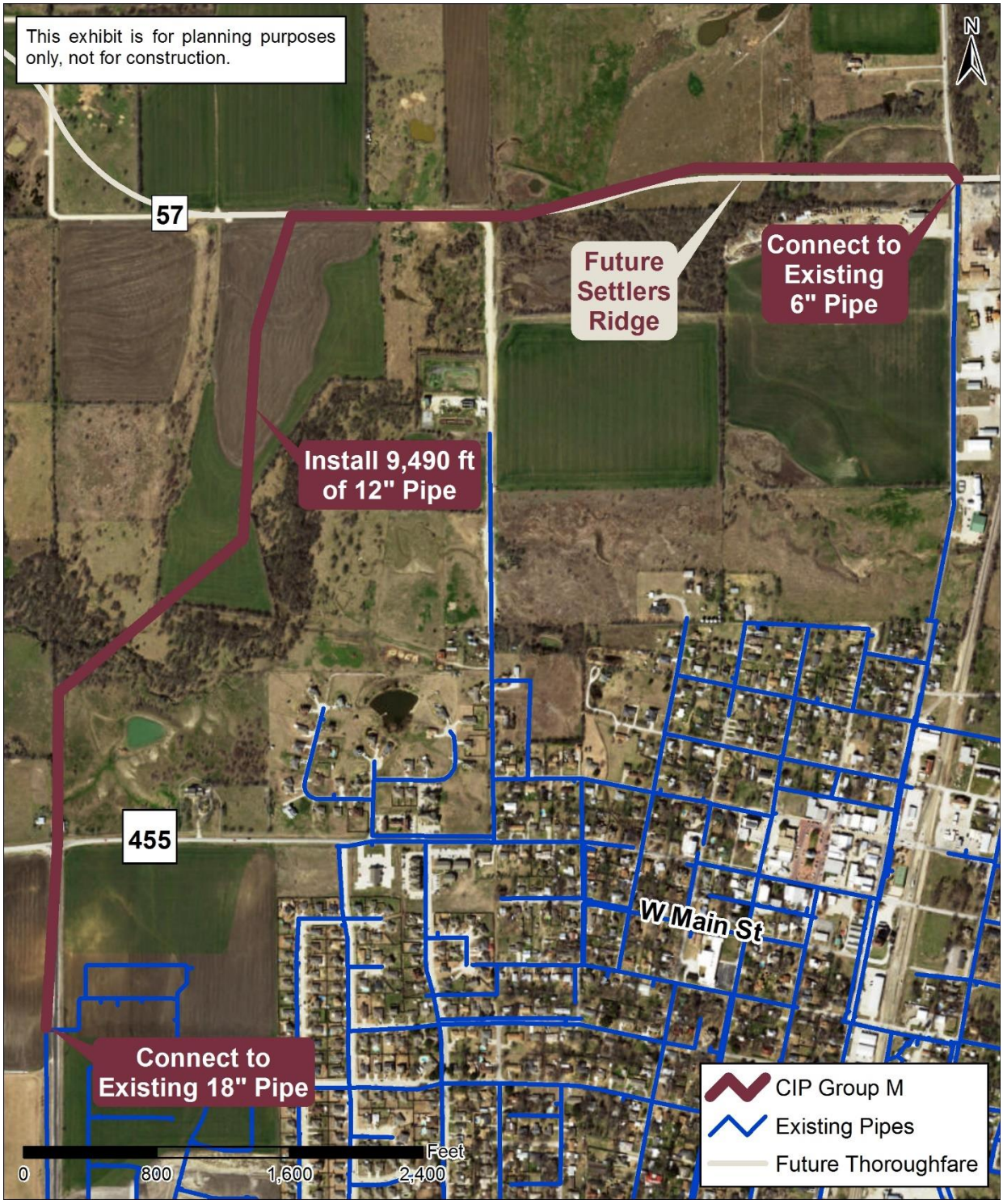
Potential Alternatives
None identified.

Project Identification	
Number:	16
Location:	Low Plane
Flexibility:	Medium
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed:	3,233
Trigger Date:	Oct-2019
Project Complete:	Oct-2021
Project Implementation (Months)	
Engineering/Design:	12
Bid/Construction:	12
Total Project Duration:	24

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$2.76	$3.10
Professional Services	$0.55	$0.60
Total Project Cost	**$3.31**	**$3.70**

Group M				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
12	Pipe installation	180	9,489	$ 1,708,020
	General improvements	40		$ 379,560
Description		**Unit**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 100,000
			Subtotal	$ 2,187,580
			Valves and Fittings (5%)	$ 109,379
			Contingency (20%)	$ 459,392
			Professional Services	$ 551,270
			OPCC	$ 3,307,621

Project 16 Schematic



Project 17: Water Group Q Capital Improvements

Project Identification		
Number:	17	
Location:	CRPS	
Flexibility:	Low	
Schedule		
Primary Trigger:	Capacity	
Secondary Trigger:	Regulatory	
Trigger # of Lots Constructed:	3,233	
Trigger Date:	Oct-2019	
Project Complete:	Oct-2020	
Project Implementation (Months)		
Engineering/Design:	6	
Bid/Construction:	6	
Total Project Duration:	12	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$0.46	$0.51
Professional Services	$0.09	$0.10
Total Project Cost	**$0.56**	**$0.61**

Project Description

This project consists of installation of one additional pump in the CRPS. Preliminary sizing indicates that the new pump should be sized to provide 3,800 gpm at 240 ft of head. A variable frequency drive will be provided for the new pump to allow efficient operation during periods of lower demands. One existing pump will be demolished during this project so that the existing CRPS footprint will not have to be expanded.

Justification

Figure 1-8 shows the expected pumping capacity needed for the CRPS through 2022. Demand will surpass the added firm capacity provided by the Group A and L improvements in 2021, and would lead to a deficiency in pumping capacity of approximately 2,300 gpm by 2022. These improvements will provide pumping capacity of 1.3x maximum day demand through 2022, allowing equalization of diurnal peaks without completely draining the elevated storage tanks.

Unintended Consequences

Although this project will not change the number of pumps in the CRPS, maintenance costs will increase due to the increased pump sizing.

Special Considerations

This project must begin in 2019 and be in place by August 2020 in preparation for the projected flows.

Potential Alternatives

None identified.

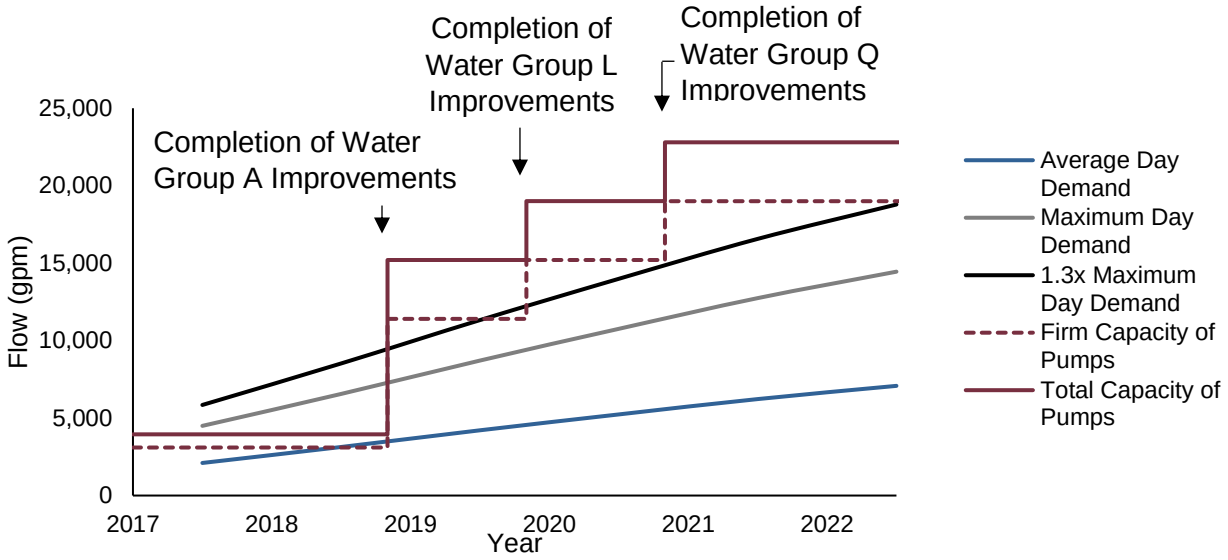


Figure 1-8: Comparison of Proposed CRPS Capacity and Demand

Group Q			
Description	**Unit**	**Quantity**	**Cost**
Pump with motor	EA	1	$ 112,500
Electrical	LS	1	$ 20,000
VFDs	EA	1	$ 80,000
Valves and fittings	LS	1	$ 35,000
Interconnecting pipes	LS	1	$ 25,000
		Subtotal	$ 272,500
		Contractor's OH&P (18%)	$ 49,050
		Miscellaneous (SCADA, etc., 20%)	$ 64,310
		Contingency (20%)	$ 77,172
		Professional Services	$ 92,606
		OPCC	$ 555,638

Project 18: Water Group AC Capital Improvements

Project Description
This project consists of development of a new 5-year Master Plan with associated hydraulic model updates and revisions needed for water quality monitoring plans such as the RTCR sample siting plan, and Nitrification Action Plan.

Justification
This master plan will evaluate future growth and lead to development of a new CIP.

Unintended Consequences
None identified.

Special Considerations
None identified.

Potential Alternatives
None identified.

Project Identification	
Number:	18
Location:	System Wide
Flexibility:	Medium
Schedule	
Primary Trigger:	Operational
Secondary Trigger:	City-directed
Trigger # of Lots Constructed:	4,894
Trigger Date:	Oct-2020
Project Complete:	Oct-2021
Project Implementation (Months)	
Engineering/Design:	12
Bid/Construction:	0
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.00	$0.00
Professional Services	$0.20	$0.23
Total Project Cost	**$0.20**	**$0.23**

Group AC			
Description	**Unit**	**Quantity**	**Cost**
2020 5-Year Master Plan	LS	1	$ 200,000
		OPCC	**$ 200,000**

Project 19: Water Group P Capital Improvements

Project Description
This project adds an 18-inch line from Morgan Lake running north to connect to the DC Ranch development and west to Preston Road.

Justification
This project will result in increased capacity and improve pressures in the distribution system. This pipeline is needed to supply projected flows during this five-year planning period.

Unintended Consequences
None identified.

Special Considerations
This project will require completion of Water Group D improvements prior to the connection at Morgan Lake. Coordination and right-of-way/easement acquisition will likely be necessary for this pipeline.

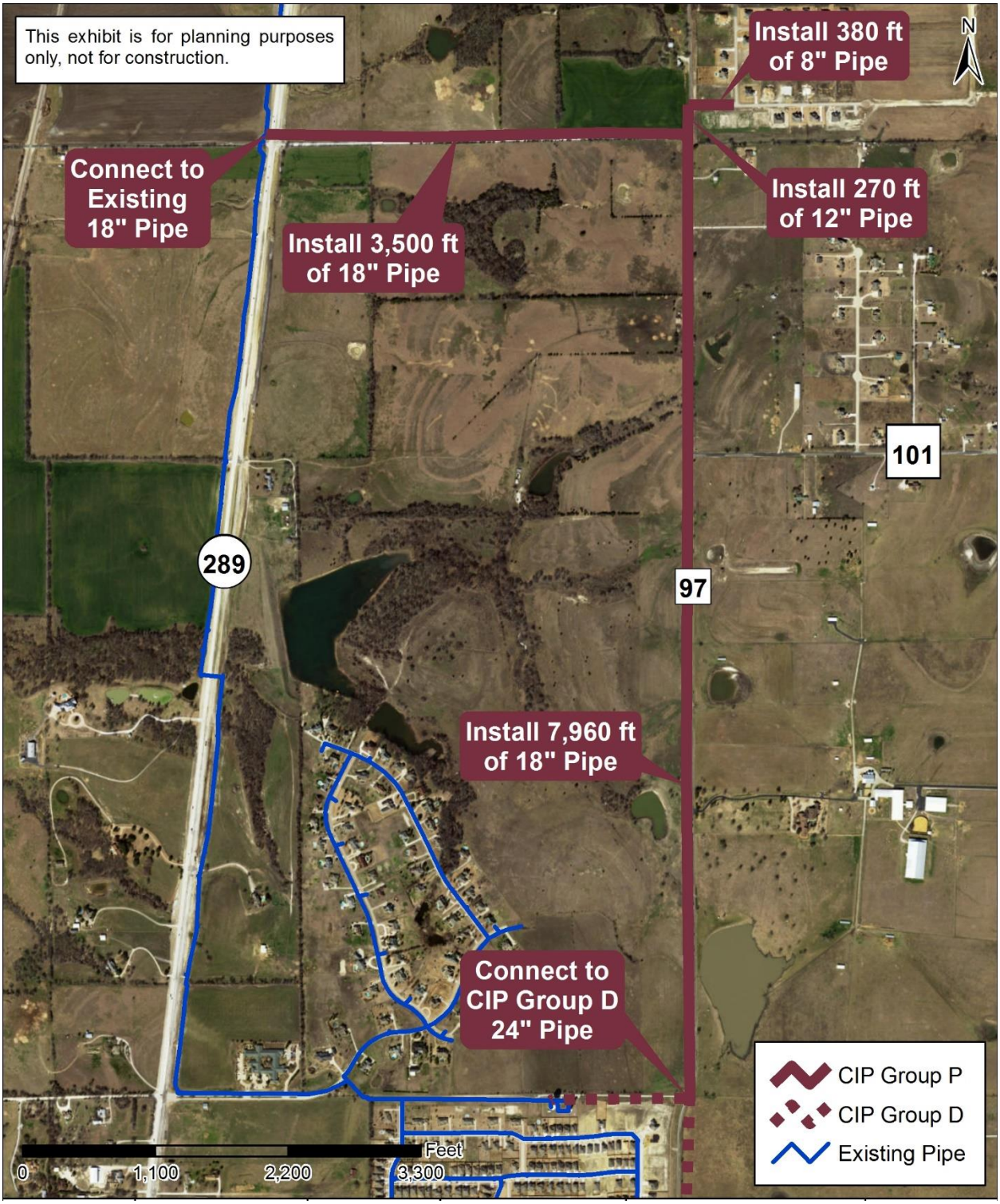
Potential Alternatives
None identified.

