CEDAR PARK

FY 14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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FY 14 LONG RANGE
WATER AND WASTEWATER PLAN UPDATE

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CEDAR PARK, TEXAS

FY 14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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EXECUTIVE SUMMARY

1.1 INTRODUCTION

The City of Cedar Park has been one of the fastest growing communities in Texas over the past decade and currently has a water service population of about 85,000. The City provides water and wastewater services to most areas within the City limits and has a planning area that extends to several extra territorial jurisdictions (ETJ) just outside the incorporated City limits. The City regularly engages in water and wastewater planning updates and studies to plan water and wastewater system expansions for future growth.

The purpose of the City of Cedar Park FY 14 Long Range Water and Wastewater Plan Update is to evaluate the water and wastewater systems and develop capital improvement recommendations to address system deficiencies and to allow the City to provide water and wastewater services for future growth. The City's water and wastewater hydraulic models were updated as part of this study and applied in the water and wastewater system evaluations.

Data used in the FY14 Long Range Water and Wastewater Plan Update include the City's most current (as of 2013) population projections, land use and zoning classifications, water demand projections, wastewater flow projections and potential future growth areas. These data were incorporated into the Geographic Information System (GIS) and hydraulic modeling analyses conducted as part of this study.

1.2 PLANNING PROJECTIONS

Cedar Park is considered to be approximately 85% built out. Table 1.1 summarizes the population and water service connections upon which this study is based.

Table 1.1 Historical and Projected Residential Population for Each Planning Period
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Planning Year	Water Household Population	Water Service Connections	Wastewater Household Population
2013	84,642	25,000	82,638
2015	87,630	26,633	85,626
2023	92,565	27,305	90,561
2040	110,000	29,689	107,996

Table 1.2 summarizes the water system demand projections that have been used in this planning study, as provided by the City.

Table 1.2	Historical and Projected Water Demands FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park		
Planning Year	**Average Daily Demand (mgd)**	**Maximum Daily Demand (mgd)**	**Average Daily Demand (acre-ft/year)**
2013	13.8	25.82	15,456
2015	14.28	26.73	15,994
2023	15.09	28.23	16,900
2040[1]	17.05	33.55	19,096

Note:
Includes demands from all ETJ areas

Table 1.3 summarizes the wastewater system flows that are anticipated, and upon which this plan is based.

Table 1.3	Wastewater Flow Projections FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park
Planning Year	**Average Daily Wastewater Flows (mgd)**
2013	5.54
2015	5.74
2023	6.07
2040	7.24

1.3 WATER SYSTEM EVALUATION AND RECOMMENDATIONS

The City's water system hydraulic model was updated from the City's GIS and demands were adjusted to match the City's demand projections. Scenarios were developed to evaluate maximum day plus fire flow and peak hour conditions.

The City receives water from two water treatment plants that take water from Lake Travis. The City's own treatment plant is fully constructed and can provide 26 mgd. Additional demand will be supplied from the Brushy Creek Regional Utility Authority (BCRUA) treatment plant, which can currently provide 4.5 mgd and can be expanded to provide up to 15 mgd (City of Cedar Park allocation).

Water supply, storage and booster pumping evaluations were performed for current and future conditions. Several water system improvements are recommended to improve pressures and fire flows and prepare for future growth as shown in Figure 1.1. Table 1.4 summarizes the infrastructure and timing of the water system recommendations. The major costs for the water system are future expansions of the BCRUA plant and a new deep water intake.

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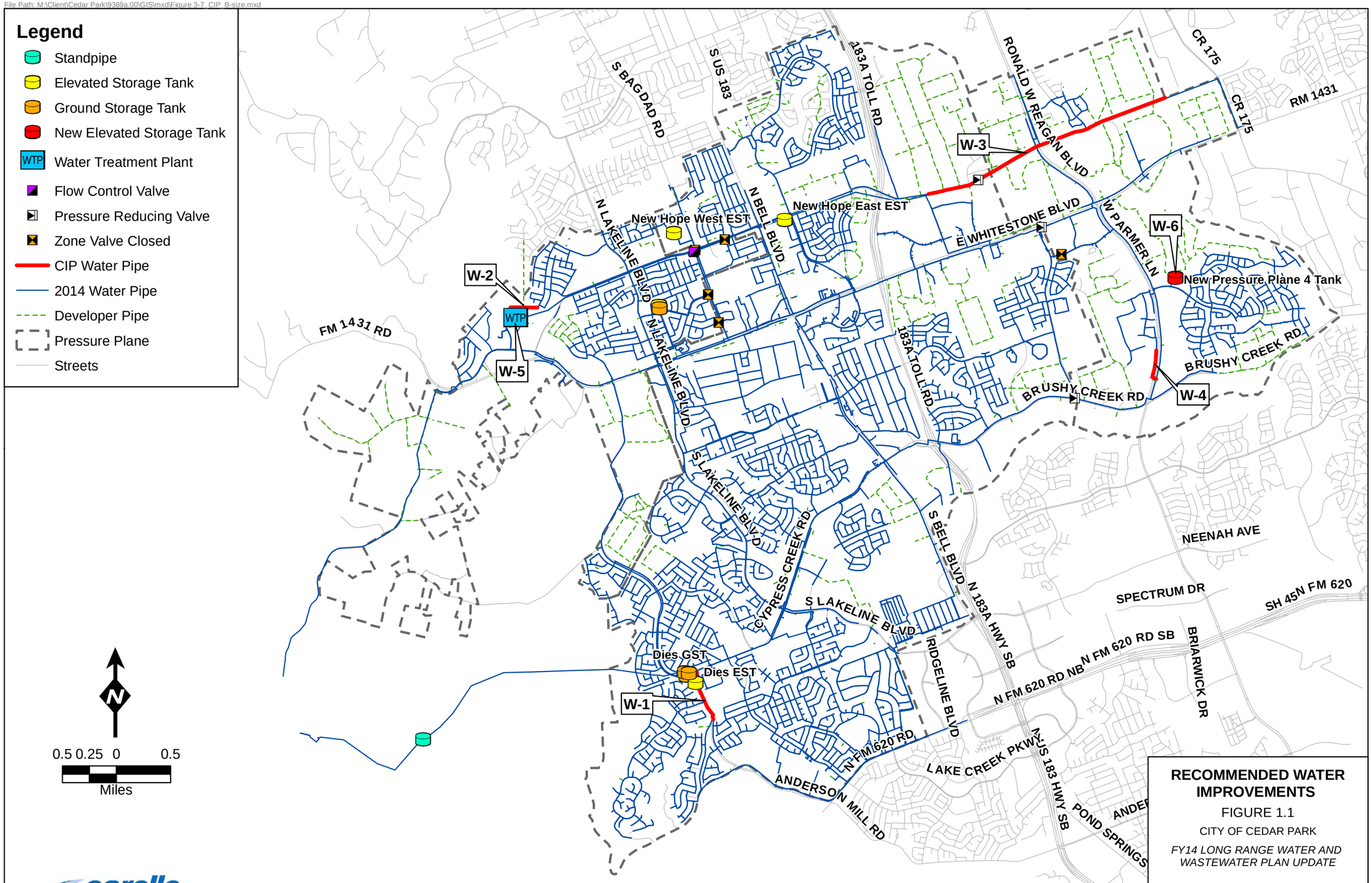

RECOMMENDED WATER IMPROVEMENTS

FIGURE 1.1

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

Table 1.4 Water Distribution System Capital Project Summary
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

CIP Project No.	Description	Diameter (in)	Length (ft)	Project Justification/Driver	Planning Period
W-1	New 16-inch on Timberwolf Trail from Cypress Creek Road to Dies EST. New 16-inch from Dies EST south along Anderson Mill Road to connection with existing 12-inch 420 feet north of Old Mill Road	16	2,520	This project will increase Peak hour pressures at the Pressure Plane 2 high point on Anderson Mill Road, and reduce pipe velocities near the Dies EST.	2018 – 2025
	New 12-inch from the south connection of the proposed 16-inch pipe on Anderson Mill Road to the adjacent 12-inch pipe heading south along Anderson Mill Road	12	110		2018 – 2025
W-2	New 12-inch pipe from the north end of HUR Industrial Boulevard to the south end of Wheaton Trail	12	1,460	This project will facilitate looping in the distribution system and help provide adequate fire flows.	2023 – 2025
W-3	New 16-inch on New Hope Dr from CR-180 to Ronald Reagan Boulevard with PRV placed east of Arrow Point Road on New Hope Drive	16	12,430	This project will prepare for future development in Pressure Plane 2 and provide looping to reduce velocities in Pressure Plane 4.	2023 – 2025
W-4	New 8-inch pipe on Polar Lane crossing Parmer Lane	8	1,540	This project will facilitate looping in the distribution system and help provide adequate fire flows.	2040
W-5.1 W-5.2	Future expansions to the BCRUA water treatment plant BCRUA deep water intake	n/a	n/a	Required to provide additional water treatment capacity	2018 – 2025
W-6	0.5 MG elevated storage tank in Pressure Plane 4 with 16-inch connecting pipe.	n/a	n/a	This project will provide increased reliability and operational flexibility.	2040

1.4 WASTEWATER SYSTEM EVALUATION AND RECOMMENDATIONS

The City's GIS was used to review and update the City's wastewater collection basins and perform hydraulic evaluations of the primary interceptors that convey flow from each collection basin downstream to either the Cedar Park Water Reclamation Facility (WRF) or the Brushy Creek Regional Wastewater System (BCRWWS). Both of these facilities have sufficient capacity to serve the City through buildout. A total of 112 collection basins were delineated in the Cedar Park wastewater system and incorporated into the City's updated wastewater hydraulic model.

The hydraulic model evaluation identified seven primary interceptors that are estimated to have capacity limitations pending on-site flow monitoring to validate model predictions. Four of these basins are estimated to have capacity limitations due to existing flows and three of the basins are expected to have capacity limitations once future development occurs in those basins. Four additional CIP projects are recommended that provide service to new areas of the collection system as a result of growth. The recommended sewer improvements are shown in Figure 1.2. Table 1.5 summarizes the recommended improvements for the wastewater collection system.

Additional flow monitoring is recommended for any interceptor to verify that actual flows are consistent with modeled flows.

1.5 CAPITAL IMPROVEMENT SUMMARY

Table 1.6 summarizes the recommended water system capital improvements. The total project cost for the four recommended projects plus Cedar Park's contribution to the BCRUA projects is $56,792,800, $51,666,600 of which is for the BCRUA projects.

Table 1.7 summarizes the recommended wastewater system capital improvements. The total project cost for the eleven recommended projects is $14,101,600.

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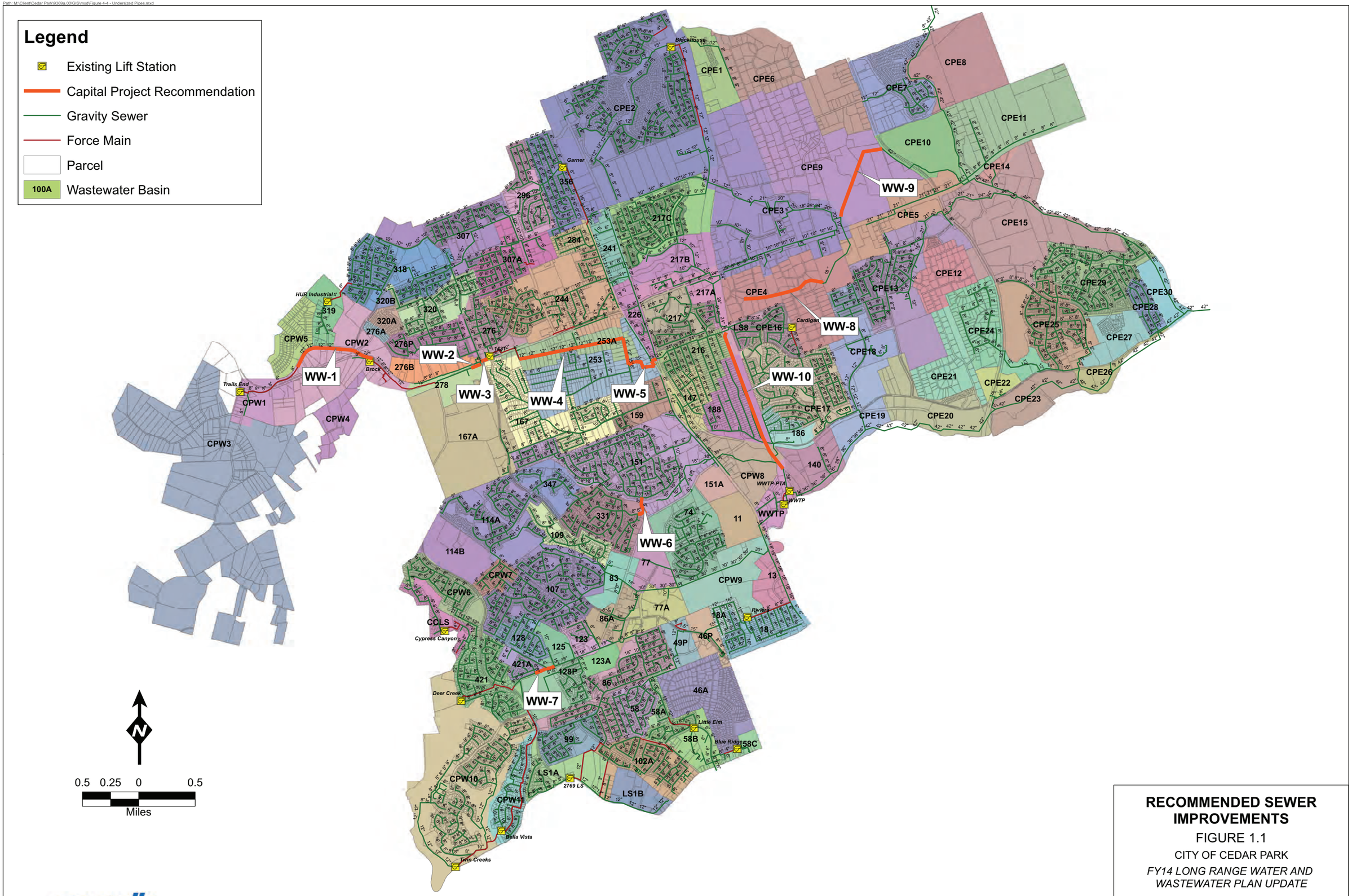