Project Identification	
Number:	19
Location:	High Plane
Flexibility:	Medium
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed:	3,233
Trigger Date:	Oct-2019
Project Complete:	Jul-2021
Project Implementation (Months)	
Engineering/Design:	9
Bid/Construction:	12
Total Project Duration:	21

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$4.27	$4.80
Professional Services	$0.85	$0.93
Total Project Cost	**$5.12**	**$5.73**

Group P				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
18	Pipe installation	225	11,453	$ 2,576,925
	General improvements	40		$ 458,120
12	Pipe installation	180	267	$ 48,060
	General improvements	25		$ 6,675
8	Pipe installation	150	384	$ 57,600
	General improvements	100		$ 38,400
Description		**Unit**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 200,000
			Subtotal	$ 3,385,780
			Valves and Fittings (5%)	$ 169,289
			Contingency (20%)	$ 711,014
			Professional Services	$ 853,217
			OPCC	$ 5,119,299

Project 19 Schematic



Project 20: Water Group O Capital Improvements

Project Description
This project will add a 24-inch line parallel to the railroad tracks in the Low Pressure Plane. The new 24-inch line will parallel an existing 12-inch line, which will stay in service.

Justification
This project will result in increased capacity and improve pressures in this area of the distribution system. This pipeline is needed to supply projected flows during this five-year planning period.

Unintended Consequences
None identified.

Special Considerations
None identified.

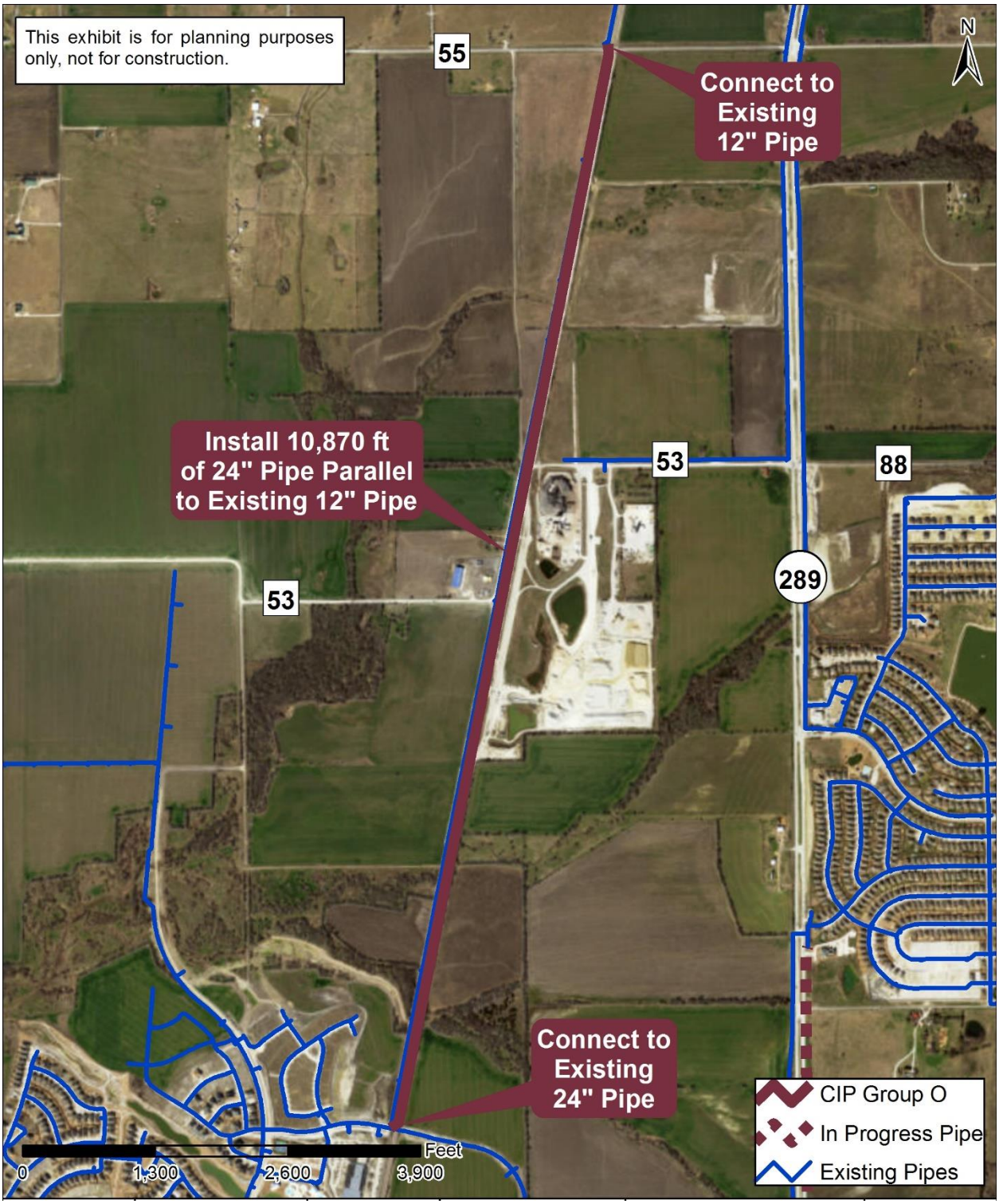
Potential Alternatives
The existing 12-inch line could be decommissioned; however, this would require the proposed 24-inch line to be upsized.

Project Identification	
Number:	20
Location:	Low Plane
Flexibility:	Medium
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed:	4,894
Trigger Date:	Oct-2020
Project Complete:	Jul-2022
Project Implementation (Months)	
Engineering/Design:	9
Bid/Construction:	12
Total Project Duration:	21

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$4.45	$5.16
Professional Services	$0.89	$1.00
Total Project Cost	**$5.34**	**$6.16**

Group O				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
24	Pipe installation	275	10,866	$ 2,988,150
	General improvements	50		$ 543,300
			Subtotal	$ 3,531,450
			Valves and Fittings (5%)	$ 176,573
			Contingency (20%)	$ 741,605
			Professional Services	$ 889,925
			OPCC	$ 5,339,552

Project 20 Schematic



Project 21: Water Group T Capital Improvements

Project Description
This project includes installation of 18- and 24-inch pipelines along Hwy. 455 to the east of CVS.

Justification
This project will remove a dead end, improving fire flow in this area.

Unintended Consequences
The additional looping would improve water quality in this area.

Special Considerations
The proposed pipeline will run alongside a future thoroughfare, and coordination of easements will be required. Also, a bored pipe installation will be required to connect to the existing 6-inch pipe serving the Preston 455 development

Potential Alternatives
None identified.

Project Identification	
Number:	21
Location:	High Plane
Flexibility:	High
Schedule	
Primary Trigger:	Fire flow
Secondary Trigger:	Operational
Trigger # of Lots Constructed:	4,894
Trigger Date:	Oct-2020
Project Complete:	Jul-2022
Project Implementation (Months)	
Engineering/Design:	9
Bid/Construction:	12
Total Project Duration:	21

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$1.99	$2.31
Professional Services	$0.40	$0.45
Total Project Cost	**$2.39**	**$2.75**

Group T				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
18	Pipe installation	225	3,930	$ 884,250
	General improvements	40		$ 157,200
24	Pipe installation	275	1422	$ 391,050
	General improvements	50		$ 71,100
Description		**Unit Cost**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 75,000
			Subtotal	$ 1,578,600
			Valves and Fittings (5%)	$ 78,930
			Contingency (20%)	$ 331,506
			Professional Services	$ 397,807
			OPCC	$ 2,386,843

Project 21 Schematic

Project 22: Water Group S Capital Improvements

Project Description
This project includes installation of 18- and 24-inch lines along Legacy Drive.

Justification
These lines provide a redundant feed to the Creeks of Legacy development with additional looping, improving pressure and flow rates in this area.

Unintended Consequences
The additional looping will improve water quality in this area.

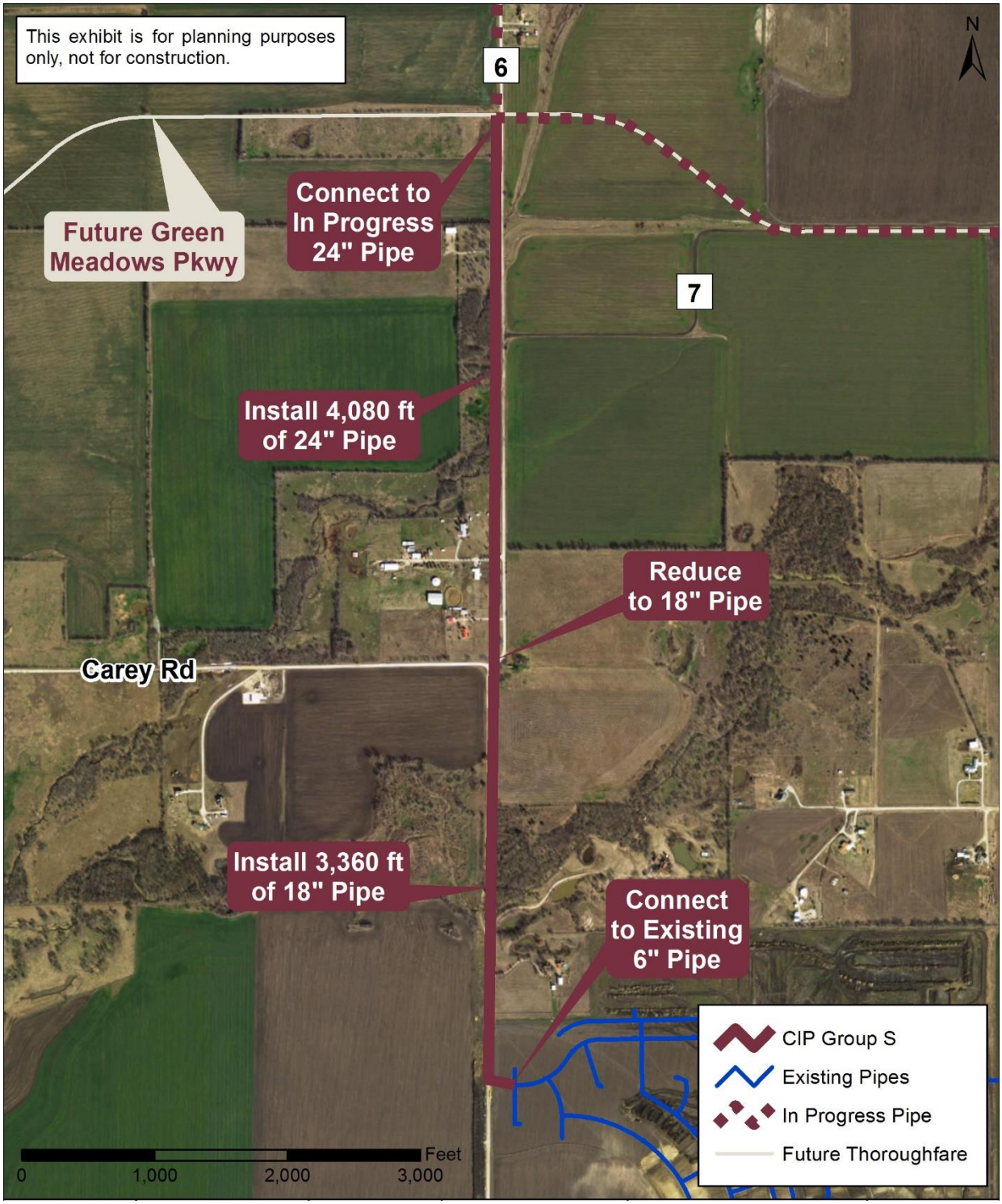
Special Considerations
These improvements will require installation of a 24-inch pipe that is part of an ongoing project for the northern connection. TxDOT coordination and right-of-way/easement acquisition will likely be necessary for this pipeline.

Potential Alternatives
None identified.

Project Identification		
Number:	22	
Location:	Low Plane	
Flexibility:	High	
Schedule		
Primary Trigger:	Operational	
Secondary Trigger:	Capacity	
Trigger # of Lots Constructed:	6,504	
Trigger Date:	Oct-2021	
Project Complete:	Jul-2023	
Project Implementation (Months)		
Engineering/Design:	9	
Bid/Construction:	12	
Total Project Duration:	21	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$2.79	$3.34
Professional Services	$0.56	$0.65
Total Project Cost	**$3.35**	**$3.98**

Group S				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
18	Pipe installation	225	3,364	$ 756,900
	General improvements	40		$ 134,560
24	Pipe installation	275	4,080	$ 1,122,000
	General improvements	50		$ 204,000
			Subtotal	$ 2,217,460
			Valves and Fittings (5%)	$ 110,873
			Contingency (20%)	$ 465,667
			Professional Services	$ 558,800
			OPCC	$ 3,352,800

Project 22 Schematic



Project 23: Water Group X Capital Improvements

Project Description
This project consists of installation of new 8-inch and 24-inch pipelines to connect the Preston Lakes development to the existing 18-inch line along the Preston Road Corridor. Another 8-inch line will be installed within the development to provide looping.

Justification
This project will result in added looping for improved fire flow in the Preston Lakes development.

Unintended Consequences
The added looping will improve water quality in this area.

Special Considerations
TxDOT coordination and right-of-way/easement acquisition will likely be necessary for this pipeline. In addition, a bored pipe installation will be needed to cross the railroad tracks.