RECOMMENDED SEWER IMPROVEMENTS

FIGURE 1.1

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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Table 1.5 Wastewater Collection System Capital Project Summary
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Location	Collection Basin	Existing Diameter (in)	Pipe Slope in Model (ft/ft)	Required Slope for Existing Pipe to Meet Capacity Requirement (ft/ft)	Recommended Diameter (in) (1)	Estimated Length (ft)	Considerations / Trigger
WW-1	CPW2	12	0.003	0.0106	18	4,065	Needed if development occurs in Basins CPW3, CPW4 and CPW5.
WW-2	278	12	0.0059	0.011	15	500	Needed if development occurs in Basins CPW3, CPW4 and CPW5. Note: upstream pipe is recommended as 18-inch.
WW-3	278	8	0.0059	0.096	15	321	Pipe into the FM 1431 Lift Station
WW-4	253A	12	0.0062	0.0220	18	5,937	Existing capacity limited
WW-5	253	15	0.004	0.0085	18	2,238	Needed if development occurs in Basins CPW3, CPW4 and CPW5. Note: an 18-inch main would require a steeper slope than the existing 15-inch main.
WW-6	331	8	0.0034	0.0144	12	1,060	Existing capacity limited.
WW-7	421A	12	0.004	0.0161	15	988	Existing capacity limited.
WW-8	CPE4	n/a	n/a	n/a	8 & 12	4,000	Spanish Oaks Wastewater Interceptor Phase II.
WW-9	CPE3 CPE9S	n/a	n/a	n/a	33	4,200	Cottonwood Creek Wastewater Interceptor Phase C.
WW-10	216 217A L58	n/a	n/a	0.0003	42	8,000	Required to avoid sanitary sewer overflows.
WW-11	n/a	n/a	n/a	n/a	n/a	n/a	Required to improve BCRWWS capacity.

Note:
(1) Assumes the same pipe slope as the existing sewer.

Table 1.6 Capital Improvement List FY 2014-2040
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Project No.	Description	Units	Quantity	Unit Price - Construction	Construction Cost (only)	Unit Price - Construction and Soft Cost	Project Budget
Water Pipelines							
W-1	16-inch pipe on Timberwolf Trail and Anderson Mill Road, installed including all valves and fittings	LF	2,520	$160	$402,600	$208	$524,200
	12-inch pipe from the south connection of the proposed 16-inch pipe on Anderson Mill Road to the adjacent 12-inch pipe heading south along Anderson Mill Road, installed including all valves and fittings	LF	110	$147	$16,200	$192	$21,200
	Subtotal						***$545,400***
W-2	12-inch pipe from the north end of HUR Industrial Boulevard to the south end of Wheaton Trail, installed including all valves and fittings	LF	1,460	$147	$214,800	$192	$280,400
W-3	16-inch pipe on New Hope Drive from CR-180 to Ronald Reagan Boulevard with PRV placed east of Arrow Point Road on New Hope Drive, installed including all valves and fittings	LF	12,430	$160	$1,988,800	$208	$2,585,500
W-4	8-inch pipe on Polar Lane crossing Parmer Lane, installed including all valves and fittings	LF	1,540	$132	$203,600	$172	$264,900
W-6	0.5 MG elevated storage tank in Pressure Plane 4 with 16-inch connecting pipe	MG	500,000	$2.23	$1,115,000	$2.90	$1,450,000

Project No.	Description	Cost	City of Cedar Park Allocation	Project Budget
W-5.1	BCRUA Plant Expansion, Phase 1B & C	$23,900,000	26.67%	$6,374,100
W-5.2	BCRUA Deep Water Intake, Phase 2	$165,000,000	27.45%	$45,292,500
	Total Capital Budget			**$56,792,800**

Table 1.7 Recommended Wastewater Improvements Cost Summary
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Project No.	Description	Units	Quantity	Unit Cost - Construction	Construction Cost	Unit Cost - Project	Project Budget
Wastewater Pipelines							
WW-1	Basin CPW2: Replace 12-inch sewer with an 18-inch gravity sewer, installed including manholes	LF	4,065	$175	$710,800	$228	$926,900
WW-2	Basin 278: Replace 12-inch sewer with a 15-inch gravity sewer, installed including manholes	LF	500	$167	$83,400	$217	$108,500
WW-3	Basin 278: Replace 8-inch sewer with a 15-inch gravity sewer, installed including manholes	LF	321	$167	$53,600	$217	$69,700
WW-4	Basin 253A: Replace 12-inch sewer with an 18-inch gravity sewer, installed including manholes	LF	5,937	$175	$1,038,100	$228	$1,353,700
WW-5	Basin 253: Replace 15-inch sewer with an 18-inch gravity sewer, installed including manholes	LF	2,238	$175	$391,400	$228	$510,300
WW-6	Basin 331: Replace 8-inch sewer with a 12-inch gravity sewer, installed including manholes	LF	1,060	$155	$164,700	$202	$214,200
WW-7	Basin 421A: Replace 12-inch sewer with a 15-inch gravity sewer, installed including manholes	LF	988	$167	$164,800	$217	$214,400
WW-8	Spanish Oaks Wastewater Interceptor Phase II	LF	4,000	$138/$155	$584,000	$180 / $202	$760,500
WW-9	Cottonwood Creek Wastewater Interceptor Phase C	LF	4,200	$207	$869,700	$270	$1.134.000
WW-10	Lobo Tunnel: Replace the Lobo lift station and force main	LF	8,000	$813	$6,500,000	$1,028	$8,225,000

Project No.	Description	Cost	City of Cedar Park Allocation	Project Budget
WW-11	BCRWWS East Plant Re-rate Improvements	$4,000,000	14.61%	$584,400
Total				**$14,101,600**

Chapter 2

PLANNING FRAMEWORK

2.1 INTRODUCTION

The City of Cedar Park is located in central Texas northwest of the Cities of Austin and Round Rock, Texas. Over the past decade, it has experienced some of the most rapid growth of any community in Texas. Cedar Park currently has a water service population of about 85,000 and is considered to be 85 percent built out. Most of the City's 25,000 water customers are residential customers, and the City is working to attract businesses to the City.

The City currently is supplied water from its water treatment plant located on the shores of Lake Travis. In 2012, the City began receiving water from a new water treatment plant constructed by the Brushy Creek Regional Utility Authority (BCRUA) that also takes water from Lake Travis. The BCRUA delivers water to the Cities of Cedar Park, Round Rock, and Leander. This treatment plant is located in the northwest part of Cedar Park. Cedar Park currently has a capacity of 4.53 mgd at the BCRUA Plant with the ability to expand up to 15 mgd. In the past, Cedar Park has purchased contractual, supplemental water from Round Rock and also delivered water to the City of Leander. Although these connections are still available, they are now used only on an emergency basis.

The City's previous major revision to the water master plan was developed in 2008 and then updated in 2011. This master plan provides an update through 2013, and also includes a master plan for the wastewater system. An update for the water plan is appropriate at this time because the BCRUA plant is now complete so the City is able to effectively plan with the certainty of the operation of this plant. The Cedar Park and Brushy Creek Regional Wastewater System Treatment Plants that will serve the City through full buildout are also constructed and in operation.

This report chapter presents the planning framework, water demand projections, and wastewater flow projections for this long-range plan update. The planning framework includes a set of assumptions and criteria that have been established through collaboration with the City and form the basis for the capital improvements and other recommendations that have been developed in this study. The planning framework includes the following:

- Water and Wastewater service areas
- Population projections
- Water demand projections
- Wastewater flow projections

Population projections are used to establish the growth rate between the planning years for the Water and Wastewater Plan Update. The planning years selected for this study span approximately 27-years from 2013 through 2040. The 2040 planning period is assumed to be close to “buildout” and assumes full development within the current planning area. The planning years for the Water and Wastewater Plan Update include:

- 2013 (Current or existing condition)
- 2015 (Near-term CIP projects)
- 2023 (Ten-year CIP projects)
- 2040 (Buildout)

The data provided by the City for the Water and Wastewater Plan Update include population projections, GIS data layers and water and wastewater hydraulic models. The GIS data sources used in this study include:

- Parcels
- Zoning and Land Use
- 2012 Aerial Photography
- Water System Infrastructure
- Wastewater System Infrastructure
- Wastewater Drainage Basins
- 2-foot Elevation Contours
- Street Centerlines

2.2 PLANNING AREA AND LAND USE

2.2.1 Planning Area

The planning area for this master plan includes the 2013 incorporated City limits and the Extra-Territorial Jurisdiction (ETJ) land areas as shown in Figure 2.1. Cedar Park plans to ultimately provide water and wastewater service to the ETJ land areas. These ETJ areas include Indian Springs, WTC MUD #1, Anderson Mill, Cross Creek, Block House, and Shenandoah. Currently, there is a small portion of the City’s service area located west of the BCRUA water treatment plant that is owned by a private water utility that takes wholesale City water. The City also serves the Shenandoah development in the ETJ in the south central part of the City’s planning area.

2.2.2 Zoning Classifications

Zoning classifications are assigned to land areas within Cedar Park’s incorporated City limits. Zoning classifications more specifically define the type of development that is allowed than land use classifications. Where available, zoning classifications were used as the primary category to determine what development will occur and where it will occur.

Figure 2.2 shows the zoning classifications for Cedar Park.

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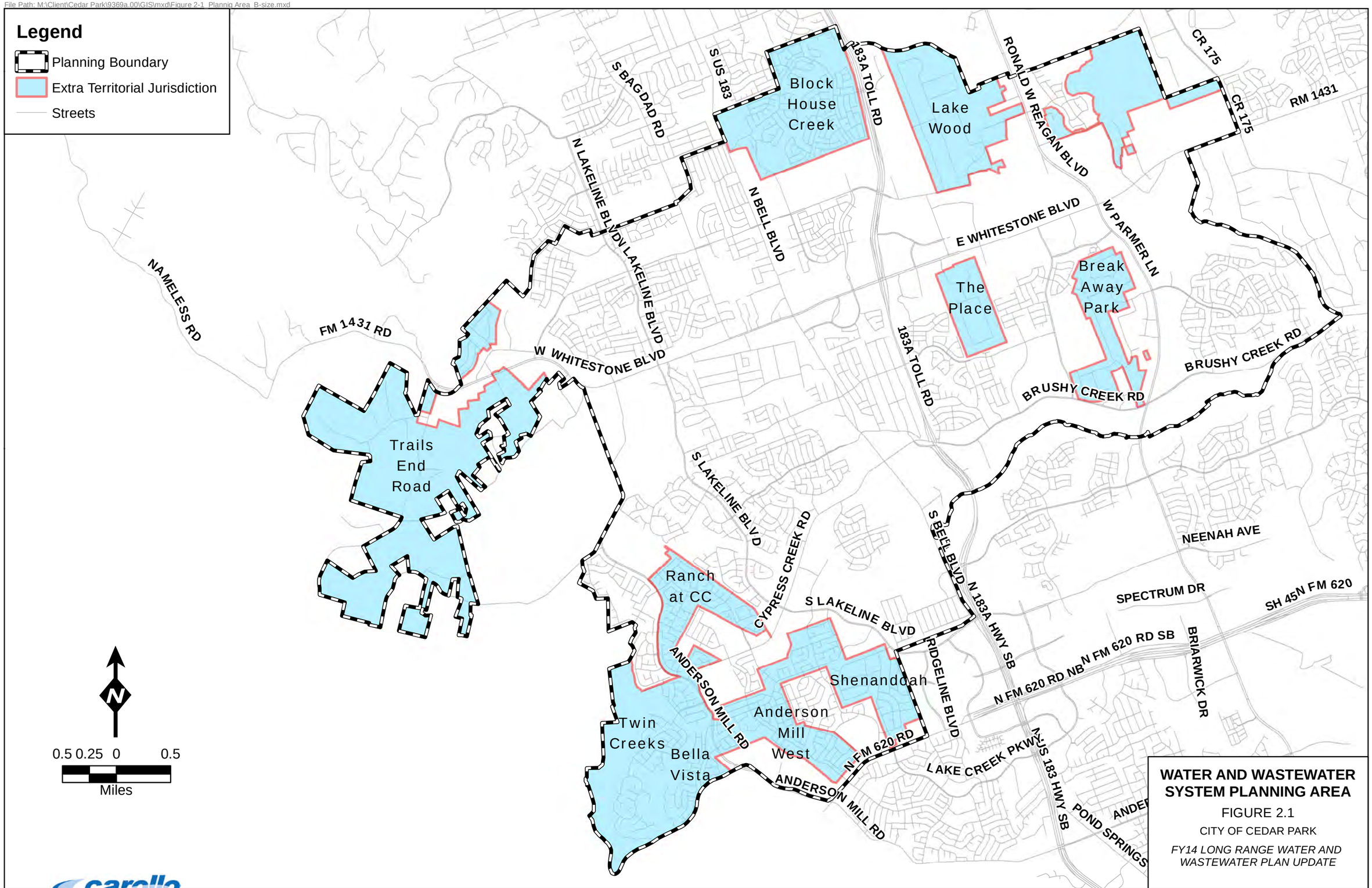

WATER AND WASTEWATER SYSTEM PLANNING AREA

FIGURE 2.1

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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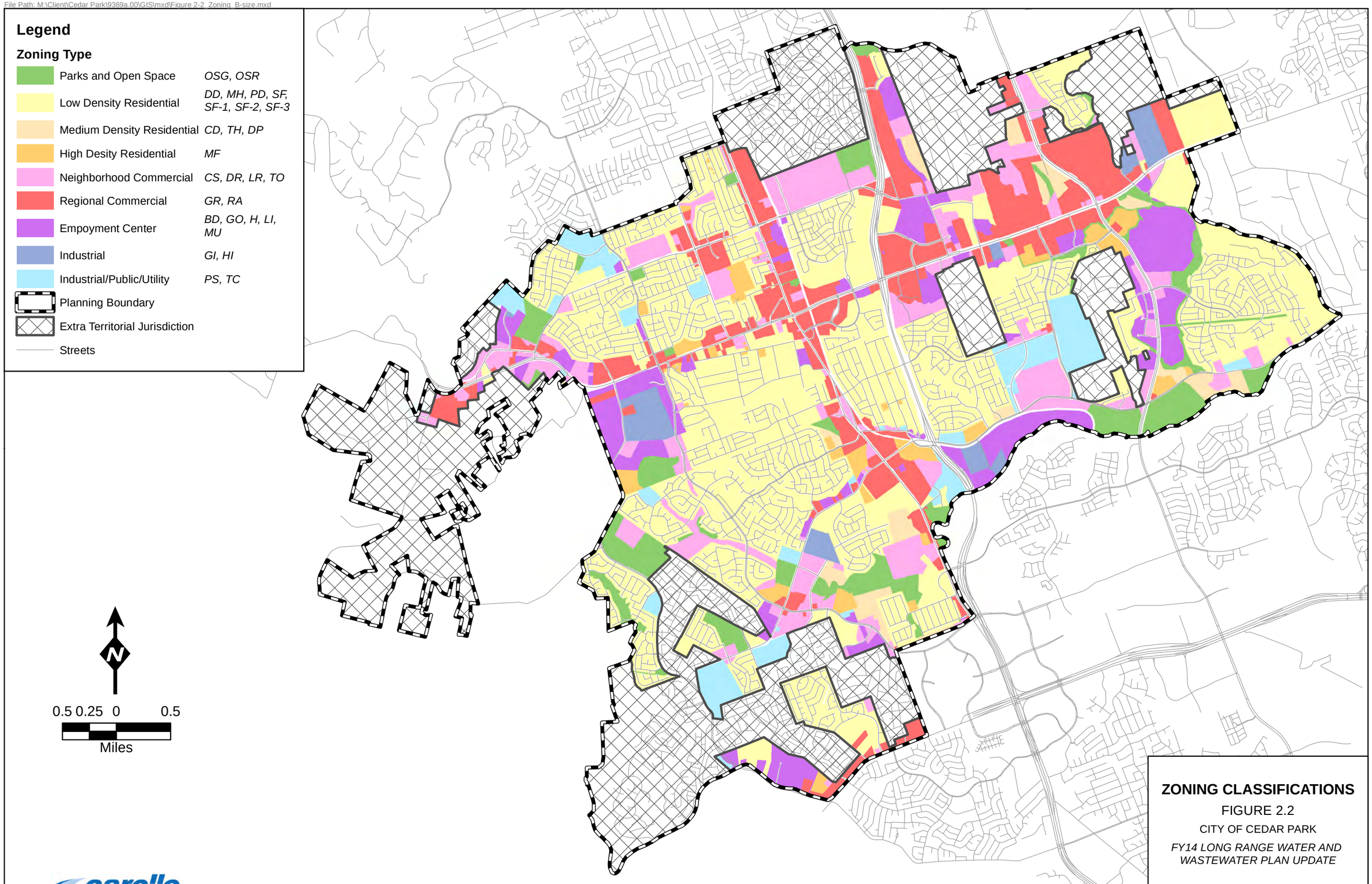

ZONING CLASSIFICATIONS

FIGURE 2.2

CITY OF CEDAR PARK

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2.3 POPULATION AND GROWTH PROJECTIONS

Table 2.1 shows the historical and projected population growth for Cedar Park that was provided by the City. These population projections were used to determine how much growth would occur each year so that water demands can be projected accordingly. Figure 2.3 shows a graphical representation of the City's growth. The City has approximately 25,000 connections, so there are approximately 3.3 people per connection. Table 2.1 also shows the estimated water service connections in each planning year. Appendix A lists the population projections and the wastewater flow projections for every year through 2040 that were provided by the City.

Table 2.1 Historical and Projected Residential Population for Each Planning Period
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Planning Year	Water Household Population	Water Service Connections	Wastewater Household Population
2013	84,642	25,000	82,638
2015	87,630	26,633	85,626
2023	92,565	27,305	90,561
2040	110,000	32,448	107,996

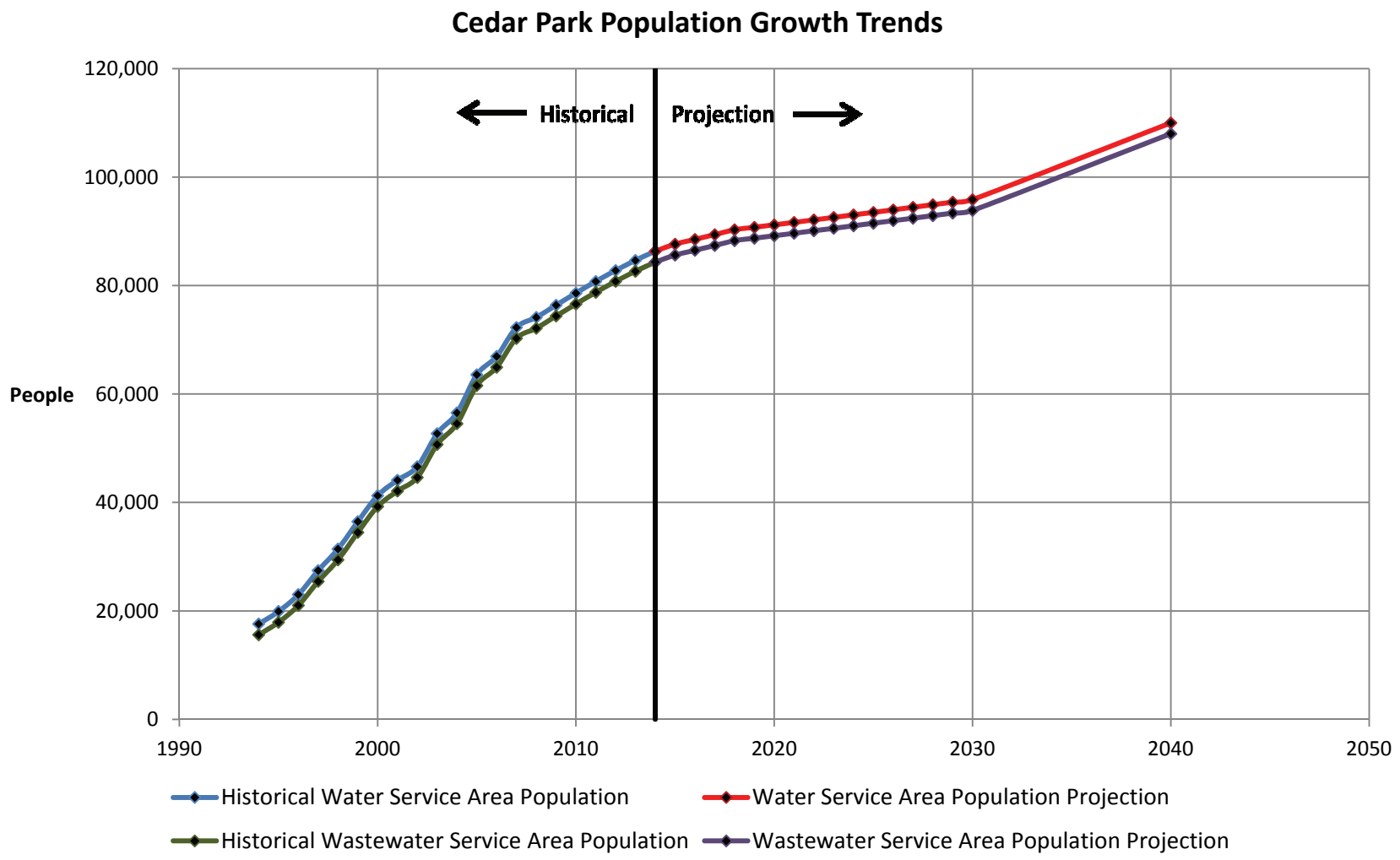
2.4 WATER DEMANDS

Cedar Park provided historical data through 2013 and future water demand information. This information is summarized in Table 2.2 and shown graphically in Figure 2.4. In the 2008 water distribution system master plan, water demands were allocated in the model using customer billing data allocated to the parcel location. Then demands were adjusted upwards to match maximum day and peak hour demand conditions. Because Cedar Park is considered to be 85 percent developed, for this study demands in 2040 were established by distributing the projected new future demand among the undeveloped areas within the City to match the demand projections in Table 2.2.

Table 2.2 Projected Water Demands
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Planning Year	Average Daily Demand (mgd)	Maximum Daily Demand (mgd)
2013	13.8	25.82
2015	14.28	26.73
2023	15.09	28.23
2040(1)	17.05	33.55

Note:
(1) Includes flows from all ETJ areas. Assumes 155 gpcd for Average Daily Demand and 305 gpcd for Maximum Daily Demand.



HISTORICAL AND PROJECTED POPULATION

FIGURE 2.3

CITY OF CEDAR PARK
FY 14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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2.4.1 Historical Per Capita Water Use

The City uses 155 gallons per capita per day for planning average annual water demands. Average water demands in recent years have been closer to 165 gallons per capita per day, but water usage trends are decreasing as more emphasis is being placed on water conservation. The City also uses 305 gpcd as a planning value for maximum daily demands.

2.4.2 Water Demand Patterns and Peaking Factors

The City's SCADA data was used to estimate the peak hour demands that the water system experiences. Based on data recorded on July 7, 2013, which is the maximum demand day for 2013, the average day to peak hour peaking factor is 3.0.

The maximum day demand represents the highest water demand during the maximum month. Based on the water production data, the estimated maximum day to annual average day (MD/AAD) peaking factor is 1.87. The peak hour to maximum day peaking factor (PH/MD) was estimated based on SCADA data obtained for July 7, 2013, which is the maximum demand day for 2013. This factor is 1.6. The peaking factors calculated for Cedar Park are summarized in Table 2.3.

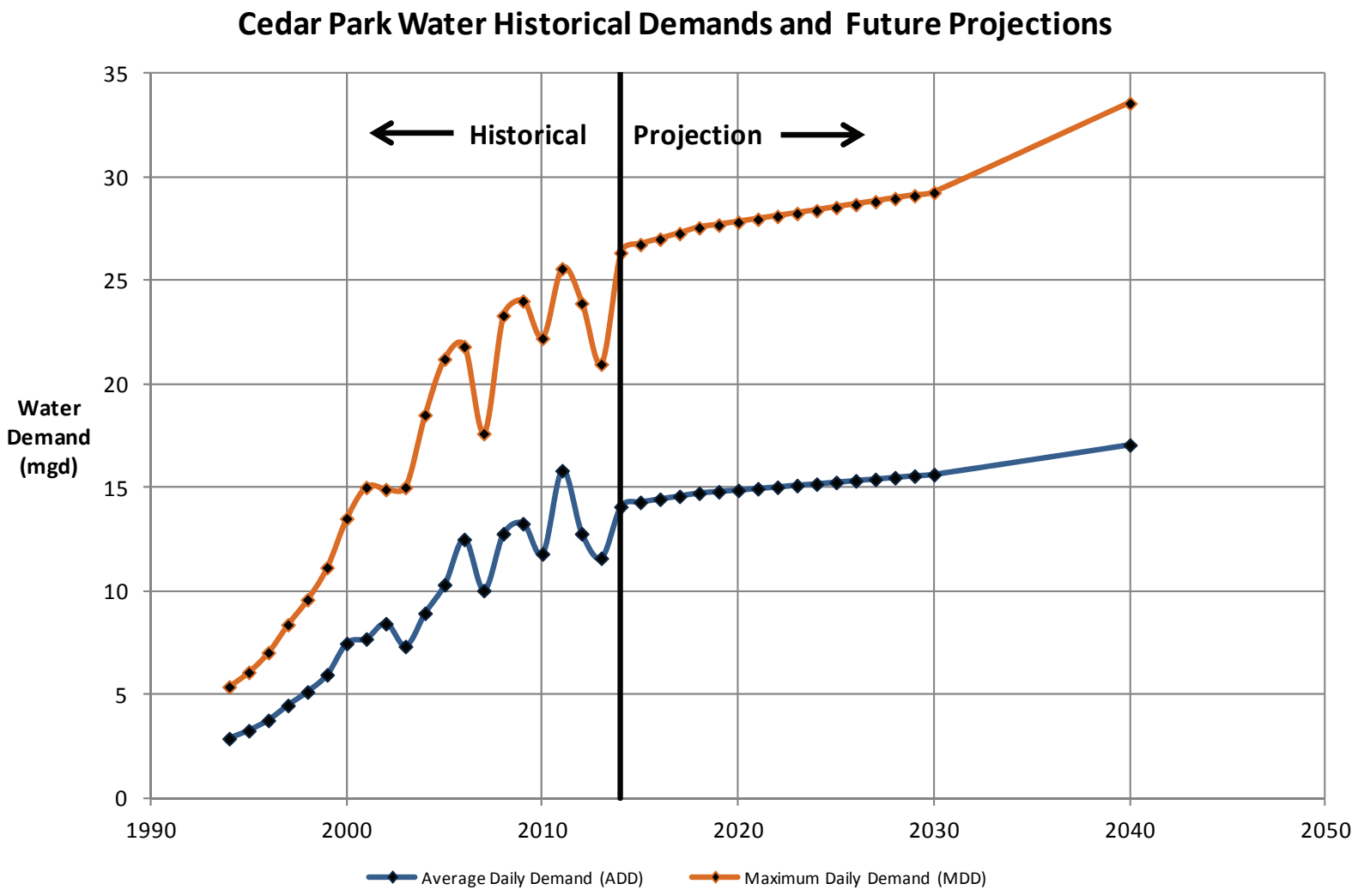
Table 2.3 Water Demand Peaking Factors
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Demand Ratio	
MD/AAD	1.87
PH/MD	1.6
PH/AAD	3.0

Peaking factors are used during the hydraulic modeling scenarios. The purpose of these scenarios is to assess existing water system performance compared to established performance criteria, and to plan future system improvements.