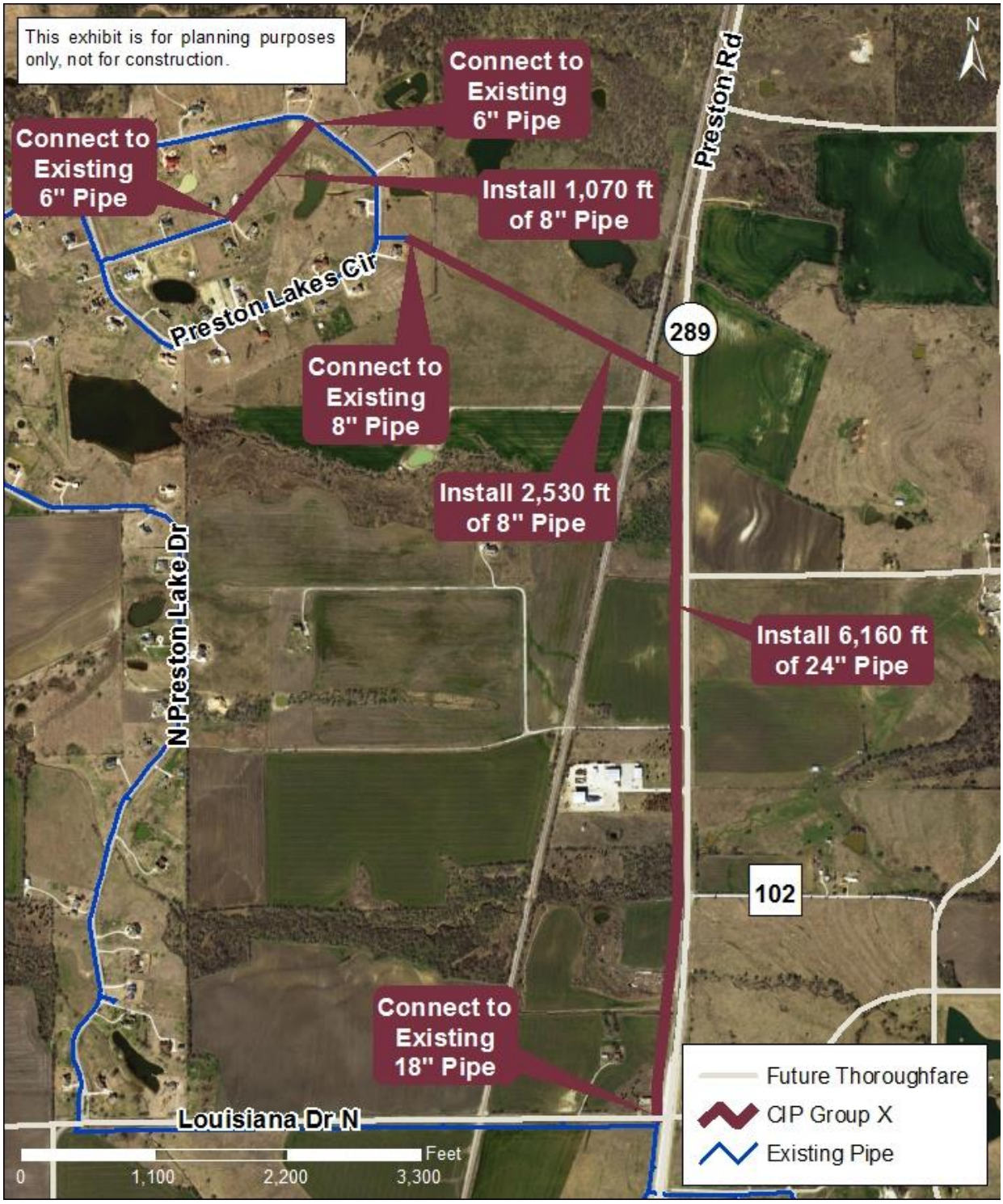
Potential Alternatives
None identified.

Project Identification	
Number:	23
Location:	Low Plane
Flexibility:	High
Schedule	
Primary Trigger:	Fire flow
Secondary Trigger:	Operational
Trigger # of Lots Constructed:	6,504
Trigger Date:	Oct-2021
Project Complete:	Jul-2023
Project Implementation (Months)	
Engineering/Design:	9
Bid/Construction:	12
Total Project Duration:	21

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$3.48	$4.15
Professional Services	$0.70	$0.81
Total Project Cost	**$4.17**	**$4.96**

Group X				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
8	Pipe installation	150	3,600	$ 540,000
	General improvements	40		$ 144,000
24	Pipe installation	275	6,160	$ 1,694,000
	General improvements	50		$ 308,000
Description		**Unit Cost**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 75,000
			Subtotal	$ 2,761,000
			Valves and Fittings (5%)	$ 138,050
			Contingency (20%)	$ 579,810
			Professional Services	$ 695,772
			OPCC	$ 4,174,632

Project 23 Schematic



Project 24: Water Group W Capital Improvements

Project Description
This project includes installation of an 8-inch line along E Malone St. and a 12-inch line along Preston Road to create looping near downtown in the High Pressure Plane.

Justification
These improvements are designed to improve looping, and thus fire flow.

Unintended Consequences
The added looping will improve water quality in this area.

Special Considerations
TxDOT coordination and right-of-way/easement acquisition will likely be necessary for this pipeline.

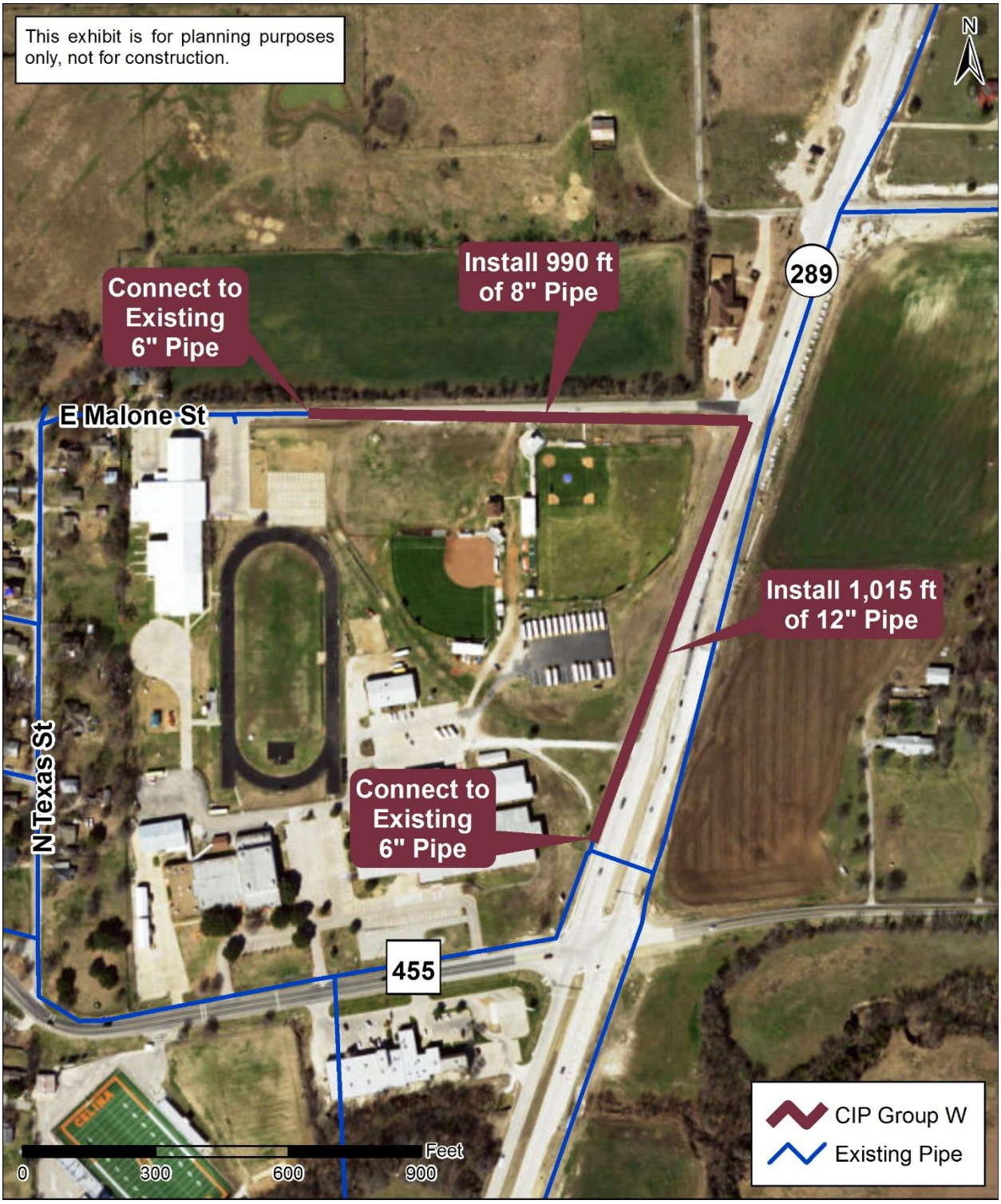
Potential Alternatives
None identified.

Project Identification	
Number:	24
Location:	High Plane
Flexibility:	High
Schedule	
Primary Trigger:	Fire flow
Secondary Trigger:	Operational
Trigger # of Lots Constructed:	4,894
Trigger Date:	Oct-2020
Project Complete:	Oct-2021
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.51	$0.57
Professional Services	$0.10	$0.11
Total Project Cost	**$0.61**	**$0.69**

Group W				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
8	Pipe installation	150	1,685	$ 252,750
	General improvements	75		$ 126,375
12	Pipe installation	180	101	$ 18,180
	General improvements	75		$ 7,575
			Subtotal	$ 404,880
			Valves and Fittings (5%)	$ 20,244
			Contingency (20%)	$ 85,025
			Professional Services	$ 102,030
			OPCC	$ 612,179

Project 24 Schematic



Project 25: Water Group V Capital Improvements

Project Description
This project consists of installation of three 8-inch pipelines in the Low Pressure Plane near downtown.

Justification
The new 8-inch lines will connect existing pipelines, providing looping to improve fire flow and water quality in the area.

Unintended Consequences
None identified.

Special Considerations
A bored pipeline installation and easement coordination will be required.

Potential Alternatives
None identified.

Project Identification		
Number:	25	
Location:	Low Plane	
Flexibility:	High	
Schedule		
Primary Trigger:	Fire flow	
Secondary Trigger:	Operational	
Trigger # of Lots Constructed:	4,894	
Trigger Date:	Oct-2020	
Project Complete:	Oct-2021	
Project Implementation (Months)		
Engineering/Design:	6	
Bid/Construction:	6	
Total Project Duration:	12	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$0.46	$0.51
Professional Services	$0.09	$0.10
Total Project Cost	**$0.55**	**$0.62**

Group V				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
8	Pipe installation	150	1,181	$ 177,150
	General improvements	100		$ 118,100
Description		**Unit Cost**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 50,000
			Subtotal	$ 345,250
			Valves and Fittings (10%)	$ 34,525
			Contingency (20%)	$ 75,955
			Professional Services	$ 91,146
			OPCC	$ 546,876

Project 25 Schematic

Project 26: Water Group Y Capital Improvements

Project Description
This project adds an 18-inch line to serve the Lakes at Mustang Ranch development from the Parks at Wilson Creek development.

Justification
These improvements will improve fire flows in the Lakes at Mustang Ranch development.

Unintended Consequences
This project would also result in improved water quality in the area.

Special Considerations
Construction of lines for the Parks at Wilson Creek by developers will be required before this project can be implemented. The proposed pipeline will run alongside a future thoroughfare, and coordination of easements will be required.

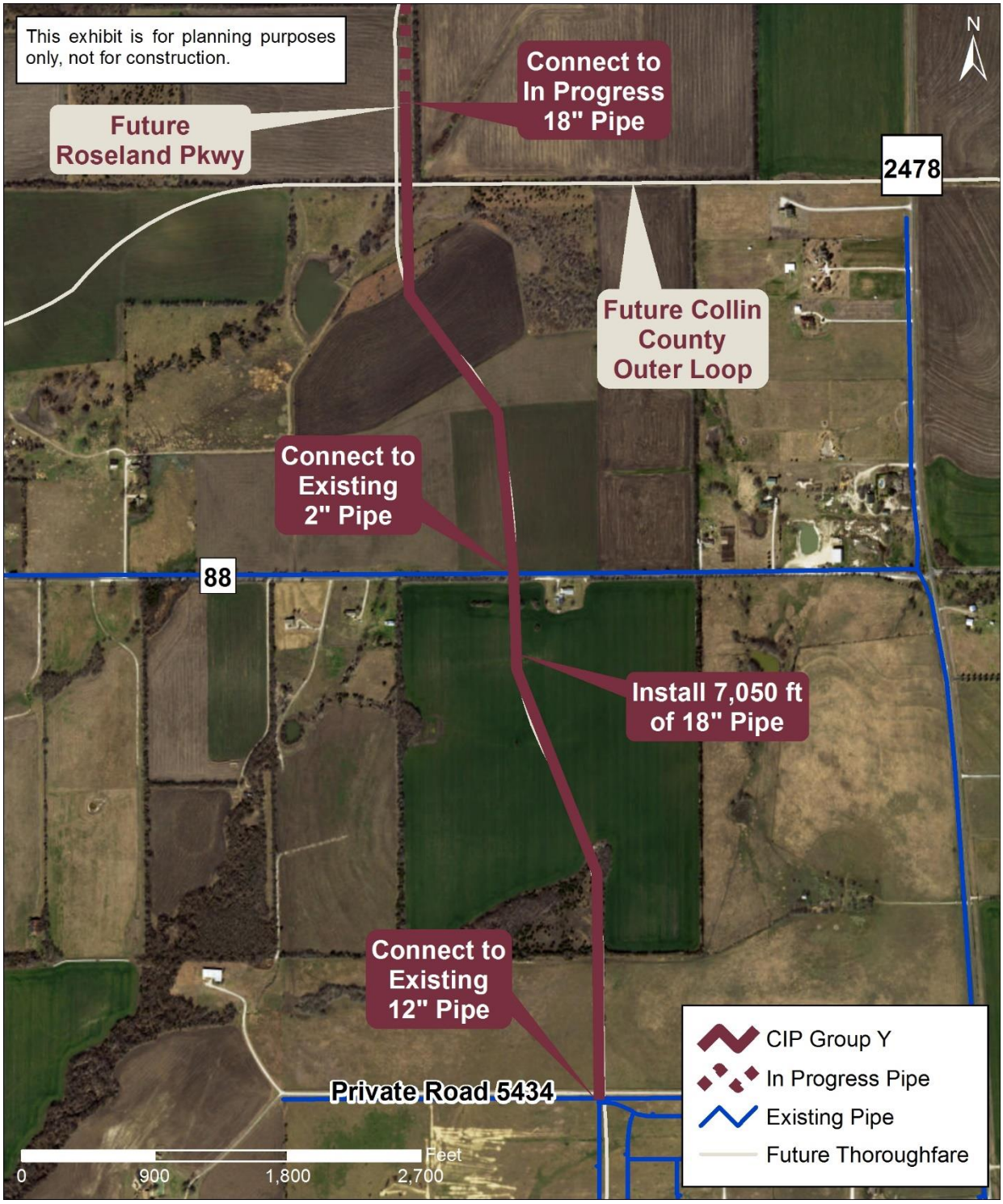
Potential Alternatives
None identified.