2.4.3 Diurnal Demand Pattern

The City's hydraulic model uses a diurnal demand pattern applied to the average daily demand of the simulation to approximate the demands that occur at each hour of the day. Figure 2.5 shows the diurnal pattern that was used in this study.



ANNUAL WATER PRODUCTION

FIGURE 2.4

CITY OF CEDAR PARK
FY 14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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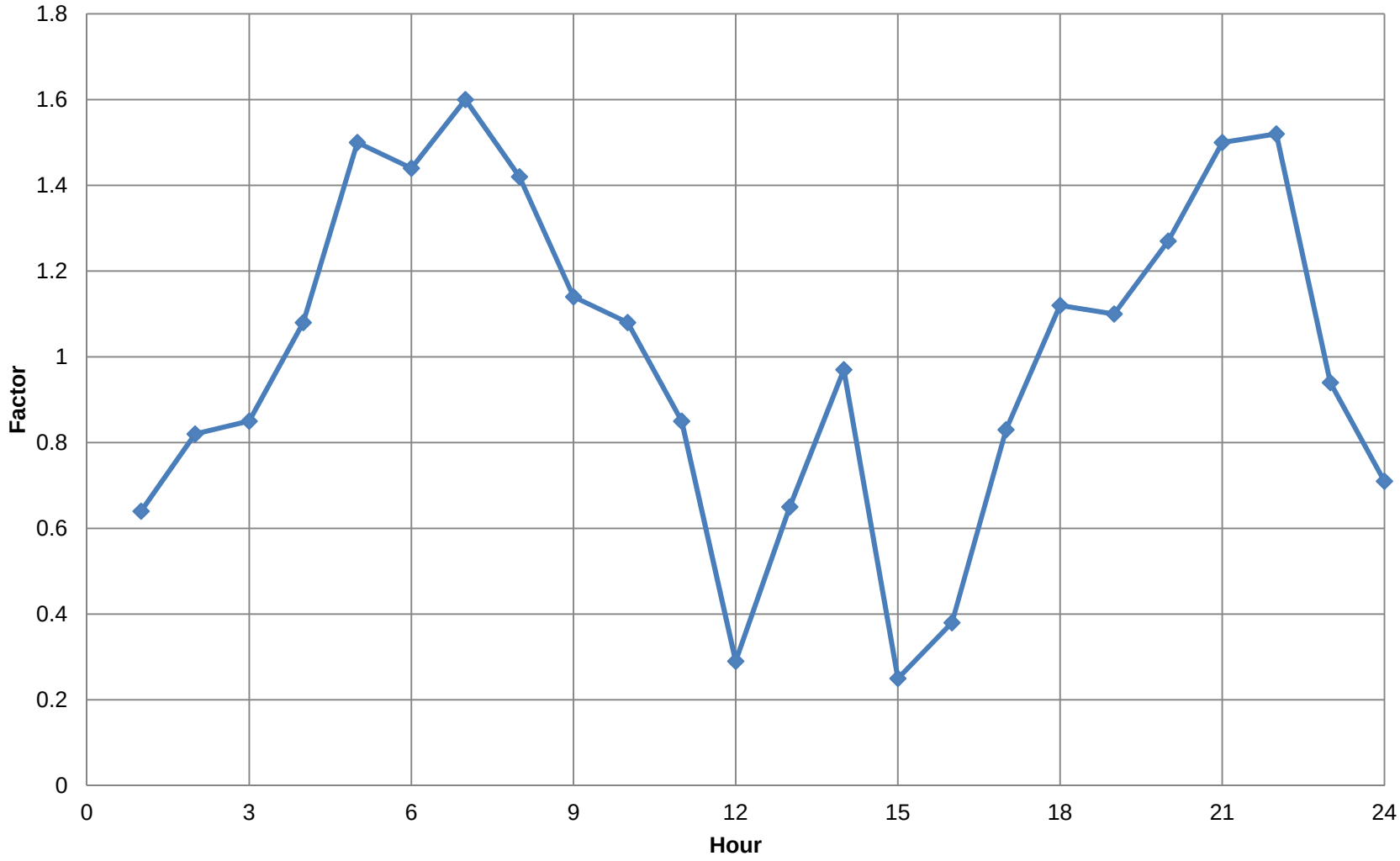

DIURNAL WATER DEMAND PATTERN

FIGURE 2.5

CITY OF CEDAR PARK
FY 14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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2.5 WASTEWATER FLOW PROJECTIONS

2.5.1 Historic Wastewater and Projected Flows

The Cedar Park wastewater collection system has two wastewater treatment plants where wastewater flows are measured. The historical and projected wastewater flows to these plants have recorded flows that are useful for making projections. Table 2.4 shows the projected wastewater flows in the planning periods for this study. Figure 2.6 shows the historical and projected wastewater flows.

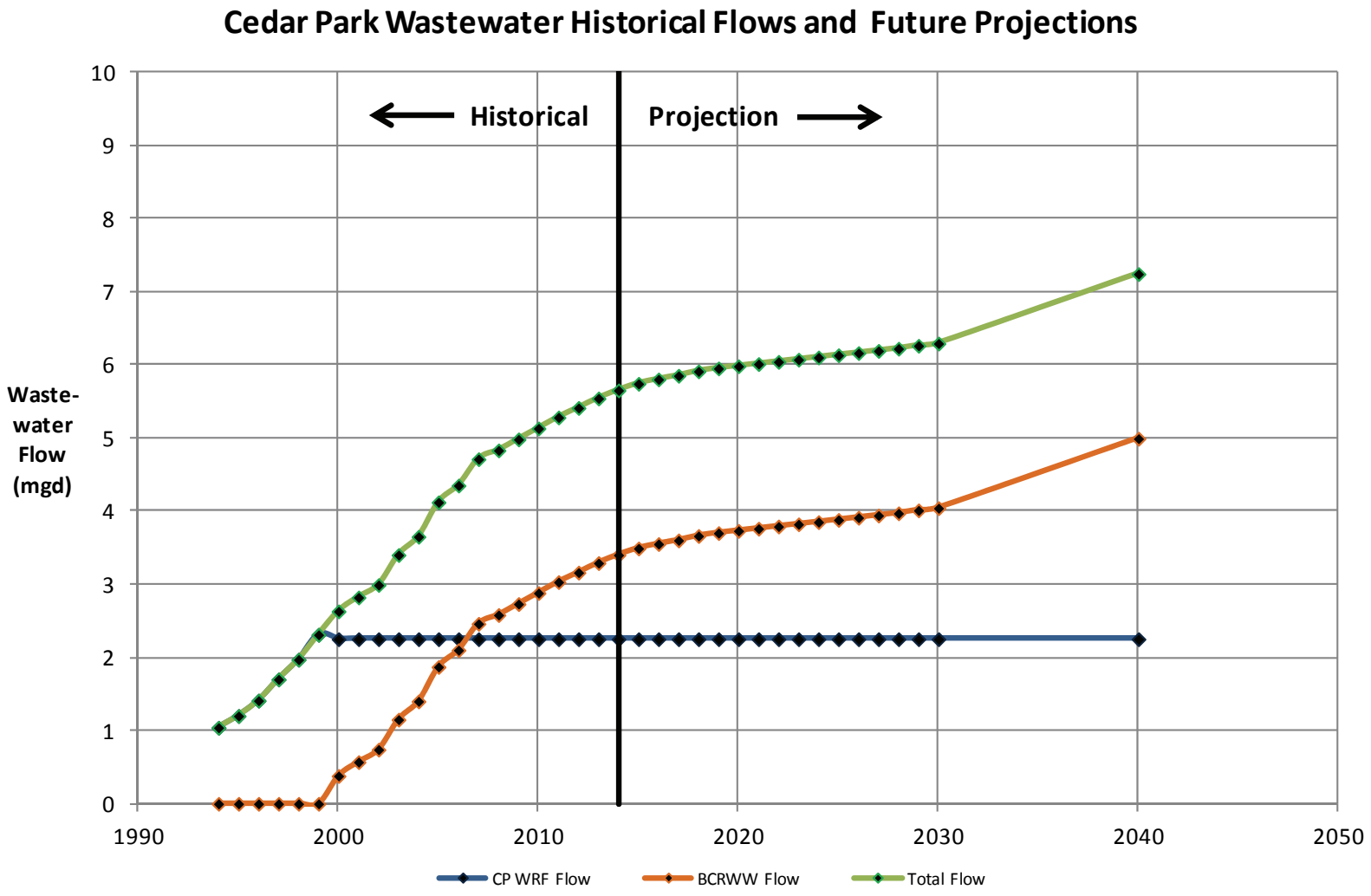
Table 2.4 Wastewater Flow Projections
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Planning Year	Average Daily Wastewater Flows (mgd)
2013	5.54
2015	5.74
2023	6.07
2040	7.24

The hydraulic model is set up to calculate dry weather flows based on a unit load of 65 gallons/capita/day for residential areas and 650 gallons/acre/day for commercial areas. Peak flows are calculated according to the following equation:

$$\text{Peaking factor} = \frac{\left(18 + (0.0144 * \text{dry flow})^{0.5}\right)}{\left(4 + (0.0144 * \text{dry flow})^{0.5}\right)}$$

Wet weather flows are estimated to be 800 gallons/acre/day.



HISTORICAL AND PROJECTED WASTEWATER FLOWS

FIGURE 2.6

CITY OF CEDAR PARK

FY 14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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WATER SYSTEM PLAN

3.1 INTRODUCTION

This chapter contains the water system plan for Cedar Park's FY14 long range plan update. This chapter is divided into the following sections:

- Model Update: The steps for updating the model are explained, along with the modeling methods.
- Performance Criteria: This section explains the performance criteria that is used in evaluating the water system.
- Water System Evaluations: This section describes the evaluations that have been undertaken to evaluate the existing system and the water system as planned for buildout.
- Capital Improvement Plan: This section contains the capital improvement projects and planning level costs for the capital improvements that have been identified.

3.2 MODEL UPDATE

The purpose of the model update portion of the project is to update the model to correctly represent the water distribution system infrastructure as it is today. Figure 3.1 is a map of the current water distribution system that is represented in the model. The distribution system is comprised of pressure planes 2, 3 and 4. Pressure plane 1 is the transmission system between the City's treatment plant and the Dies pump station.

3.2.1 Conversion from WaterGEMS to H_2O Map Water

The water model data used in previous model studies resided in a WaterGEMS model database. After an evaluation of the features of leading modeling software programs, the H2O Map Water modeling program by Innovyze was selected for use in the model because it provided the best match with the City's specific needs. Data in the City's GIS database for existing infrastructure was imported into H2O Map Water. Data in the previous model for future pipes was converted over to the H2O Map format using GIS shapefiles exported from WaterGEMS. The updated model data included pipes, demands, pump stations, and storage tanks.

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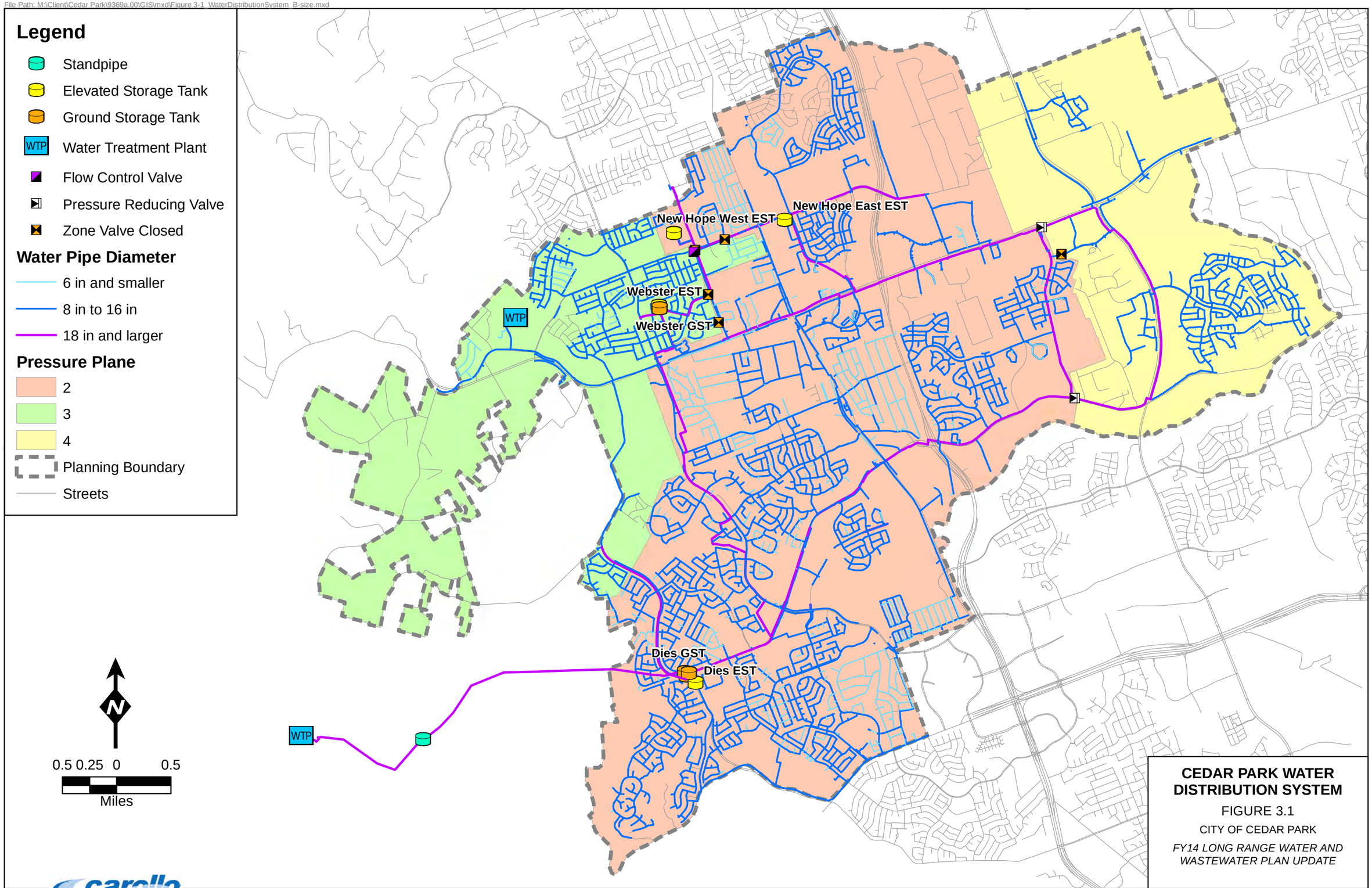

CEDAR PARK WATER DISTRIBUTION SYSTEM

FIGURE 3.1

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

3.2.2 GIS Data

The City provided a set of GIS data representing the City's water infrastructure assets. The pipe assets in the model were updated with the pipe data in the GIS system so that the most current pipe data was most correctly represented in the model. The GIS data included additional pipes for Pressure Plane 1 as well as developments that have been constructed since the previous model was last updated.

The City provided a new set of elevation contour data that was used to update the elevations of model nodes throughout the distribution system.

3.2.3 Demands

Considerable effort was spent during the last long range plan update to establish demands throughout the water system. In locations that were not yet developed, demands in future years were placed on a pipe at the approximate location of the future development. If a development was constructed since the last long range plan update, then the demand for the development area was dispersed throughout the development. The approach to allocating demands used for the previous long range plan update made it possible to apply a factor to the existing demands to increase the demand projections to match the projected demands for the planning periods in this study. The demands in each planning period are given in Table 2.2.

3.2.4 Operational Data

Operational controls in the model include pump curves, pump controls, and PRV setpoints. This information was brought over directly from the WaterGEMS model. Appendix B lists the pump design points and on/off setpoints.

There are two PRV stations currently serving Pressure Plane 4. These PRV stations have pressure setpoints to maintain a hydraulic gradeline of approximately 1,007 feet downstream of the PRVs. The north PRV has a setpoint of 64 psi and the south PRV has a setpoint of 78 psi.

3.2.5 Validation

The model underwent an extensive calibration for the 2007 master plan so the current updated model was evaluated only with SCADA data from July 2013 to make certain that the updated information in this model is consistent with the current system operation.

The City provided SCADA data for the week that included July 7, 2013, which is the day of the maximum daily demands for 2013. The model was configured to have the same demands, initial reservoir levels, and pump status as on this day. Then the model was run for a 24-hour period and compared with the SCADA data to demonstrate that the model provides results that are similar to the measured pressures, flows, and tank levels in the actual water system.

Appendix C contains graphs of model validation results. The tank levels show a reasonable correlation at the New Hope West, New Hope East, and Webster tanks.

3.3 PERFORMANCE CRITERIA

3.3.1 Background

The water distribution infrastructure for the City of Cedar Park needs to provide acceptable levels of performance and reliability, while being sensitive to the cost of new infrastructure. As new infrastructure is planned, “standards of measurement” or performance criteria established by the City are necessary to evaluate the adequacy of the infrastructure. This section describes the performance criteria that were used to evaluate the existing water system and to determine the capacity requirements of future improvements. This performance criteria comes from the Texas Administrative Code (TAC), the Texas Commission on Environmental Quality (TCEQ), the Texas Department of Insurance (TDI), and the City of Austin design standards as adopted by Cedar Park.

3.3.2 Water System Components

The City’s water system consists of the following components:

- Power Sources
- PRV Stations
- Booster Pump Stations
- Storage Facilities
- Transmission and Distribution Mains

The function of these water system components is discussed in the following sections and the performance criterion for each is described.

3.3.3 Basis of Criteria

The acceptable level of service expected from the water system is defined by the adequacy and reliability of the water supply delivered to the customer. A reasonable level of service usually includes the provision for adequate system pressure, fire protection, and supply reliability. Therefore, water system performance criteria address the following areas:

- Water Supply Redundancy: A level of service such that water supplies can be delivered into the distribution system from more than one source.
- Water System Reliability: A level of service such that the distribution system infrastructure can deliver water to as many areas as possible even when a key facility is not in service.
- System Operational Requirements: A level of service such that water can be delivered reliably under fire flow, maximum day demand, and peak hour demand conditions.

3.3.3.1 Water Supply Redundancy

Water supply redundancy refers to the degree to which water can be supplied to the City's customers in the event that one or more of the water supply sources is unavailable. Decisions about the extent of redundancy are often policy decisions influenced by the price a utility is willing to pay for redundancy compared to the risk of having to implement water use restrictions or provide a lower level of service to the customer if a water supply source is unavailable. Under some conditions, it may be more economical for the City to implement water demand management or conservation measures rather than build infrastructure that will be used infrequently in response to water source availability.

3.3.3.2 Water System Reliability

The City's water system reliability is dependent on the reliability of all the components within the system and the reliability of the energy sources that supply the pump stations. The level of reliability provided is usually based on historic operational experience and judgment, which results in confidence that the system can deliver water under a variety of normal and emergency conditions. Consequently, professional judgment must be used when specifying system components and the number and location of components needed to meet reliability criteria.

Reliability of the City's water system is provided by a combination of the following factors:

- Sufficient water sources to meet maximum day demand,
- Reserve system storage to meet emergency conditions, in addition to fire and normal operational needs,
- Transmission capability to deliver water to the distribution system,
- Looped transmission and distribution system network,

- Sufficient booster pumping capabilities with a pump station or the largest pump in a station out of service, and
- Backup power supply for critical facilities.

3.3.3.3 Water System Operational Requirements

System operational requirements provide for a defined level of service from the City to the customer. Levels of service include many parameters, such as maximum and minimum pressures, maximum flow velocities, storage, redundancy, and provisions for emergency conditions. Adequate pressure is usually defined in terms of a minimum pressure under certain demand conditions, such as peak hour or fire flow. Adequate fire protection refers to providing adequate flow to meet firefighting demands. The water system is considered to be adequate when system demand conditions are satisfied while meeting system performance criteria, such as system pressure, velocity, and head loss.

3.3.4 Water Production Facilities

Production facilities for the water system should have sufficient capacity to meet the demands of the maximum day of the year.

3.3.5 Fire Flow

The TDI uses the ISO ratings for fire flow requirements for specific buildings. These requirements are based on the needed fire flow to suppress a fire and are not specific design requirements. These requirements are shown in Table 3.1.

Table 3.1 Fire Flow Requirements for One and Two Family Dwellings
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Distance Between Buildings	Required Fire Flow, gpm
More than 100 feet	500
31 – 100 feet	750
11-30 feet	1,000
10 feet or less	1,500
Other Unclassified uses	3,500

Note:
(1) Larger fire flows may be required for specific buildings.

The City's fire flow requirements were established in previous planning efforts for specific land use categories and will remain consistent in this study. Table 3.2 lists the fire flow requirements used in this study.

Table 3.2 Fire Flow Requirements Based on Land Use Type FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park	
Land Use Type	**Fire Flow (gpm)**
Low Density Residential	500
Medium Density Residential	750
High Density Residential	1,500
Regional Office/Retail/Commercial	3,000
Neighborhood Office/Retail/Commercial	1,500
Employment Center	3,000
Institutional/Public/Utility	3,000
Industrial	3,000
Parks & Open Space	1,500

The minimum pressure within the pressure plane where fire flows are occurring is to be no less than 20 psi. (TAC 290.44 (d)).

3.3.6 Pump Stations

Pump stations are often the most critical components in a distribution system with respect to meeting reliability/redundancy criteria, because these facilities are subject to disruption by power outages, mechanical failures or line breaks.

Table 3.3 summarizes these conditions and the criteria to be employed for reliability.

Table 3.3 Booster Pump Station Reliability Criteria FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park		
Condition	**Result**	**Criteria**
Power Outage	Creates loss of pumping capacity at one or more pumping facilities.	Provide emergency backup power supply generation or dual power feed to critical facilities.
Mechanical Failure or Unscheduled Maintenance	Creates loss of pumping capacity due to one or more pumps at a facility being out of service.	Produce sufficient pumping capacity at each booster pumping station to meet maximum day demands with any one pump or the largest pump out of service (referred to as “firm capacity” of the station).
Line Break	Occurs at or near the booster station, creating a loss of all or a portion of the pumping capacity at the facility.	Mitigate a short-term (less than one day) disruption in supply caused by a line break at or near a booster station by providing multiple pumping facilities, storage, looped transmission/distribution lines, PRV stations throughout the system.

The firm pumping capacity supplying water to a pressure plane needs to be capable of supplying 2 gpm/connection or peak hour flow plus 1,000 gpm, whichever is less. For water systems with at least 200 gal/connection of elevated storage, the firm pumping capacity needs to be 0.6 gpm/connection (TAC 290.45 (b)(2)).

When pumping to a closed system with no other sources or elevated storage, a pump station should be sized for the larger of peak hour demand or maximum day demand plus fire flow demand conditions.

Pump stations should be designed based on the firm capacity that can be consistently provided with the largest pump out of service. In addition, pump stations that deliver water into higher pressure planes must be sized to meet the demands of all downstream pressure planes.

3.3.7 Transmission/Distribution Mains

Water distribution mains should be looped and interconnected wherever possible so that in the event of a fire, failure of a portion of the distribution system, or another emergency, there is more than one path for water to flow to supply customer demands and fire flows.

Transmission and distribution mains are sized as follows for the greater of the following two demand conditions:

- Maximum day demand plus fire flow: maximum velocity = 9 ft/sec.
- Peak hour demand: maximum velocity = 7 ft/sec.

The minimum pipe size is 8 inches for water distribution mains, except for cul-de-sacs where the minimum pipe diameter is 6 inches. Allowable larger diameters are 8, 12, 16, 24, 30, 36, and 42 inches in diameter.

Reference: City of Austin water system design standards, Section 2.9.2 p 17, 18, 19.

3.3.8 Pressures

Pressure in a water distribution system is based on multiple factors that include the elevation within a pressure plane as well as the pressure losses through the pipes. Standards for pressures are as follows:

1. A minimum pressure of 35 psi needs to be maintained at all points in a pressure plane with a water demand of 1.5 gpm per connection. (TAC 290.44 (d))
2. A minimum pressure of 20 psi during fire flow conditions. (TAC 290.44 (d))
3. The maximum allowable pressure is 110 psi. Service line PRVs are required for pressures above 80 psi. (Austin Design Standards, section 2.9.2, p 17.)

3.3.9 Storage Facilities

Water storage in a distribution system is intended to accomplish the following purposes:

- Balance the diurnal flows that occur in a distribution system over a 24-hour period.
- Provide fire flows
- Provide water in emergencies such as during power outages and main breaks
- Provide storage for operational flexibility

TCEQ requires a total storage capacity of 200 gallons per connection, of which elevated storage needs to be 100 gallons per connection. Emergency power is required when elevated storage requirements are not met. (TAC 290.45 (b)(2)).

3.3.10 Water Demands

For planning purposes, the water demands that are assumed for infrastructure sizing are as follows:

1. Average daily demand: 165 gallons per person per day.
2. Maximum daily demand: 305 gallons per person per day.
3. Peak hour demand: 500 gallons per person per- /day.

Actual demand projections are based on the City's projections as shown in Table 2.2.

3.4 WATER SYSTEM EVALUATIONS

The water distribution system was evaluated to determine if the performance criteria are met. The sections below document the Cedar Park water system infrastructure and how the water system compares against the performance criteria.

3.4.1 Pressure Planes

Figure 3.2 is a pressure plane schematic that shows a representation of the Cedar Park water system with the elevations of each pressure plane in relation to the storage reservoirs. The elevation range associated with each pressure plane is shown in the figure, as well as in tabular form in Table 3.4. The pressure planes each cover an appropriate elevation range. There is some overlap in the elevation range of Pressure Plane 2 with Pressure Planes 3 and 4. However, this is not unusual given the terrain in the Cedar Park service area.