Project Identification	
Number:	26
Location:	Low Plane
Flexibility:	High
Schedule	
Primary Trigger:	Fire flow
Secondary Trigger:	Operational
Trigger # of Lots Constructed:	6,504
Trigger Date:	Oct-2021
Project Complete:	Jul-2023
Project Implementation (Months)	
Engineering/Design:	9
Bid/Construction:	12
Total Project Duration:	21

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$2.45	$2.92
Professional Services	$0.49	$0.57
Total Project Cost	**$2.94**	**$3.49**

Group Y				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
18	Pipe installation	225	7,052	$ 1,586,700
	General improvements	40		$ 282,080
Details		**Unit Cost**	**Quantity**	**Cost**
Bored pipe installation		LS	1	$ 75,000
			Subtotal	$ 1,943,780
			Valves and Fittings (5%)	$ 97,189
			Contingency (20%)	$ 408,194
			Professional Services	$ 489,833
			OPCC	$ 2,938,995

Project 26 Schematic



Project 27: Water Group U Capital Improvements

Project Description
This project includes installation of a new 12-inch line from Preston Road to feed the Morgan Lake Estates development.

Justification
This project will improve fire flows in the Morgan Lake Estates development.

Unintended Consequences
This project would also result in improved water quality in the area.

Special Considerations
This pipeline would run through currently undeveloped land and would require coordination of easements. Also, detailed design should incorporate ongoing development in the proposed alignment.

Potential Alternatives
None identified.

Project Identification		
Number:	27	
Location:	High Plane	
Flexibility:	High	
Schedule		
Primary Trigger:	Fire flow	
Secondary Trigger:	Operational	
Trigger # of Lots Constructed:	6,504	
Trigger Date:	Oct-2021	
Project Complete:	Oct-2022	
Project Implementation (Months)		
Engineering/Design:	6	
Bid/Construction:	6	
Total Project Duration:	12	
	2017 Costs ($ Millions)	**Forecasted Costs ($ Millions)**
Construction	$0.28	$0.33
Professional Services	$0.06	$0.07
Total Project Cost	**$0.34**	**$0.40**

Group U				
Diameter (in.)	**Description**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
12	Pipe installation	180	886	$ 159,480
	General improvements	75		$ 66,450
			Subtotal	$ 225,930
			Valves and Fittings (5%)	$ 11,297
			Contingency (20%)	$ 47,445
			Professional Services	$ 56,934
			OPCC	$ 341,606

Project 27 Schematic

Appendix D

Water & Wastewater System Improvements
Wastewater Capital Improvements Plan

City of Celina, Texas

Prepared by:

3010 Gaylord Parkway
Suite 190
Frisco, TX 75034

September 2017

Garver Project No.: 16088050

1.0 Executive Summary

This Wastewater Capital Improvements Plan utilizes the model criteria and simulations detailed in the Water and Wastewater Modeling Improvements, discussions with City staff, and the results of the 2016 Inflow and Infiltration (I/I) Study prepared by Pacheco Koch to develop proposed projects from the recommended improvements. These improvements are identified for a 5-year planning horizon (2017 – 2022 fiscal years).

A summary of all proposed project costs and schedules is displayed on Page 5, while a proposed schedule is located on Page 6. Project descriptions are in order based on priority ranking following this summary.

1.1 Identification and Ranking

Each project will be initiated based on one or more of the triggers described below:

1.1.1 Capacity

This trigger is activated if a section or segment of sewer is unable to provide the modeled flow during peak demand or is at risk of producing overflows. Trigger limits are a function of the level of expected surcharging and the available cover (i.e., the depth of the pipe).

1.1.2 Condition

This trigger would be activated if a known condition requires repair or replacement of the infrastructure. City staff input was also solicited to identify known pipe condition issues in the collection system.

1.1.3 Operational

Operational triggers are activated when an improvement will provided increased operational benefit, such as decommissioning aged infrastructure. This includes any lift station decommissioning.

1.1.4 City-Directed

This trigger is activated when City staff have indicated that items will be replaced, are required as part of upcoming policy changes, or are needed to manage growth.

In addition to these triggers, areas of the collection system not meeting minimum slope requirements were identified. Replacement of these existing lines was not recommended unless the minimum slope issue resulted in a previously listed trigger.

After triggers were identified, a modeling analysis was conducted to determine the most cost-effective improvements to implement, i.e., improvements that provided the maximum impact with minimal infrastructure for near and long term system growth. Alphabetical project groupings were developed in localized areas to address the identified improvements. The groupings were divided into three levels of flexibility based on the current condition of the need and anticipated criticality of the improvements. All groupings were then ranked numerically, with the most critical, lowest flexibility needs given the highest priority. For capacity triggers, higher priority was given to pipes with significant surcharging and low cover. The resultant project identification and rankings list provides the City with a directory of the most critical needs addressed in near-term and long-term projects.

1.2 Cost Development

Costs estimates were prepared for each individual project, based on industry standards and the 2017 bidding environment. These costs are an estimate, and should be re-evaluated as each project nears the trigger date. Each project has the following costs associated with the total OPCC:

1.2.1 Construction Costs

This cost is the estimated cost once the project has been designed and is ready for the bid phase to begin. It represents a combination of the estimated total construction costs, and includes a 20% contingency.

1.2.2 Engineering

The engineering estimate includes all professional services currently anticipated to bid each project, including survey, deed research (as needed), preliminary, and final design of all improvements. This cost is 20% of the estimated construction costs, including contingency. This does not include construction observation or start-up services.

1.2.3 Bid Item Descriptions:

Costs for manhole rehabilitation and pipeline installation costs were developed from a combination of neighboring city water and sewer project bid tabulations. Forecasted project costs are the estimated engineering and construction costs escalated by 3 percent per year to account for inflation between development of the OPCC and the midpoint of design and construction, respectively. Individual bid items are described as follows.

General Improvements: Anticipated sitework, backfill, erosion control, rehabilitation of existing structures, testing, easements, and contractor overhead costs.

Pipe Installation: Material and labor costs associated with SDR-35 pipe installation by open cut on a linear footage basis, depending on line size. Cost for all manholes, assuming an even distribution of 4-foot and 5-foot diameter installations is included, along with all sewer service wye connections and connections to existing pipes or manholes. The unit cost is also a function of pipe depth, where installations greater than or equal to 20-feet deep are subject to a 1.5x multiplier to reflect additional manhole, trench safety, and site improvements needed for the larger trenches required.

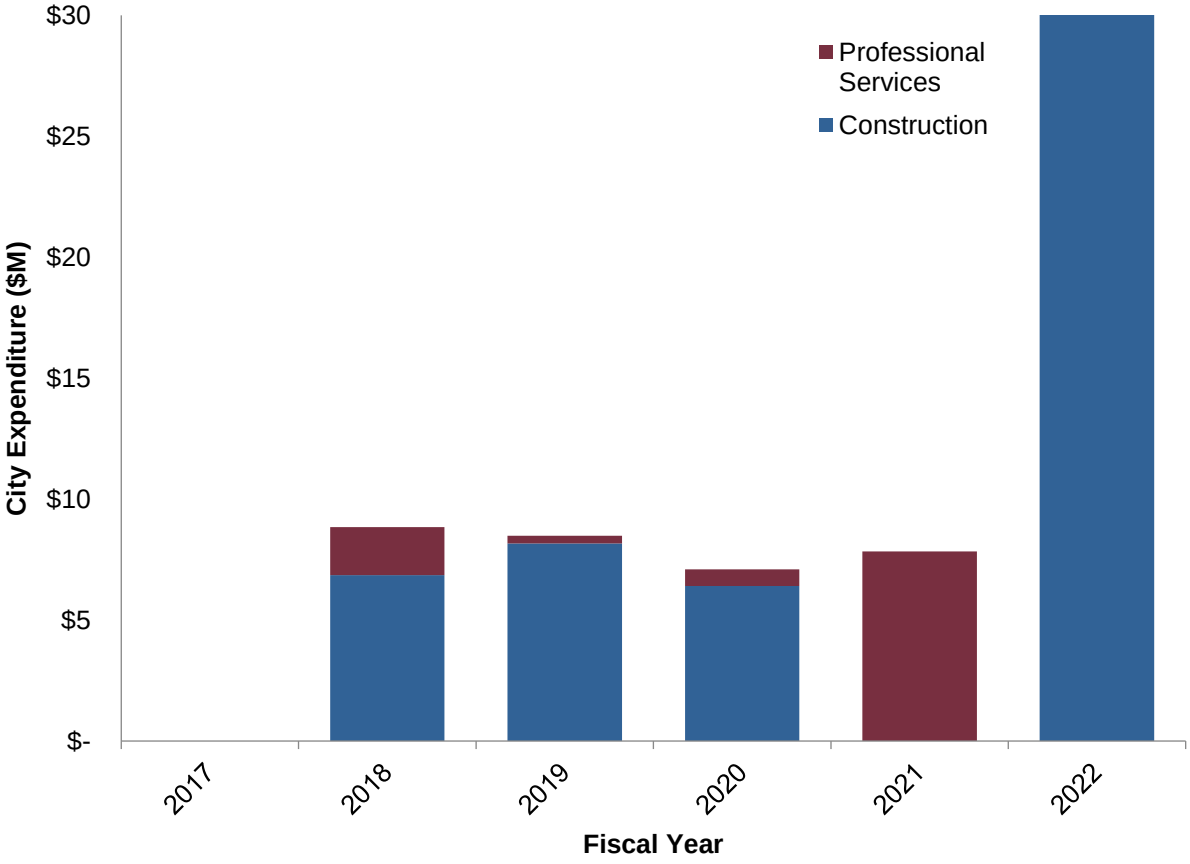
Bored Pipe Installation: Anticipated material, labor, sitework, backfill, erosion control, testing, easements, and contractor overhead costs associated with installation of pipe where boring is required, on a lump sum basis. These costs are dependent on line size, length and depth of boring, and location of boring.

A summary of pipe installation costs and typical associated general improvements is provided in Table 1. Table 1 was produced as a function of pipe diameter size and used to calculate the unit costs in $/LF. General improvements were assessed on a site-specific basis and the typical unit costs were used unless a specific project required a greater amount of general improvements. The unit price increase for pipe installation at a depth greater than 20-feet utilizing the 1.5x multiplier is also included in the table.

Table 1 - Pipe Installation Costs

	$/LF				
Size (in.)	PVC Sewer	General Improvements	Subtotal	Unit Price Increase, Depth >20'	Depth >20' Unit Price
6	$125.0	$75.0	$200.0	$62.5	$187.5
8	$150.0	$75.0	$225.0	$75.0	$225.0
10	$185.0	$75.0	$260.0	$92.5	$277.5
12	$195.0	$75.0	$270.0	$97.5	$292.5
15	$210.0	$100.0	$310.0	$105.0	$315.0
18	$225.0	$100.0	$325.0	$112.5	$337.5
21	$240.0	$100.0	$340.0	$120.0	$360.0
24	$255.0	$100.0	$355.0	$127.5	$382.5
27	$270.0	$100.0	$370.0	$135.0	$405.0
30	$275.0	$150.0	$425.0	$137.5	$412.5
36	$305.0	$150.0	$455.0	$152.5	$457.5
42	$335.0	$150.0	$485.0	$167.5	$502.5
48	$365.0	$150.0	$515.0	$182.5	$547.5
54	$400.0	$150.0	$550.0	$200.0	$600.0
60	$425.0	$150.0	$575.0	$212.5	$637.5

A proposed spending schedule is provided in . Further refinement of this spending schedule and associated project trigger dates is possible, depending upon City funding timeframes.



Proposed Spending Schedule for Wastewater CIP

1.3 Project Descriptions and Legend

A summary of Wastewater CIP items, schedule, and individual project descriptions and schematics are provided in the following pages.

Table 2: Wastewater CIP Summary

Project Identification					Schedule									Forecasted Cost ($1,000)		
Project	Grouping	Description	Location	Flexibility	Primary Trigger	Secondary Trigger	Trigger Lots	Trigger Date	Project Complete	Engineering /Design	Bid/ Construction	Total Project Duration	OPCC	Construction	Professional Services	OPCC
1	AC	WWTP expansion to 0.75 MGD	WWTP	Low	Capacity	Regulatory	0	Oct-17	Oct-18	12	12	12	$8,300	$8,169	$618	$8,787
2	B	12" line to replace Carter Ranch LS	South	Medium	Operational	Capacity	0	Oct-17	Oct-18	6	6	12	$1,502	$1,289	$258	$1,547
3	P	6" line to replace Lucy's LS	Downtown	High	Operational	Capacity	0	Oct-17	Jun-18	4	4	8	$120	$103	$20	$123
4	Q	8" and 10" line to replace Shawnee Trail No. 1 LS	South	High	Operational	Capacity	0	Oct-17	Oct-18	6	6	12	$1,172	$1,006	$201	$1,207
5	C	8" line to replace Winn Road LS	Downtown	High	Operational	Capacity	0	Oct-17	Oct-18	6	6	12	$486	$417	$83	$501
6	R	10" and 12" line to provide additional capacity for the addition of the Chalk Hill LS	North	Medium	Capacity	Operational	0	Oct-17	Oct-18	6	6	12	$915	$785	$157	$943
7	AA	Manhole rehabilitation from PK I/I study	Downtown	Medium	Condition	Operational	0	Oct-17	Oct-18	6	6	12	$422	$362	$72	$434
8	AB	Pipeline rehabilitation from PK I/I study	Downtown	Medium	Condition	Operational	0	Oct-17	Oct-18	6	6	12	$761	$653	$131	$784
9	O	12" line replacement to increase capacity to Heritage	North	High	Capacity	Operational	0	Oct-17	Oct-18	6	6	12	$1,244	$1,068	$214	$1,281
10	A	24" line replacement to increase capacity along Light Farms	South	High	Capacity	Operational	0	Oct-17	Oct-18	6	6	12	$1,362	$1,169	$234	$1,403
11	AD	WWTP expansion to 0.95 MGD	WWTP	Low	Capacity	Regulatory	1,526	Oct-18	Oct-20	12	12	24	$3,000	$2,950	$318	$3,269
12	N	New 30", 36", 42", and 60" interceptor from Downtown WWTP to future WWTP; 8" interceptor to replace Willock Hills LS	South	Low	Capacity	Operational	3,233	Oct-19	Oct-22	24	12	36	$43,144	$41,680	$7,857	$49,537
13	T	18" line replacement to increase capacity Downtown	Downtown	High	Capacity	Operational	3,233	Oct-19	Oct-20	6	6	12	$3,066	$2,792	$558	$3,351
14	U	15" line along FM 455 across Preston Rd	South	High	Capacity	Operational	3,233	Oct-19	Oct-20	6	6	12	$734	$668	$134	$802

Total 2017 OPCC:	**$66,227,007**	**Total Forecasted OPCC:**	**$73,967,030**

Table 3: Development Driven Projects

Project Identification					Schedule									Forecasted Cost ($1,000)		
Project	Grouping	Description	Location	Flexibility	Primary Trigger	Secondary Trigger	Trigger Lots	Trigger Date	Project Complete	Engineering /Design	Bid/ Construction	Total Project Duration	OPCC	Construction	Professional Services	OPCC
1	AC	WWTP expansion to 0.75 MGD	WWTP	Low	Capacity	Regulatory	0	Oct-17	Oct-18	12	12	12	$8,300	$8,169	$618	$8,787
6	R	10" and 12" line to provide additional capacity for the addition of the Chalk Hill LS	North	Medium	Capacity	Operational	0	Oct-17	Oct-18	6	6	12	$915	$785	$157	$943
10	A	24" line replacement to increase capacity along Light Farms	South	High	Capacity	Operational	0	Oct-17	Oct-18	6	6	12	$1,362	$1,169	$234	$1,403
11	AD	WWTP expansion to 0.95 MGD	WWTP	Low	Capacity	Regulatory	1,526	Oct-18	Oct-20	12	12	24	$3,000	$2,950	$318	$3,269
12	N	New 30", 36", 42", and 60" interceptor from Downtown WWTP to future WWTP; 8" interceptor to replace Willock Hills LS	South	Low	Capacity	Operational	3,233	Oct-19	Oct-22	24	12	36	$43,144	$41,680	$7,857	$49,537
												Total 2017 OPCC:	**$56,720,948**	**Total Forecasted OPCC:**		**$63,938,025**

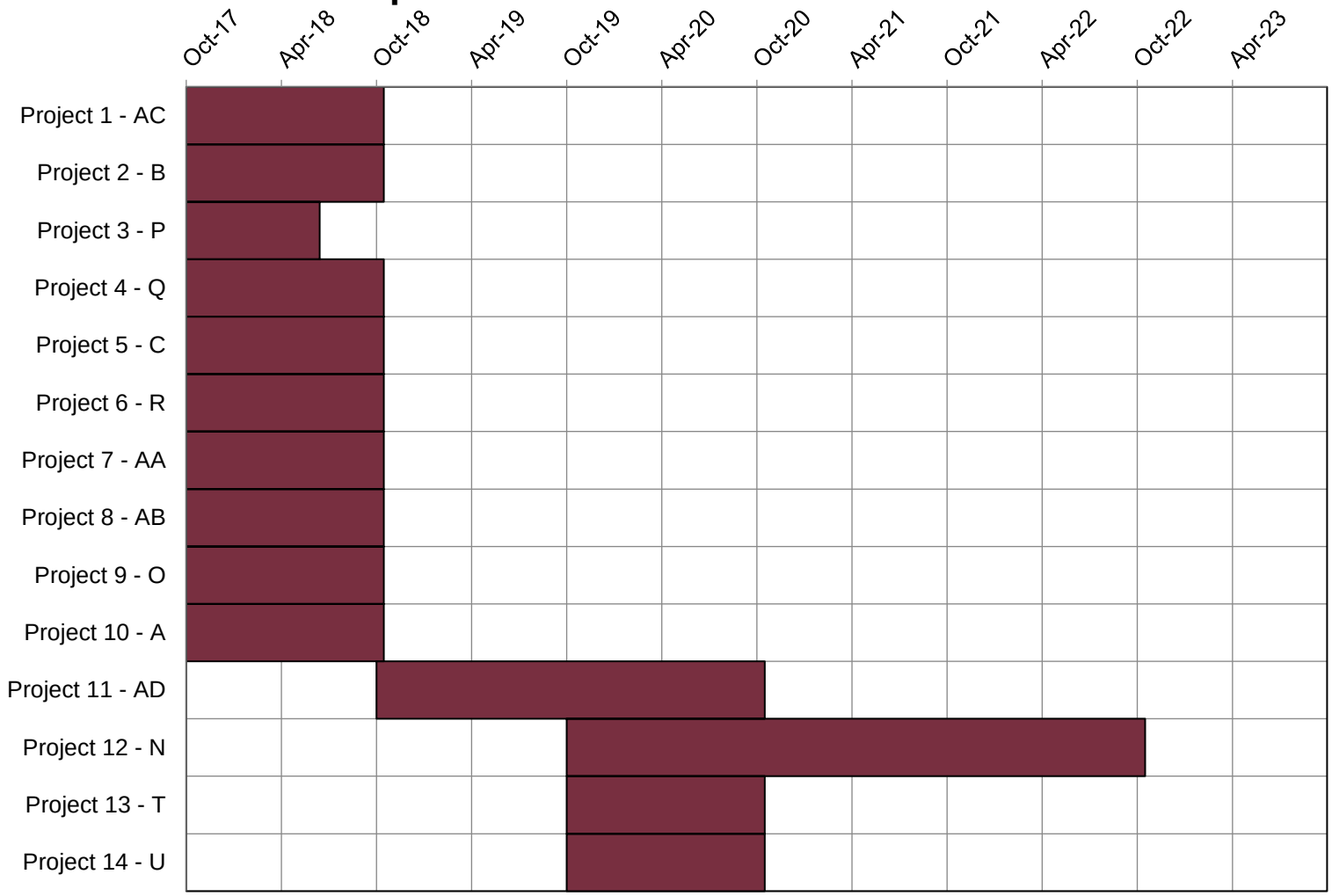
Table 4: Operational Projects

Project Identification					Schedule									Forecasted Cost ($1,000)		
Project	Grouping	Description	Location	Flexibility	Primary Trigger	Secondary Trigger	Trigger Lots	Trigger Date	Project Complete	Engineering /Design	Bid/ Construction	Total Project Duration	OPCC	Construction	Professional Services	OPCC
2	B	12" line to replace Carter Ranch LS	South	Medium	Operational	Capacity	0	Oct-17	Oct-18	6	6	12	$1,502	$1,289	$258	$1,547
3	P	6" line to replace Lucy's LS	Downtown	High	Operational	Capacity	0	Oct-17	Jun-18	4	4	8	$120	$103	$20	$123
4	Q	8" and 10" line to replace Shawnee Trail No. 1 LS	South	High	Operational	Capacity	0	Oct-17	Oct-18	6	6	12	$1,172	$1,006	$201	$1,207
5	C	8" line to replace Winn Road LS	Downtown	High	Operational	Capacity	0	Oct-17	Oct-18	6	6	12	$486	$417	$83	$501
												Total 2017 OPCC:	**$3,279,312**	**Total Forecasted OPCC:**		**$3,377,092**

Table 5: I/I Projects

Project Identification					Schedule									Forecasted Cost ($1,000)		
Project	Grouping	Description	Location	Flexibility	Primary Trigger	Secondary Trigger	Trigger Lots	Trigger Date	Project Complete	Engineering /Design	Bid/ Construction	Total Project Duration	OPCC	Construction	Professional Services	OPCC
7	AA	Manhole rehabilitation from PK I/I study	Downtown	Medium	Condition	Operational	0	Oct-17	Oct-18	6	6	12	$422	$362	$72	$434
8	AB	Pipeline rehabilitation from PK I/I study	Downtown	Medium	Condition	Operational	0	Oct-17	Oct-18	6	6	12	$761	$653	$131	$784
9	O	12" line replacement to increase capacity to Heritage	North	High	Capacity	Operational	0	Oct-17	Oct-18	6	6	12	$1,244	$1,068	$214	$1,281
13	T	18" line replacement to increase capacity Downtown	Downtown	High	Capacity	Operational	3,233	Oct-19	Oct-20	6	6	12	$3,066	$2,792	$558	$3,351
14	U	15" line along FM 455 across Preston Rd	South	High	Capacity	Operational	3,233	Oct-19	Oct-20	6	6	12	$734	$668	$134	$802
												Total 2017 OPCC:	**$6,226,747**	**Total Forecasted OPCC:**		**$6,651,913**

Proposed 5 Year Wastewater CIP Schedule



Project 1: Sewer Group AC Downtown WWTP Phase I Improvements

Project Identification	
Number:	1
Grouping:	AC
Location:	WWTP
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	12
Bid/Construction:	12
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$7.70	$8.17
Professional Services	$0.60	$0.62
Total Project Cost	**$8.30**	**$8.79**

Project Description
This ongoing project involves conversion of the Downtown WWTP from a flow-through SBR and oxidation ditch plant to a conventional activated sludge plant as part of an expansion to 0.75 MGD. This project also includes upgrades to the headworks and construction of new disinfection facilities. Engineering of the improvements began in 2017.

Justification
The Downtown WWTP is currently operating at or above its permitted capacity, and flows from new developments will overwhelm the plant's capacity in the near future. These improvements will provide capacity needed for the Downtown WWTP to remain in compliance with its discharge permit.

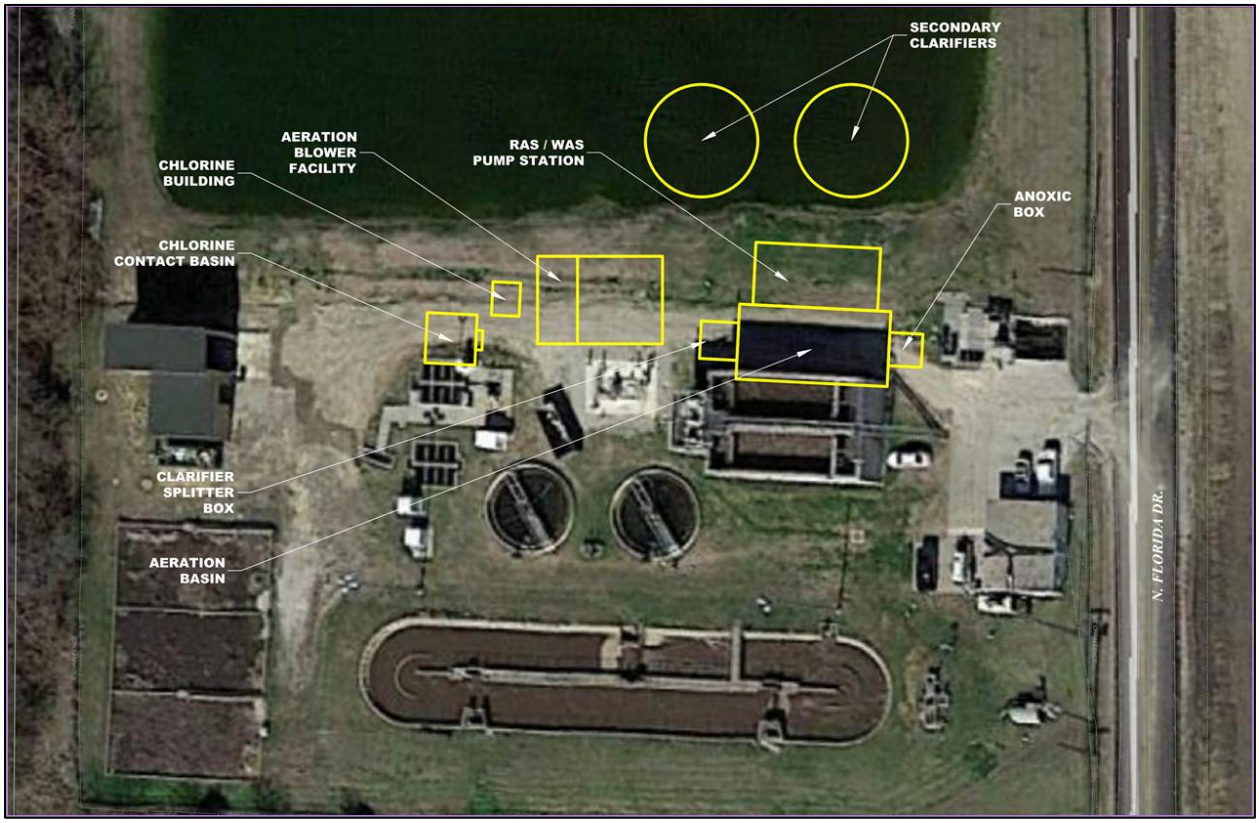
Unintended Consequences
None identified.

Special Considerations
None identified.

Potential Alternatives
The City could proceed with a package WWTP until a regional WWTP is available to take flow from the Downtown WWTP.

AC			
Description	**Unit Cost**	**Quantity**	**Cost**
WWTP improvements (0.75 MGD)	LS	1	$ 7,700,000
		Subtotal	$ 7,700,000
		Professional Services	$ 600,000
		OPCC	$ 8,300,000

Project 1 Schematic



Project 2: Sewer Group B Line Improvements

Project Description
The project includes installation of 12-inch pipe to eliminate the need for the Carter Ranch Lift Station.

Justification
This project allows decommissioning of the Carter Ranch Lift Station and provides for gravity rather than pumped flow.