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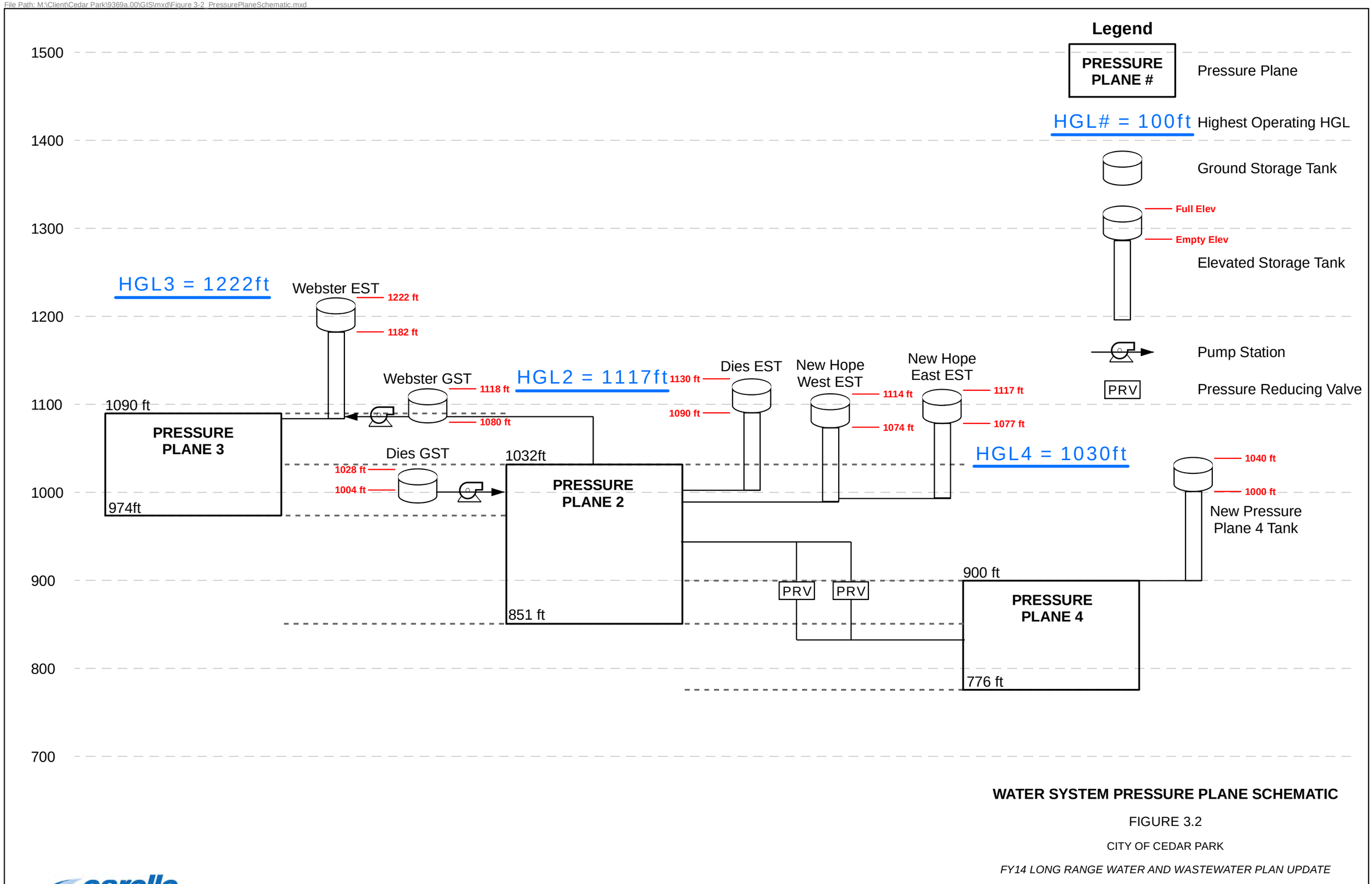

WATER SYSTEM PRESSURE PLANE SCHEMATIC

FIGURE 3.2

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

carollo

Table 3.4 Pressure Plane Elevation and Pressure Ranges FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park			
Pressure Plane	**Elevation Range (MSL) (ft)**	**Operating HGL (ft)**	**Static Pressure Range @ Maximum Tank Levels (psi)**
2	851-1032	1,117	37-114
3	974-1090	1,222	55-103
4	776-900	1,030	56-110

The demands are allocated in each pressure plane in the 2013 model scenario as shown in Table 3.5.

Table 3.5 Pressure Plane Demand Distribution FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park	
Pressure Plane	**Percent of 2013 Total Demand**
2	83.9
3	9.8
4	6.3

3.4.2 Water Supply

Table 3.6 shows the City's water supplies in comparison with the projected demands for each planning period. Based on the projected demands, the BCRUA needs to provide water to Cedar Park as shown. The planned maximum day water supply is greater than the 0.6 gpm per connection that is required by the TCEQ regulations.

Table 3.6 Water Supplies and Demands FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park				
	Planning Year			
	2013	**2015**	**2023**	**2040**
Max Day Demand (mgd)				
Cedar Park Service Area Demand	25.82	26.73	28.23	31.05
Additional ETJ Area Demand	0	0	0	2.50
Total Maximum Day Demand (mgd)	**25.82**	**26.73**	**28.23**	**33.55**
Available Supply (mgd)				
BCRUA WTP	4.53	4.53	5.87	8.00
CP WTP	26	26	26	26
Total Supply	**30.53**	**30.53**	**31.87**	**34.00**
Surplus/(Deficit) (mgd)	4.71	3.8	3.64	0.45

According to the schedule provided by the City, the BCRUA water treatment plant will have additional expansions between 2018 and 2025 that will provide the additional capacity needed to supply water to the City through 2040.

3.4.3 Pumping Capacity

The pump capacity in each pressure plane has been compared with the maximum day demands to determine if the pumps are adequately sized for each planning period. Table 3.7 summarizes the estimated operating points for the water pumps that are in the model. Pump curves used in the model were revised from the previous study based on pump test data supplied by the City. Pump operating points may differ from the manufacturer's curve due to wear on the pumps. Table 3.8 shows the pumping capacity in comparison with the demands to demonstrate that the pumping capacity is adequate through buildout for the entire system. Table 3.9 shows the required pumping capacity for Pressure Plane 3.

Table 3.7 Approximate Pump Design Points
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Pump	Head (ft)	Flow (gpm)
Dies 1	140	1,200
Dies 2	140	1,200
Dies 3	110	2,000
Dies 4	110	2,000
Dies 5	150	3,500
Dies 6	150	3,500
Dies 7	150	3,500
Dies 8	150	3,500
Dies 9	140	2,500
Dies 10	140	2,500
Dies 11	140	2,500
Total Capacity	**--**	**27,900**
Firm Capacity (1)		**24,400**
Webster 1	130	3,500
Webster 2	130	3,500
Webster 3	130	3,500
Total Capacity	**--**	**10,500**
Firm Capacity (1)		**7,000**

Notes:
(1) Capacity with the largest pump out of service

Table 3.8	**Pumping and Water Delivery Requirements through 2040 FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park**			
Entire Water System	**Planning Year**			
Source	**2013**	**2015**	**2023**	**2040[1]**
Estimated Population	84,642	87,630	92,565	110,000
Estimated Connections[2]	25,000	25,850	27,305	32,448
Required Firm Capacity by TCEQ (mgd)[3]	**23.0**	**23.8**	**25.0**	**29.5**
Required Firm Capacity by Demand Projection (mgd)	**25.8**	**26.7**	**28.2**	**33.55**
Pumping Facilities (gpm)				
Dies Pump Station	24,400	24,400	24,400	24,400
BCRUA FCV (current capacity = 3,146 gpm)	1,850	2,875	3,354	5,069
Total Firm Pumping Capacity (mgd)[4]	**37.8**	**39.3**	**40.0**	**42.4**
Surplus/(Deficit) by TCEQ (mgd)	**14.8**	**15.5**	**15.0**	**12.9**
Surplus/(Deficit) by City Demand Projection (mgd)	**12.0**	**12.6**	**11.8**	**8.9**

Notes:
(1) Includes all ETJ areas
(2) 3.39 people/connection
(3) 0.6 gpm/connection +1,000 gpm
(4) 694.44 gpm/mgd

Table 3.9	**Pumping Requirements through 2040 for Pressure Plane Three FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park**			
Pressure Plane 3	**Planning Year**			
Source	**2013**	**2015**	**2023**	**2040**
Estimated Population[1]	8,295	8,588	9,071	10,750
Estimated Connections[2]	2,450	2,533	2,676	3,180
Required Firm Capacity by TCEQ (mgd)[3]	**3.6**	**3.6**	**3.8**	**4.2**
Required Firm Capacity by Demand Projection (mgd)	**2.6**	**2.7**	**2.8**	**3.2**
Pumping Facilities (gpm)				
Webster Pump Station	7,000	7,000	7,000	7,000
Total Firm Pumping Capacity (mgd)[4]	**10.1**	**10.1**	**10.1**	**10.1**
Surplus/(Deficit) by TCEQ (mgd)	**6.5**	**6.5**	**6.3**	**5.9**
Surplus/(Deficit) by Demand Projection (mgd)	**7.5**	**7.4**	**7.3**	**6.9**

Notes:
(1) Includes all ETJ areas
(2) 3.39 people/connection
(3) 0.6 gpm/connection + 1,000 gpm
(4) 694.44 gpm/mgd

3.4.4 Storage Capacity

Table 3.10 lists the storage capacity in Pressure Planes 2 in comparison with the storage requirements according to the performance criteria. A portion of the Pressure Plane 2 storage is allocated to Pressure Plane 4 because Pressure Plane 4 can be served from Pressure Plane 2 through PRVs. Table 3.11 shows the storage capacity in Pressure Plane 3. Table 3.12 shows the storage capacity in Pressure Plane 4. These three tables show that the City has sufficient storage capacity through 2040 according to the performance criteria.

The City may choose to add an elevated storage tank in Pressure Plane 4 to provide increased reliability and operational flexibility. This storage tank would have a storage volume of 0.5 million gallons and would be located adjacent to Fire Station No. 4 on Church Street and would require a 16-inch main to connect to the existing system. To ensure adequate turnover in the storage tank, the PRVs would need to be equipped with additional controls so that the valves would close based on tank level and allow water to cycle out of the tank and then refill when the valves opened again. In the storage analysis this tank was assumed to be in service by year 2040.

Table 3.10 Storage Capacity Evaluation for Pressure Plane Two
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Pressure Plane	**Planning Year**			
Source	**2013**	**2015**	**2023**	**2040**
Estimated Population(1)	71,038	73,546	77,688	92,321
Estimated Connections(2)	20,982	21,695	22,917	27,233
Total Storage Required (MG)(3)	4.20	4.34	4.58	5.45
Elevated Storage Required (MG)(4)	2.10	2.17	2.29	2.72
Elev. Storage Reserved for PP 4 (MG)	0.25	0.25	0.25	0.00
Ground Storage Reserved for PP 4 (MG)	0.25	0.25	0.25	0.00
Storage Facilities (MG)				
New Hope West EST	1.50	1.50	1.50	1.50
New Hope East EST	1.00	1.00	1.00	1.00
Dies EST	0.50	0.50	0.50	0.50
Total Elevated Storage	**3.00**	**3.00**	**3.00**	**3.00**
Dies GST 1	0.75	0.75	0.75	0.75
Dies GST 2	1.50	1.50	1.50	1.50
Dies GST 3	3.00	3.00	3.00	3.00
Total Ground Storage	**5.25**	**5.25**	**5.25**	**5.25**
Total Storage Available (MG)	**8.25**	**8.25**	**8.25**	**8.25**
Total Storage Surplus/(Deficit) (MG)	**3.55**	**3.41**	**3.17**	**2.80**
Elevated Storage Surplus/(Deficit) (MG)	**0.65**	**0.58**	**0.46**	**0.28**

Notes:
(1) Includes all ETJ areas
(2) 3.39 people/connection
(3) 200 gal/connection
(4) 100 gal/connection

Table 3.11 Storage Capacity Evaluation for Pressure Plane Three FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park				
Pressure Plane 3	**Planning Year**			
Source	**2013**	**2015**	**2023**	**2040**
Estimated Population	8,272	8,564	9,046	10,750
Estimated Connections(1)	2,443	2,526	2,668	3,180
Total Storage Required (MG)(2)	0.49	0.51	0.53	0.63
Elevated Storage Required (MG)(3)	0.24	0.25	0.27	0.32
Storage Facilities (MG)				
Webster EST	0.75	0.75	0.75	0.75
Total Elevated Storage	**0.75**	**0.75**	**0.75**	**0.75**
Webster GST	0.56	0.56	0.56	0.56
Total Ground Storage	**0.56**	**0.56**	**0.56**	**0.56**
Total Storage Available (MG)	**1.31**	**1.31**	**1.31**	**1.31**
Total Storage Surplus/(Deficit) (MG)	**0.82**	**0.80**	**0.78**	**0.68**
Elevated Storage Surplus/(Deficit) (MG)	**0.51**	**0.50**	**0.48**	**0.43**

Notes:
(1) 3.39 people/connection
(2) 200 gal/connection
(3) 100 gal/connection

Table 3.12 Storage Capacity Evaluation for Pressure Plane Four FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park				
Pressure Plane 4	**Planning Year**			
	2013	**2015**	**2023**	**2040**
Estimated Population	5,332	5,520	5,831	6,930
Estimated Connections(1)	1,575	1,628	1,720	2,044
Total Storage Required (MG)(2)	0.31	0.33	0.34	0.41
Elevated Storage Required (MG)(3)	0.16	0.16	0.17	0.20
Storage Facilities (MG)				
New Pressure Plan 4 Tank	0.00	0.00	0.00	0.50
Elev. Storage Reserved from PP2	0.25	0.25	0.25	0.00
Total Elevated Storage	**0.25**	**0.25**	**0.25**	**0.50**
Ground Storage Reserved from PP2	0.25	0.25	0.25	0.00
Total Ground Storage	**0.25**	**0.25**	**0.25**	**0.00**
Total Storage Available (MG)	**0.50**	**0.50**	**0.50**	**0.50**
Total Storage Surplus/Deficit (MG)	**0.19**	**0.17**	**0.16**	**0.09**
Elevated Storage Surplus/Deficit (MG)	**0.09**	**0.09**	**0.08**	**0.30**

Notes:
(1) 3.39 people/connection
(2) 200 gal/connection
(3) 100 gal/connection

3.4.5 Distribution Pipelines

Figure 3.3 shows the 2013 peak hour demand scenario of the water distribution system model with the pipes color coded by velocity. Low pressures can be caused by high elevations or excessive head losses. Pressures below 35 psi are caused primarily by high elevations. Low pressures were predicted in the model along the Whitestone Boulevard. The other location of low pressures is along the south part of the City's service area along Anderson Mill Road and Ranch Road 620 North. If the City desires to increase pressures at this location, an inline booster station serving the higher elevations is one way to ensure adequate pressures. However, adding an inline booster station should only be done as a last resort because of the operational costs associated with an inline booster station. Pressures can be improved by adding additional pipe capacity along Timberwolf Trail and Anderson Mill Road (Project W-1).

Figure 3.4 shows the water distribution system in 2040. This map also shows pipes color coded by velocity and nodes color coded by pressure. The map shows one location where peak hour velocities slightly exceed 5 ft/sec. in the 12-inch pipe serving the Block House development. However, the water system serving this area is configured such that there will only be one pipe serving this development. This development is also served by a ground storage tank.

Due to successful implementation of previous long range plans, most of the water transmission mains needed to serve the City are already constructed. One additional main is needed to serve the northeast part of Pressure Plane Two and the northern part of Pressure Plane Four. This main would connect to the existing distribution system on New Hope Drive and go east to Ronald Reagan Boulevard, with a PRV station to separate the two pressure planes.

The model contains additional distribution system mains that are located along roads that have already been constructed to serve future customers along those roads. These pipes could be constructed by developers, but are included in the list of water mains shown herein that are being recommended by 2040.