Unintended Consequences
The lift station currently pumps north, then flows across Preston in a gravity sewer interceptor. That interceptor would see additional capacity by the decommissioning of the lift station, while the line interceptor that feeds the SE Sector LS will see increased flow.

Special Considerations
A bored pipe installation will be required to cross Preston Road.

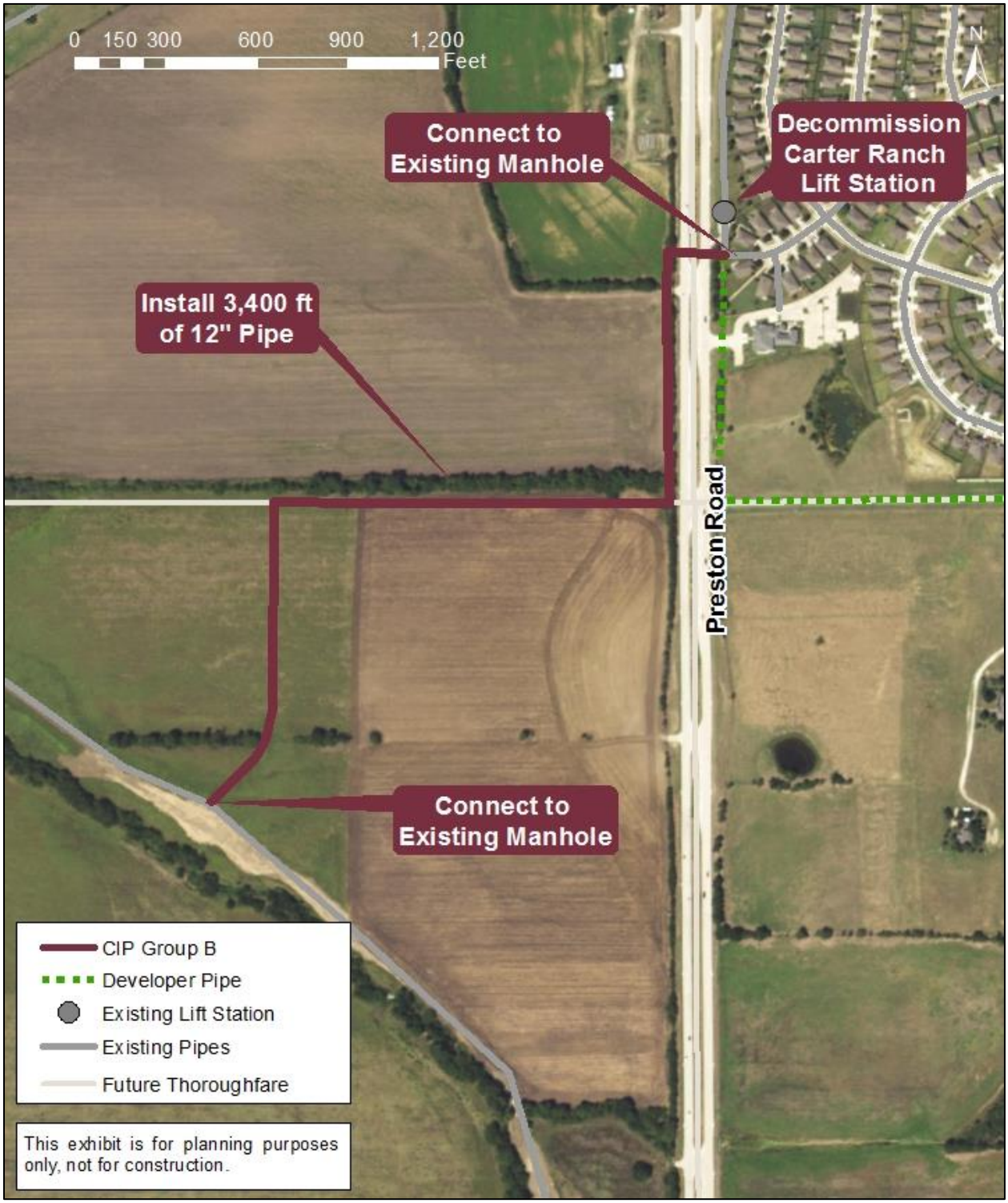
Potential Alternatives
If this project is not constructed, the Carter Ranch Lift Station must remain online. Alternative alignments are also possible, depending on the development plans for the undeveloped area.

Project Identification	
Number:	2
Grouping:	B
Location:	South
Flexibility:	Medium
Schedule	
Primary Trigger:	Operational
Secondary Trigger:	Capacity
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$1.25	$1.29
Professional Services	$0.25	$0.26
Total Project Cost	**$1.50**	**$1.55**

Group B					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft)**	**Cost**
12	Pipe installation	<20	195	3,400	$ 663,000
	General improvements		75		$ 255,000
Description			**Unit**	**Quantity**	**Cost**
Bored pipe installation			LS	1	$ 125,000
				Subtotal	$ 1,043,000
				Contingency (20%)	$ 208,600
				Professional Services	$ 250,320
				OPCC	$ 1,501,920

Project 2 Schematic



Project 3: Sewer Group P Improvements

Project Description
This project involves replacement of the existing Lucy's Lift Station force main with a 6-inch gravity collector.

Justification
This project will allow the Lucy's Lift Station to be decommissioned.

Unintended Consequences
None identified.

Special Considerations
Utility easements may be needed in this area and the alignment may need to shift during detailed design to accommodate property lines and easements. General improvements costs have been increased due to the location of the proposed pipeline.

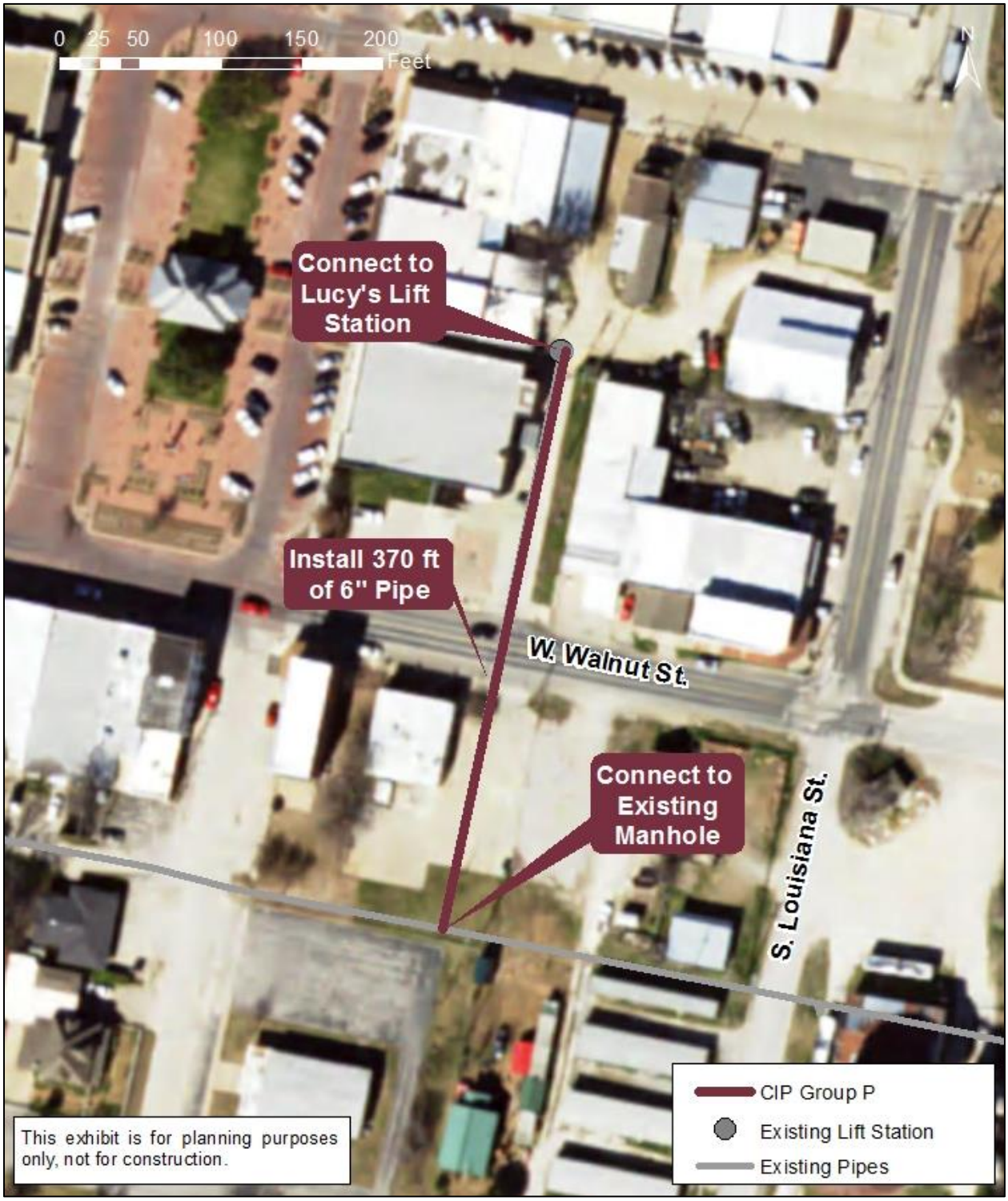
Potential Alternatives
If this project is not completed, Lucy's Lift Station would remain in service. The continued use of Lucy's Lift Station as a manhole versus installation of a new manhole and connection of existing services should be evaluated during the design of this project.

Project Identification	
Number:	3
Grouping:	P
Location:	Downtown
Flexibility:	High
Schedule	
Primary Trigger:	Operational
Secondary Trigger:	Capacity
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Jun-2018
Project Implementation (Months)	
Engineering/Design:	4
Bid/Construction:	4
Total Project Duration:	8

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.10	$0.10
Professional Services	$0.02	$0.02
Total Project Cost	**$0.12**	**$0.12**

Group P					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
6	Pipe installation	<20	125	370	$ 46,250
	General improvements		100		$ 37,000
				Subtotal	$ 83,250
				Contingency (20%)	$ 16,650
				Professional Services	$ 19,980
				OPCC	$ 119,880

Project 3 Schematic



Project 4: Sewer Group Q Improvements

Project Description
This project involves installation of new 8- and 10-inch gravity lines along Doe Branch, just south of FM 455.

Justification
This project will allow the Shawnee Trail No. 1 Lift Station to be decommissioned.

Unintended Consequences
None identified.

Special Considerations
This pipeline crosses an undeveloped area and easement acquisition is likely required. Bored pipe installation may be required to cross FM 455. The alignment is flexible and should be optimized during design to minimize the necessary installation depth. The alignment shown has an approximate depth of 10-ft, relative to the 30-ft depth required if the pipe follows the alignment of FM 455.

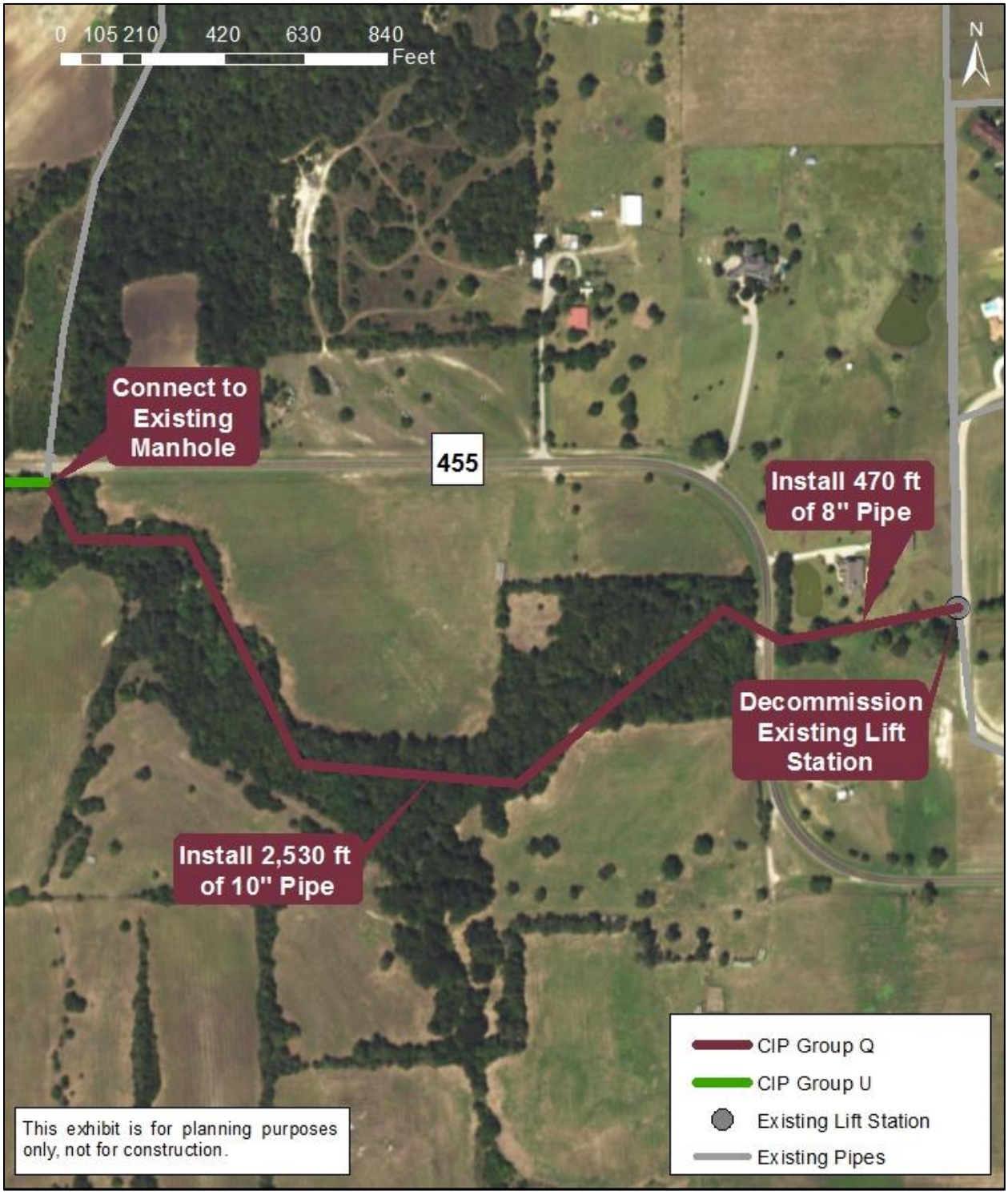
Potential Alternatives
If this project is not completed, Shawnee Trail No. 1 Lift Station would remain in service.