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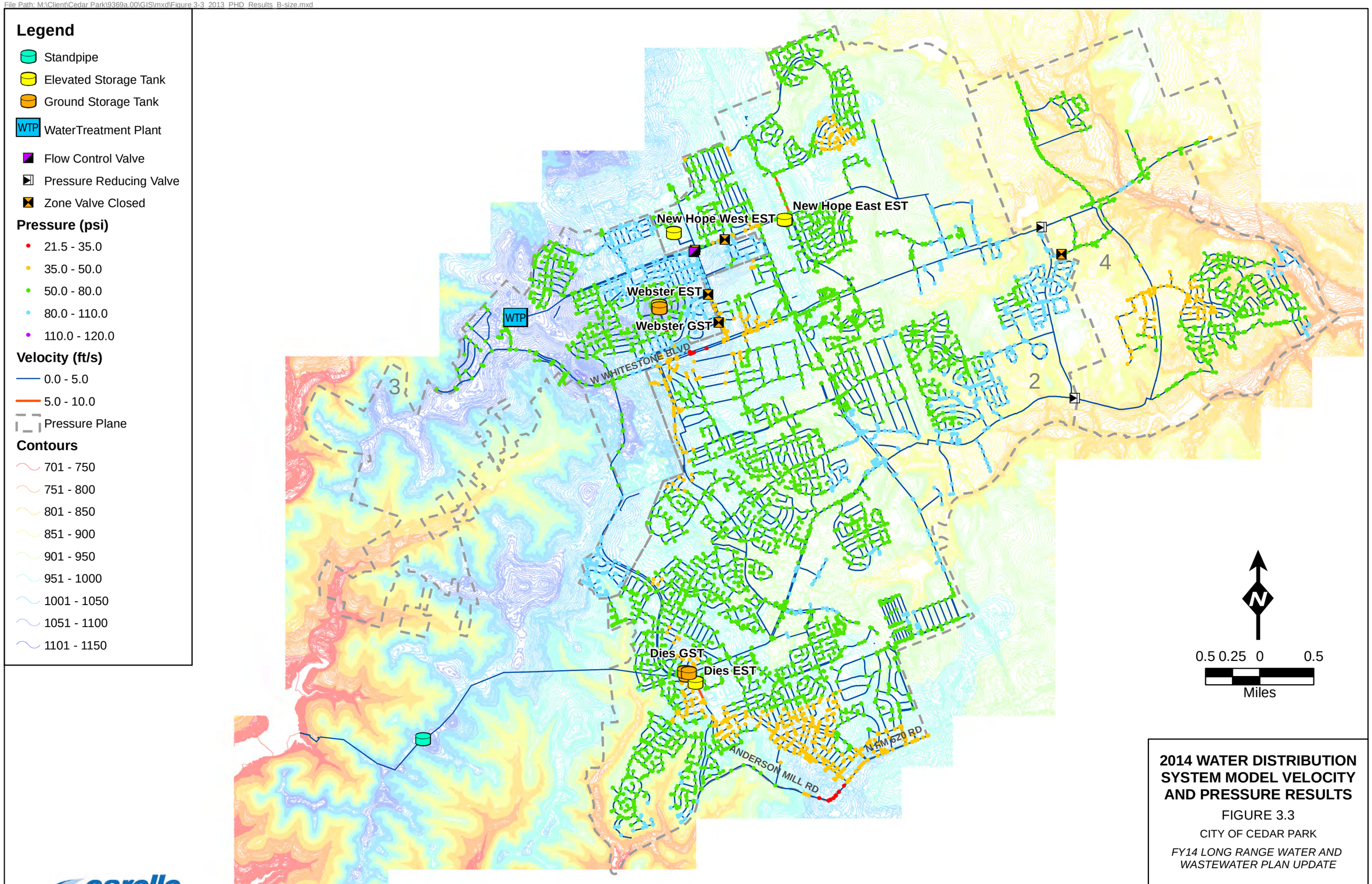

2014 WATER DISTRIBUTION SYSTEM MODEL VELOCITY AND PRESSURE RESULTS

FIGURE 3.3

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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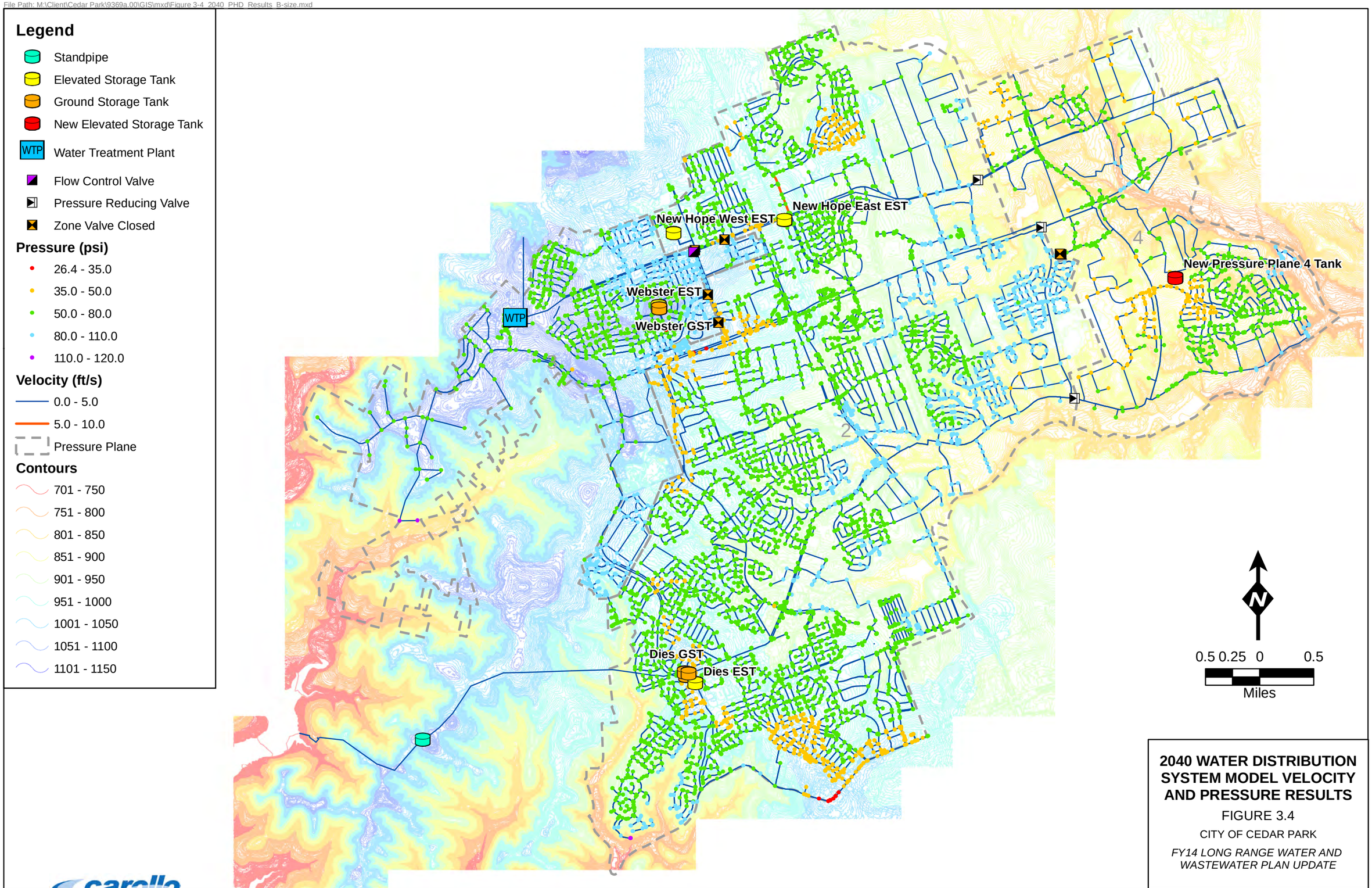
File Path: M:\Client\Cedar Park\9369a.00\GIS\mxd\Figure 3-4_2040_PHD_Results_B-size.mxd



2040 WATER DISTRIBUTION SYSTEM MODEL VELOCITY AND PRESSURE RESULTS

FIGURE 3.4

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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3.4.6 Fire Flows

Figure 3.5 shows the results of the fire flow study using the 2013 model scenario. Fire flow demands are allocated according to Table 3.2. Locations where the fire flows are inadequate can exist on un-looped or dead end mains. The fire flow standard requirements are not expected to be satisfied at all cul-de-sac locations where looping or additional capital improvements are not practical.

The Shenandoah subdivision is constructed of smaller diameter mains that were not intended to deliver fire flows. If the City chooses to deliver fire flows to this development, then 26,800 ft. of pipe would need to be replaced with 8-inch mains.

Water mains in the developments west of the BCRUA water treatment plant are owned by a private water supplier and are not large enough to deliver fire flows. The water mains along Running Doe Lane, Fawn Valley Drive, Indian Chief Drive, Wagon Way, and Frostdale Drive would need to be replaced with 11,600 feet of 8-inch mains to provide required fire flows.

The water main along HUR Industrial Boulevard requires looping to deliver fire flows that meet the standard. Adequate flows can be delivered by looping a new main to connect with the main in Wheaton Trail.

A new water main is needed to complete the connection between water mains on Polar Lane and Parmer Lane as this area continues to develop to improve fire flows in this area.

Figure 3.6 shows the fire flow analysis at buildout. This figure shows improvements for some of the deficiencies that were identified in the 2013 model.

3.4.7 Project Summary

Table 3.13 summarizes the projects needed to provide sufficient water supply and water distribution capacity to the Cedar Park water system. These capital improvement projects are shown in Figure 3.7.

Print Date: May 14, 2014
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Legend

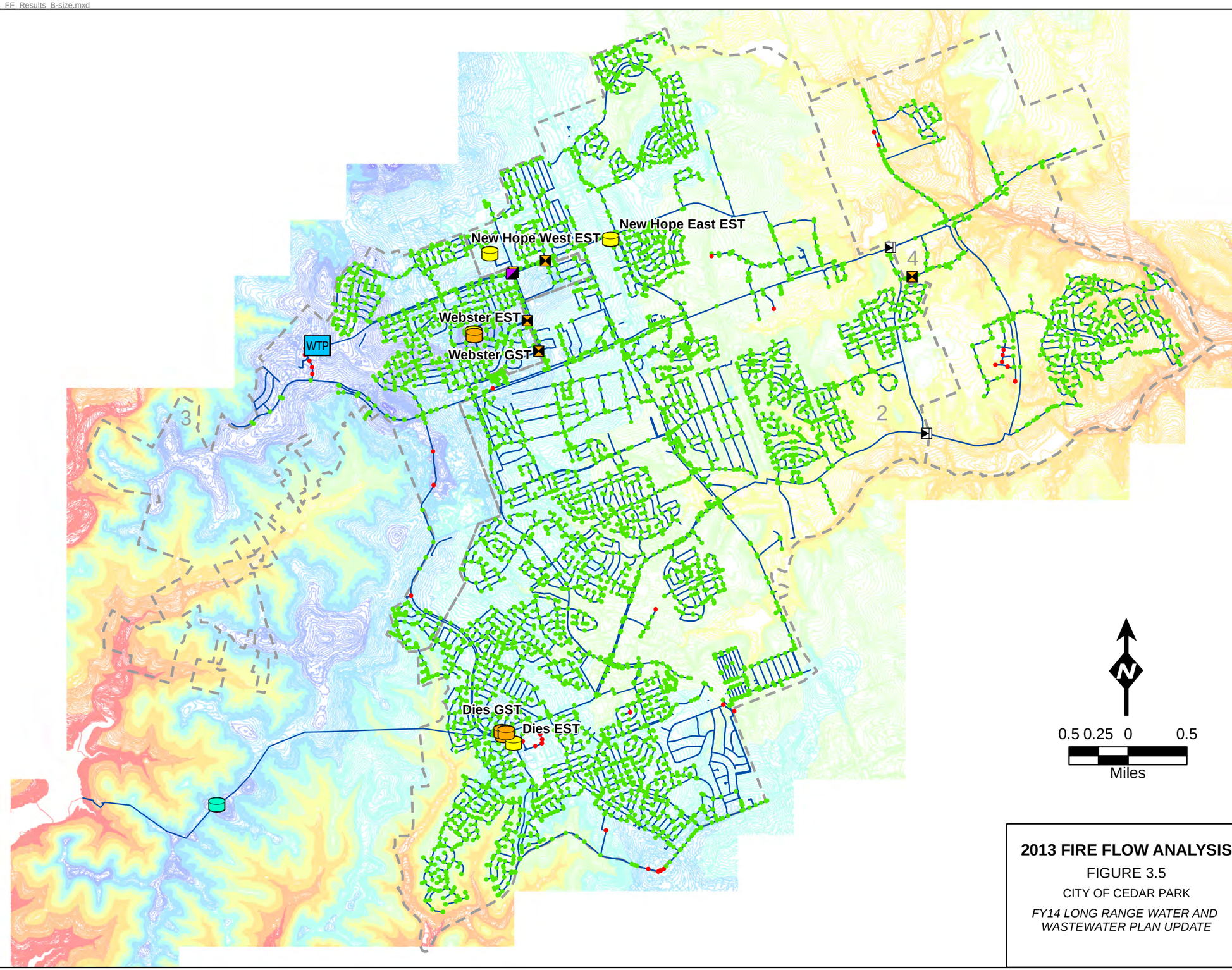
- Standpipe
- Elevated Storage Tank
- Ground Storage Tank
- WTP Water Treatment Plant
- Flow Control Valve
- Pressure Reducing Valve
- Zone Valve Closed

Fire Flow Results

- Pressure Below 20 psi
- Pressure Above 20 psi
- 2014 Water Pipe
- Pressure Plane

Contours

- 701 - 750
- 751 - 800
- 801 - 850
- 851 - 900
- 901 - 950
- 951 - 1000
- 1001 - 1050
- 1051 - 1100
- 1101 - 1150