Project Identification	
Number:	4
Grouping:	Q
Location:	South
Flexibility:	High
Schedule	
Primary Trigger:	Operational
Secondary Trigger:	Capacity
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.98	$1.01
Professional Services	$0.20	$0.20
Total Project Cost	**$1.17**	**$1.21**

Group Q					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
8	Pipe installation	<20	150	470	$ 70,500
	General improvements		75		$ 35,250
10	Pipe installation	<20	185	2,530	$ 468,050
	General improvements		75		$ 189,750
Description			**Unit**	**Quantity**	**Cost**
Bored pipe installation			LS	1	$ 50,000
				Subtotal	$ 813,550
				Contingency (20%)	$ 162,710
				Professional Services	$ 195,252
				OPCC	$ 1,171,512

Project 4 Schematic



Project 5: Sewer Group C Line Improvements

Project Description
This project involves installation of a new 8-inch gravity line along Winn Road from S. Arizona Drive to the intersection of South Utah Drive and West Cedar Street northwest of Celina Elementary school.

Justification
This project will allow the Winn Road Lift Station to be decommissioned.

Unintended Consequences
None identified.

Special Considerations
None identified.

Potential Alternatives
If this project is not completed, the Winn Road Lift Station would remain in service.

Project Identification	
Number:	5
Grouping:	C
Location:	Downtown
Flexibility:	High
Schedule	
Primary Trigger:	Operational
Secondary Trigger:	Capacity
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.41	$0.42
Professional Services	$0.08	$0.08
Total Project Cost	**$0.49**	**$0.50**

Group C					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft)**	**Cost**
8	Pipe installation	<20	150	1,500	$ 225,000
	General improvements		75		$ 112,500
				Subtotal	$ 337,500
				Contingency (20%)	$ 67,500
				Professional Services	$ 81,000
				OPCC	$ 486,000

Project 5 Schematic

Project 6: Sewer Group R Line Improvements

Project Description
This project replaces existing 8-inch gravity lines along Preston Road with 10-inch and 12-inch pipelines.

Justification
This project provides the additional capacity needed to accommodate flows from the Chalk Hill Lift Station installed under CIP Group Y.

Unintended Consequences
None identified.

Special Considerations
None identified.

Potential Alternatives
These pipelines will not be necessary if the City elects not to install the Chalk Hill Lift Station.

Project Identification	
Number:	6
Grouping:	R
Location:	North
Flexibility:	Medium
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Operational
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.76	$0.79
Professional Services	$0.15	$0.16
Total Project Cost	**$0.92**	**$0.94**

Group R					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft)**	**Cost**
10	Pipe installation	<20	185	1,520	$ 281,200
	General improvements		75		$ 114,000
12	Pipe installation	<20	195	890	$ 173,550
	General improvements		75		$ 66,750
				Subtotal	$ 635,500
				Contingency (20%)	$ 127,100
				Professional Services	$ 152,520
				OPCC	$ 915,120

Project 6 Schematic

Project 7: Sewer Group AA Improvements

Project Identification	
Number:	7
Grouping:	AA
Location:	Downtown
Flexibility:	Medium
Schedule	
Primary Trigger:	Condition
Secondary Trigger:	Operational
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.35	$0.36
Professional Services	$0.07	$0.07
Total Project Cost	**$0.42**	**$0.43**

Project Description

The project involves the rehabilitation of manholes throughout Downtown as identified in the manhole assessment. This assessment was conducted under a separate inflow and infiltration (I/I) study performed by Pacheco Koch.

Manhole repairs are intended to reduce I/I into the City's collection system. Methods for repair will vary depending on the type and severity of the defect. Manholes in the CIP group exhibited I/I, and application of a cementitious lining material with an antimicrobial additive was recommended, along with replacement of the cone sections. Some of these manholes will require a watertight sealant due to large amounts of I/I.

Smoke testing identified other manholes that contribute to I/I, but can be repaired using simple maintenance procedures. These maintenance costs are listed in the Manhole Repairs group.

This project should be completed at the same time as Project 8: Sewer Group AB Improvements.

Further cost information is located in the I/I Report, completed in June 2016.

Justification

Through the I/I study, it was determined that these manholes presented severe defects that contribute to inflow and infiltration in the Downtown portion of the collection system. It is intended that the base wastewater flow would be decreased as the inflow and infiltration into the system is improved, and the manhole useful life would be extended by these repairs. In addition, the new cone sections will accommodate 30-inch manholes in accordance with TCEQ requirements. Some damage due to H_2S gas was identified, and although it was not identified as an immediate safety or operational concern, manhole rehabilitation will prevent future damage.

Unintended Consequences

Reducing infiltration in certain areas may cause groundwater tables to rise slightly, however this is not expected to be significant.

Special Considerations

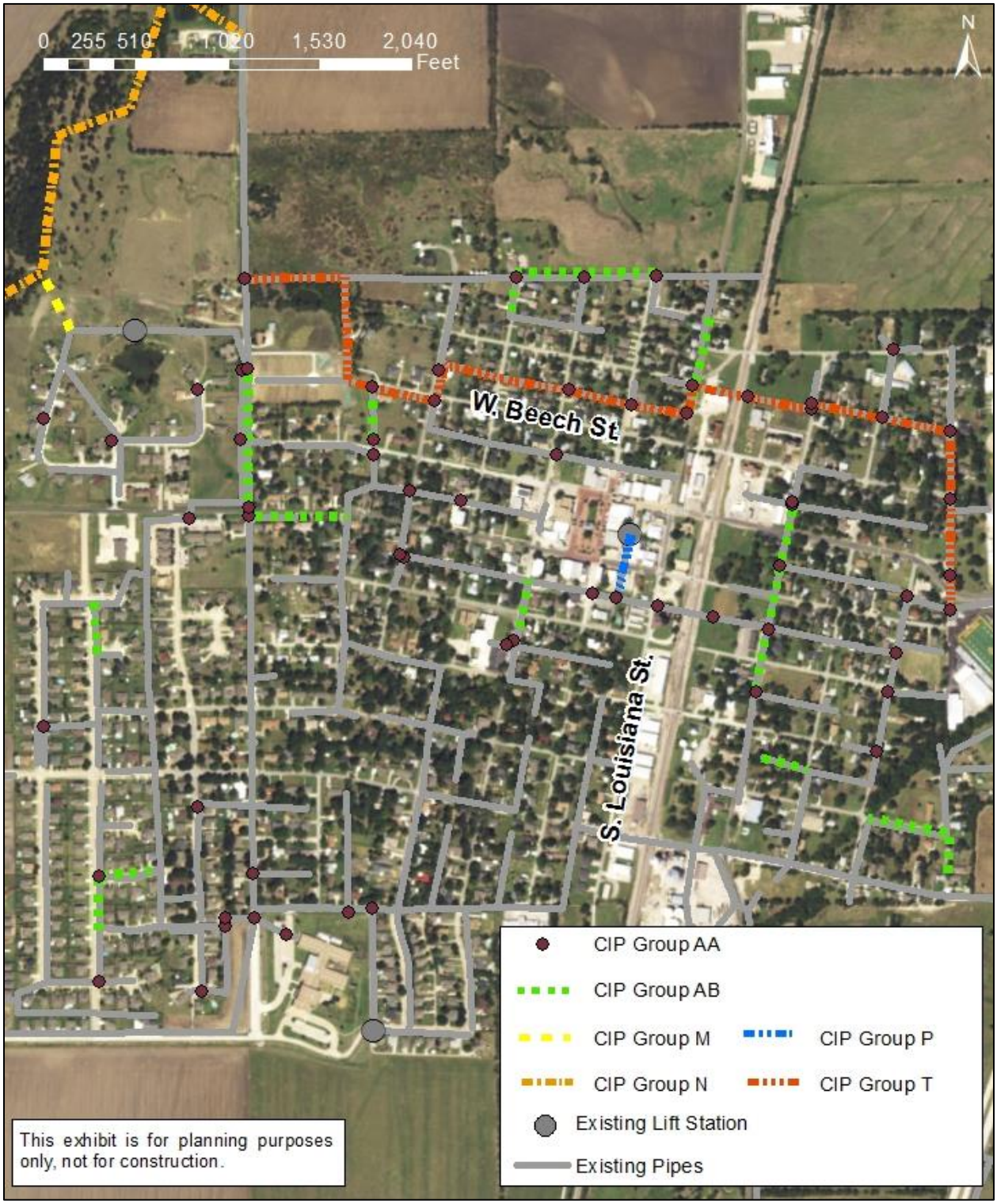
Consideration should be given to the type of rehabilitation technology employed. Waterproofing manholes in high groundwater tables may have a tendency to cause the manholes to float, and some manhole rehabilitation types would prevent future modifications to the manhole inverts (thereby requiring full manhole replacement if future lines are added or modified).

Potential Alternatives

While various alternatives exist for each of the recommended rehabilitation methods, the only alternative to manhole rehabilitation in most cases is total replacement, which is anticipated to be more expensive. Manholes identified as part of this project could be shifted to other Wastewater CIP projects to minimize duplicated efforts.

AA			
Description	**Unit Cost**	**Quantity**	**Cost**
Manhole CIP	LS	1	$ 279,160
Manhole repairs	LS	1	$ 13,760
		Subtotal	$ 292,920
		Contingency (20%)	$ 58,584
		Professional Services	$ 70,301
		OPCC	$ 421,805

Project 7 Schematic



Project 8: Sewer Group AB Improvements

Project Identification	
Number:	8
Grouping:	AB
Location:	Downtown
Flexibility:	Medium
Schedule	
Primary Trigger:	Condition
Secondary Trigger:	Operational
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.63	$0.65
Professional Services	$0.13	$0.13
Total Project Cost	**$0.76**	**$0.78**

Project Description

The project involves the replacement or rehabilitation of pipelines in the downtown area. These pipelines and recommendations were identified under a separate inflow and infiltration (I/I) study performed by Pacheco Koch.

Pipeline repairs are intended to reduce I/I and minimize future pipe structural failures in the City's collection system. Pipelines were grouped according to the type and severity of defects. The Pipeline CIP group consists of pipes designated as in need of replacement due to collapse, imminent collapse, or I/I exposure. The Pipeline Cleaning group includes a list of pipes that should be cleaned to reduce the potential for mainline blockages.

This project should be completed at the same time as Project 7: Sewer Group AA Improvements.

Pipeline repairs identified by the I/I study and included under Project 13: Sewer Group T Line Improvements are not included in this project cost. Further cost information is located in the I/I Report, completed in June 2016.

Justification

Through the I/I study, it was determined that these pipelines presented severe defects that contribute to inflow and infiltration in the Downtown portion of the collection system. It is intended that the base wastewater flow would be decreased as the inflow and infiltration into the system is improved, and the useful life of system components would be extended by these repairs. In addition, these repairs will also minimize the chance of future problems due to pipe collapse. Pipeline cleaning will improve the reliability of the system by minimizing blockages.

Unintended Consequences

Reducing infiltration in certain areas may cause groundwater tables to rise slightly, however this is not expected to be significant.

Special Consideration

Pipeline replacement and maintenance of pipelines connecting to other Wastewater CIP groups should be coordinated with the Wastewater CIP groups to minimize duplication of effort. These efforts could be combined with the connecting Wastewater CIP groups.

Potential Alternatives

None identified.

AB			
Description	**Unit Cost**	**Quantity**	**Cost**
Pipeline CIP	LS	1	$ 434,830
Pipeline cleaning	LS	1	$ 93,480
		Subtotal	$ 528,310
		Contingency (20%)	$ 105,662
		Professional Services	$ 126,794
		OPCC	$ 760,766

Project 8 Schematic

Project 9: Sewer Group O Improvements

Project Description
This project includes replacing existing 8-inch pipelines that serve the Heritage development with 12-inch pipelines to increase capacity.

Justification
This project would increase capacity in this area to alleviate surcharging.

Unintended Consequences
None identified.

Special Considerations
None identified.

Potential Alternatives
This drainage basin receives high inflow and infiltration (I/I), and these improvements could potentially be eliminated if I/I is reduced. An I/I study is recommended and currently ongoing to attempt to reduce I/I levels. Following the I/I reduction efforts, the proposed pipe sizing could be re-evaluated.

Project Identification	
Number:	9
Grouping:	O
Location:	North
Flexibility:	High
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Operational
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$1.04	$1.07
Professional Services	$0.21	$0.21
Total Project Cost	**$1.24**	**$1.28**

Group O					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
12	Pipe installation	<20	195	3,200	$ 624,000
	General improvements		75		$ 240,000
				Subtotal	$ 864,000
				Contingency (20%)	$ 172,800
				Professional Services	$ 207,360
				OPCC	$ 1,244,160

Project 9 Schematic

Project 10: Sewer Group A Line Improvements

Project Identification	
Number:	10
Grouping:	A
Location:	South
Flexibility:	High
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Operational
Trigger # of Lots Constructed	0
Trigger Date:	Oct-2017
Project Complete:	Oct-2018
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$1.13	$1.17
Professional Services	$0.23	$0.23
Total Project Cost	**$1.36**	**$1.40**

Project Description
This project includes replacing existing 18-inch pipes along Light Farms Way with a 24-inch pipe for increased capacity.

Justification
This project will increase capacity and eliminate an area in which a 21-inch pipe feeds into an 18-inch pipe. These repairs will be needed when the SE Sector Lift Station operates at higher flow rates.

Unintended Consequences
None identified.

Special Considerations
Consideration should be given to the type of pipeline installation method chosen during construction, to ensure that proper slopes are met and the existing pipeline at either end of the improvement is maintained.

Potential Alternatives
To provide full build-out capacity, a parallel 30-inch line will be required in the future. Alternatively, a single 36-inch line could be installed as part of this CIP. If this alternative is pursued, special consideration should be given to existing flows during design, as deposition may occur during low flows. In either case, flows to the SE Sector Lift Station are currently low, so this project has high flexibility.

Group A					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft)**	**Cost**
24	Pipe installation	≥20	382.5	1,960	$ 749,700
	General improvements		100		$ 196,000
				Subtotal	$ 945,700
				Contingency (20%)	$ 189,140
				Professional Services	$ 226,968
				OPCC	$ 1,361,808

Project 10 Schematic

Project 11: Sewer Group AD Downtown WWTP Phase II Improvements

Project Description
The project involves expansion of the Downtown WWTP from 0.75 to 0.95 MGD through construction of additional conventional activated sludge treatment volume. This project also includes headworks upgrades.

Justification
These improvements will provide capacity needed for the Downtown WWTP to remain in compliance with its discharge permit.

Unintended Consequences
None identified.

Special Considerations
None identified.

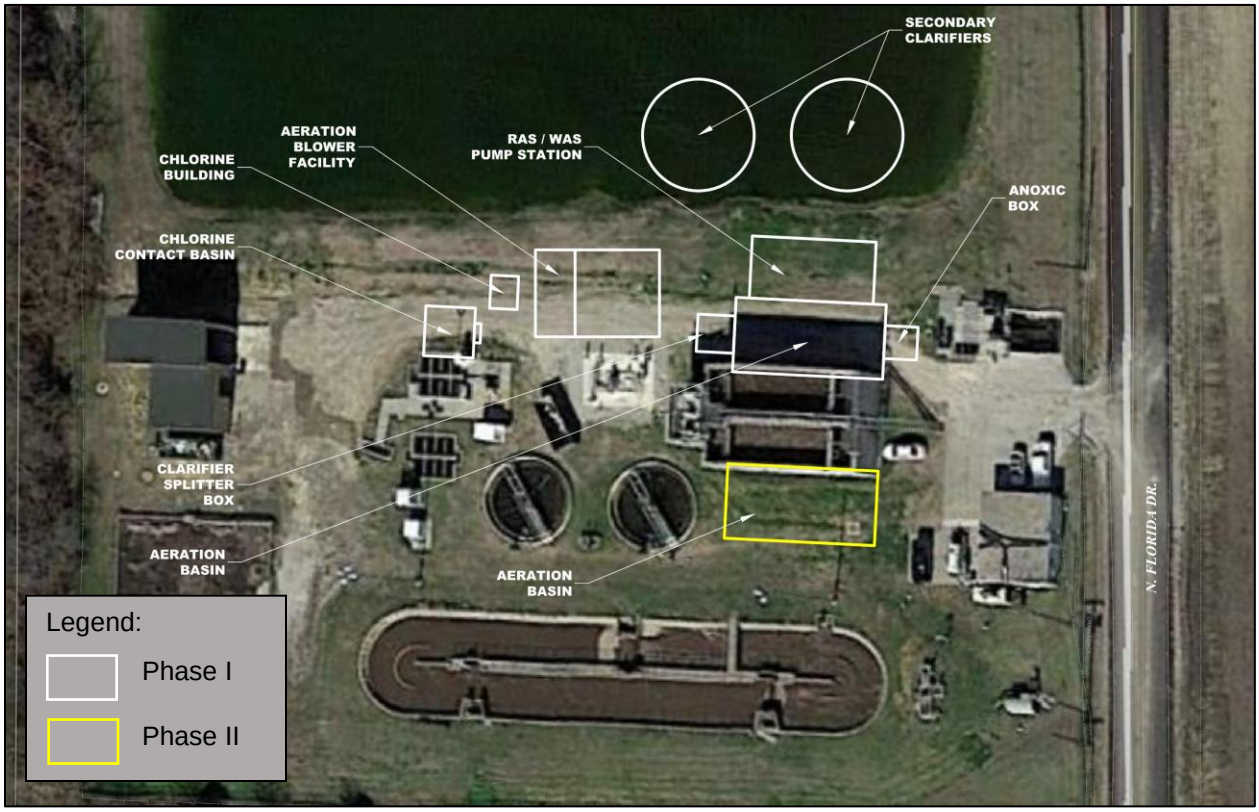
Potential Alternatives
None identified.

Project Identification	
Number:	11
Grouping:	AD
Location:	WWTP
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Regulatory
Trigger # of Lots Constructed	1,526
Trigger Date:	Oct-2018
Project Complete:	Oct-2020
Project Implementation (Months)	
Engineering/Design:	12
Bid/Construction:	12
Total Project Duration:	24

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$2.70	$2.95
Professional Services	$0.30	$0.32
Total Project Cost	**$3.00**	**$3.27**

AD			
Description	**Unit Cost**	**Quantity**	**Cost**
WWTP Improvements (0.95 MGD)	LS	1	$ 2,700,000
		Subtotal	$ 2,700,000
		Professional Services	$ 300,000
		OPCC	$ 3,000,000

Project 11 Schematic



Project 12: Sewer Group N Improvements

Project Identification	
Number:	12
Grouping:	N
Location:	South
Flexibility:	Low
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Operational
Trigger # of Lots Constructed	3,233
Trigger Date:	Oct-2019
Project Complete:	Oct-2022
Project Implementation (Months)	
Engineering/Design:	24
Bid/Construction:	12
Total Project Duration:	36

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$35.95	$41.68
Professional Services	$7.19	$7.86
Total Project Cost	**$43.14**	**$49.54**

Project Description

This project includes a new interceptor from the Downtown WWTP across undeveloped land to the future WWTP and the Willock Hills gravity bypass. This interceptor will consist of 30-, 36-, 42-, and 60-inch pipelines. Full buildout of this area will include the installation of an additional parallel pipeline on the 36-, 42-, and 60-inch pipelines to accommodate future flows. The Willock Hills gravity bypass will consist of an 8-inch pipeline.

Justification

Even with the expansion currently in design, the Downtown WWTP will rapidly reach its capacity due to development in the northern part of the City. This project will allow flows from the Downtown WWTP to be directed to a new WWTP, allowing the City to accommodate ongoing and future development.

Unintended Consequences

None identified.

Special Considerations

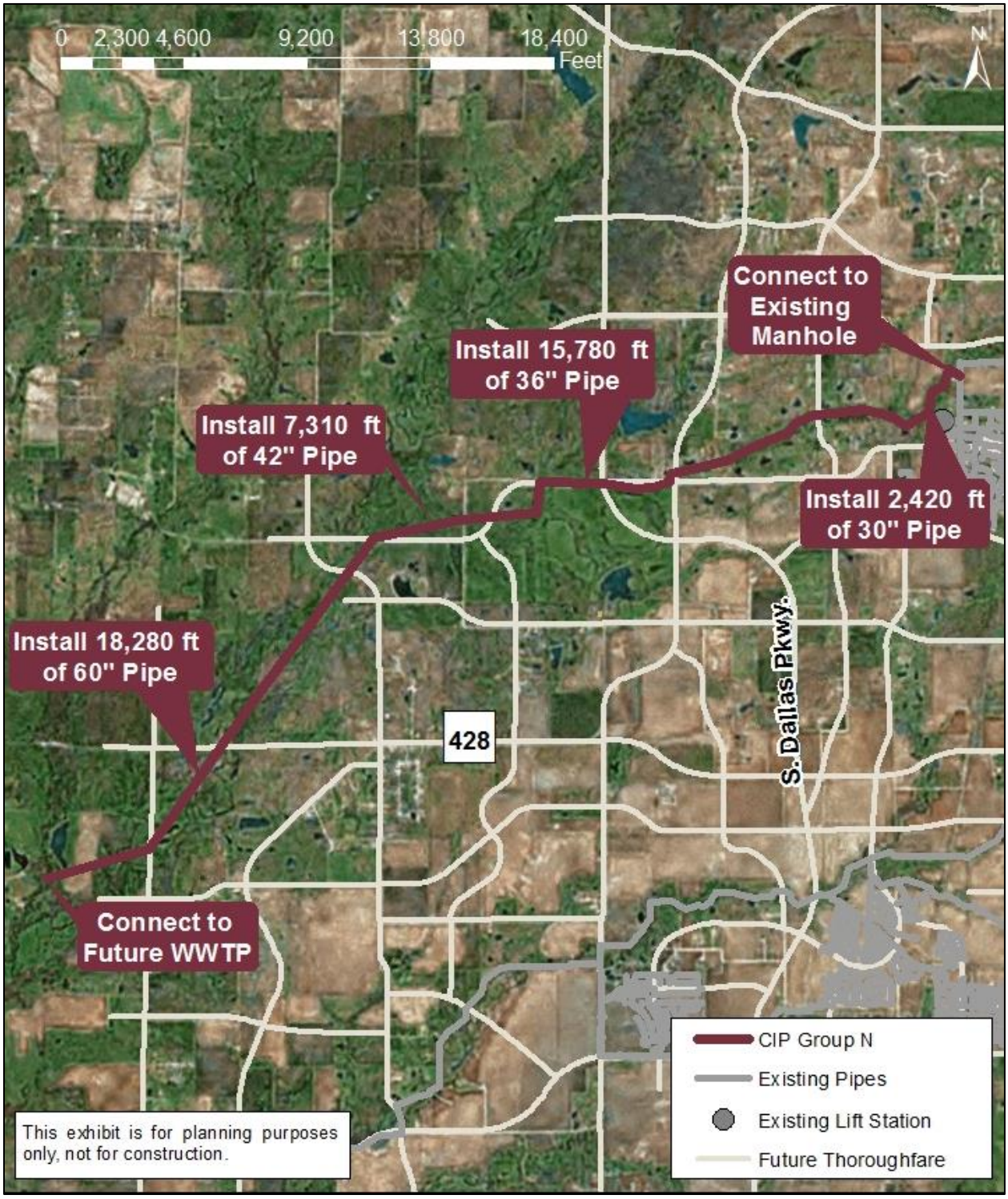
The alignment of this interceptor is flexible, and may be optimized during design. Bored pipeline installations may be required to cross FM 1385 and CR 455, and easement acquisition may be necessary in undeveloped areas.

Potential Alternatives

In lieu of constructing this interceptor, the City could elect to construct additional treatment volume, in excess of the planned expansion to 0.95 MGD, at the Downtown WWTP.

Group N					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft)**	**Cost**
8	Pipe installation	<20	150	360	$ 54,000
	General improvements		75		$ 27,000
30	Pipe installation	<20	275	2,420	$ 665,500
	General improvements		150		$ 363,000
36	Pipe installation	≥20	457.5	15,780	$ 7,219,350
	General improvements		150		$ 2,367,000
42	Pipe installation	≥20	502.5	7,310	$ 3,673,275
	General improvements		150		$ 1,096,500
60	Pipe installation	≥20	637.5	18,280	$ 11,653,500
	General improvements		150		$ 2,742,000
Description			**Unit**	**Quantity**	**Cost**
Bored pipe installation			LS	1	$ 100,000
				Subtotal	$ 29,961,125
				Contingency (20%)	$ 5,992,225
				Professional Services	$ 7,190,670
				OPCC	$ 43,144,020

Project 12 Schematic



Project 13: Sewer Group T Line Improvements

Project Description
The project includes a replacement of an existing 12-inch line with an 18-inch line in the Downtown area.

Justification
This project provides capacity needed to send flow from the Heritage development to the Downtown WWTP.

Unintended Consequences
None identified.

Special Considerations
Bored pipe installation would be required to cross the railroad tracks, N. Louisiana Drive., N. Oklahoma Drive, and FM 455, and easement coordination will be required.

Potential Alternatives
An I/I study is recommended and currently ongoing to attempt to reduce I/I levels. Following the I/I reduction efforts, the proposed pipe sizing could be re-evaluated.

Project Identification	
Number:	13
Grouping:	T
Location:	Downtown
Flexibility:	High
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Operational
Trigger # of Lots Constructed	3,233
Trigger Date:	Oct-2019
Project Complete:	Oct-2020
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$2.56	$2.79
Professional Services	$0.51	$0.56
Total Project Cost	**$3.07**	**$3.35**

Group T					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
18	Pipe installation	<20	225	5,860	$ 1,318,500
	General improvements		100		$ 586,000
Description			**Unit Cost**	**Quantity**	**Cost**
Bored pipe installation			LS	1	$ 225,000
				Subtotal	$ 2,129,500
				Contingency (20%)	$ 425,900
				Professional Services	$ 511,080
				OPCC	$ 3,066,480

Project 13 Schematic

Project 14: Sewer Group U Line Improvements

Project Description
The project includes a new 15" line along FM 455, crossing Preston Road.

Justification
This project provides capacity needed to send flow from the Heritage development to the Downtown WWTP.

Unintended Consequences
None identified.

Special Considerations
Bored pipe installation would be required to cross Preston Road, and easement coordination will be required.

Potential Alternatives
An I/I study is recommended and currently ongoing to attempt to reduce I/I levels. Following the I/I reduction efforts, the proposed pipe sizing could be re-evaluated.

Project Identification	
Number:	14
Grouping:	U
Location:	South
Flexibility:	High
Schedule	
Primary Trigger:	Capacity
Secondary Trigger:	Operational
Trigger # of Lots Constructed	3,233
Trigger Date:	Oct-2019
Project Complete:	Oct-2020
Project Implementation (Months)	
Engineering/Design:	6
Bid/Construction:	6
Total Project Duration:	12

	2017 Costs ($ Millions)	Forecasted Costs ($ Millions)
Construction	$0.61	$0.67
Professional Services	$0.12	$0.13
Total Project Cost	**$0.73**	**$0.80**

Group U					
Diameter (in.)	**Description**	**Depth (ft)**	**Unit Cost ($/LF)**	**Length (ft.)**	**Cost**
15	Pipe installation	<20	210	1,240	$ 260,400
	General improvements		100		$ 124,000
Description			**Unit Cost**	**Quantity**	**Cost**
Bored pipe installation			LS	1	$ 125,000
				Subtotal	$ 509,400
				Contingency (20%)	$ 101,880
				Professional Services	$ 122,256
				OPCC	$ 733,536

Project 14 Schematic

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