2013 FIRE FLOW ANALYSIS

FIGURE 3.5

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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Print Date: May 14, 2014
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Legend

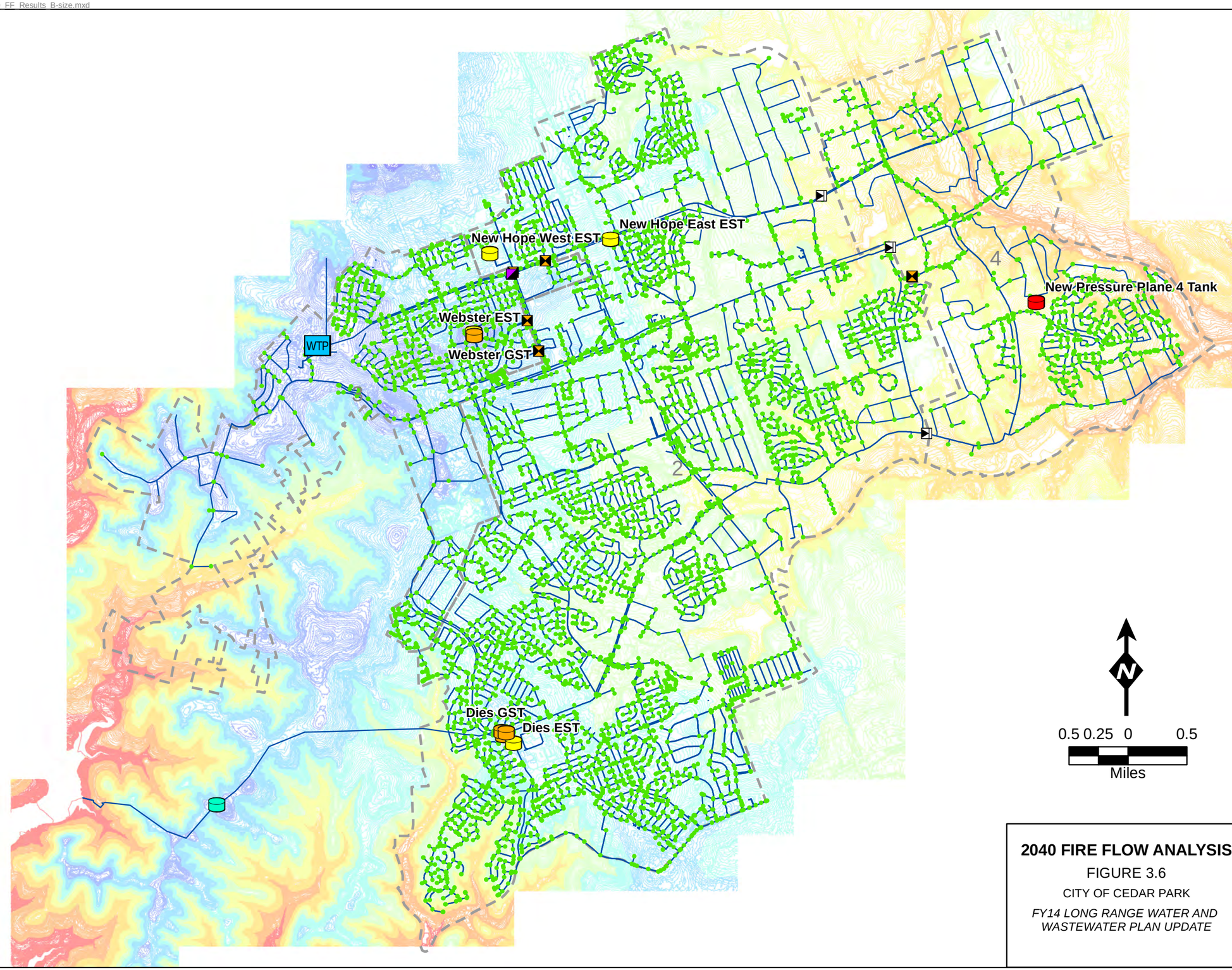
- Standpipe
- Elevated Storage Tank
- Ground Storage Tank
- New Elevated Storage Tank
- WTP Water Treatment Plant
- Flow Control Valve
- Pressure Reducing Valve
- Zone Valve Closed

Fire Flow Results

- Pressure Below 20 psi
- Pressure Above 20 psi
- 2040 Water Pipe
- Pressure Plane

Contours

- 701 - 750
- 751 - 800
- 801 - 850
- 851 - 900
- 901 - 950
- 951 - 1000
- 1001 - 1050
- 1051 - 1100
- 1101 - 1150



2040 FIRE FLOW ANALYSIS

FIGURE 3.6

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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Table 3.13 Water Distribution System Capital Project Summary
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

CIP Project No.	Description	Diameter (in)	Length (ft)	Project Justification/Driver	Planning Period
W-1	New 16-inch on Timberwolf Trail from Cypress Creek Road to Dies EST. New 16-inch from Dies EST south along Anderson Mill Road to connection with existing 12-inch 420 feet north of Old Mill Road	16	2,520	This project will increase Peak hour pressures at the Pressure Plane 2 high point on Anderson Mill Road, and reduce pipe velocities near the Dies EST.	2018 – 2025
	New 12-inch from the south connection of the proposed 16-in pipe on Anderson Mill Road to the adjacent 12-inch pipe heading south along Anderson Mill Road	12	110		2018 – 2025
W-2	New 12-inch pipe from the north end of HUR Industrial Boulevard to the south end of Wheaton Trail	12	1,460	This project will facilitate looping in the distribution system and help provide adequate fire flows.	2023 – 2025
W-3	New 16-inch on New Hope Dr from CR-180 to Ronald Reagan Boulevard with PRV placed east of Arrow Point Road on New Hope Drive	16	12,430	This project will prepare for future development in Pressure Plane 2 and provide looping to reduce velocities in Pressure Plane 4.	2023 – 2025
W-4	New 8-inch pipe on Polar Lane crossing Parmer Lane	8	1,540	This project will facilitate looping in the distribution system and help provide adequate fire flows.	2040
W-5.1 W-5.2	Future expansions to the BCRUA water treatment plant BCRUA deep water intake	n/a	n/a	Required to provide additional water treatment capacity	2018 – 2025
W-6	0.5 MG elevated storage tank in Pressure Plane 4 with 16-inch connecting pipe.	n/a	n/a	This project will provide increased reliability and operational flexibility.	2040

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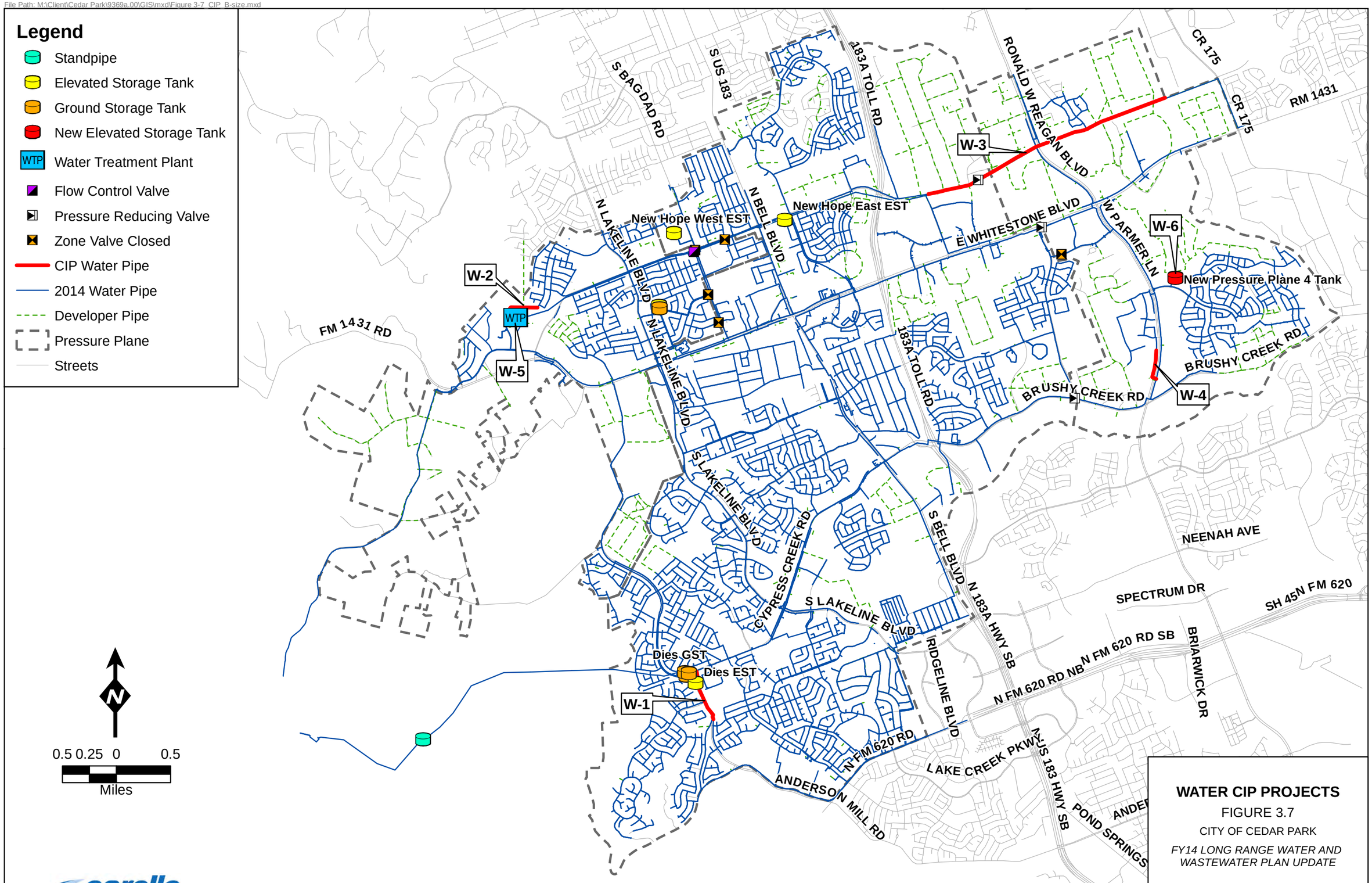


WATER CIP PROJECTS

FIGURE 3.7

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

3.5 CAPITAL IMPROVEMENT RECOMMENDATIONS

3.5.1 Cost Development

Costs have been developed for the recommended capital improvements for this long-range water and wastewater plan update. This cost estimate is a planning level estimate that is developed without the detailed information commands available at the design stage of a project. Therefore, the estimate was prepared in accordance with the guidelines of the AACE International (the Association for the Advancement of Cost Engineers) for a Class 5 estimate. According to the definitions of AACE International, the Class 5 estimate is defined as:

> *"CLASS 5 ESTIMATE. Generally prepared based on very limited information, where little more than proposed plant type, its location, and the capacity are known. Strategic planning purposes, such as but not limited to, market studies, assessment of viability, evaluation of alternative schemes, project screening, location and evaluation of resource needs and budgeting, long range capital planning, etc. Some examples of estimating methods used would be estimating methods such as cost/capacity curves and factors, scale up factors, parametric and modeling techniques. Typically, very little time is expended in the development of this estimate. The typical expected accuracy range for this class estimate is -20 percent to -50 percent on the low side and +30 percent to + 100 percent on the high side."*

Table 3.14 lists the unit costs that have been used to calculate construction costs. These costs are conservatively based on compiled bid tabulations for similar projects constructed in the South and central Texas region, including West Harris County, City of Houston, City of Austin, and the City of Windermere. Recent bid results received by the City of Cedar Park for the CR180 CR185 project, which included water and sanitary sewer lines were referenced specifically. To obtain project costs, a factor of 1.3 is applied to the construction cost to account for engineering design, construction management, and a contingency. Costs are based on the Engineering News-Record 20-City Average Construction Cost Index (ENR CCI). The October 2013 ENR CCI is 9689.

3.5.2 Capital Plan

Table 3.15 summarizes the recommended water system capital improvements, including Cedar Park's contribution to the BCRUA plant expansions and Cedar Park's contribution to the deep water intake.

Appendix D contains CIP project maps that describe each capital improvement.

Table 3.14 Unit Costs
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Water Pipelines

Diameter (in)	Material	Pipe Cost ($/LF)	Excavation & Backfill 5 - 10 ft Deep ($/LF)	Paving and Sidewalk Replacement ($/LF)	General Requirements[1] ($/LF)	Fittings and Valves ($/LF)	Contractor Overhead and Profit (15%) ($/LF)	Total Pipe Construction Cost ($/LF)	Engineering, Construction Management, Administration (30%) ($/LF)	Total Pipe Project Cost ($/LF)
8	PVC/C900	$28.00	$44.00	$38.00	$6.50	$5.00	$14.40	$132	$40	$172
12	PVC/C900	$40.00	$44.00	$38.00	$6.50	$6.00	$16.35	$147	$44	$192
16	PVC/C905	$50.00	$44.00	$38.00	$6.50	$7.00	$18.00	$160	$48	$208

Elevated Storage Reservoirs

Capacity (MG)	Construction Cost ($/gal)	Engineering, Construction Management, Administration (30%)	Total Project Cost ($/gal)
0.5	$2.23	$0.67	$2.90

Note:
(1) General Requirements includes reinforced filter fabric fence, inlet protection barriers, traffic control and trench safety.

Table 3.15 Capital Improvement List FY 2014-2040
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Project No.	Description	Units	Quantity	Unit Price - Construction	Construction Cost (only)	Unit Price - Construction and Soft Cost	Project Budget
Water Pipelines							
W-1	16-inch pipe on Timberwolf Trail and Anderson Mill Road, installed including all valves and fittings	LF	2,520	$160	$402,600	$208	$524,200
	12-inch pipe from the south connection of the proposed 16-inch pipe on Anderson Mill Road to the adjacent 12-inch pipe heading south along Anderson Mill Road, installed including all valves and fittings	LF	110	$147	$16,200	$192	$21,200
	Subtotal						***$545,400***
W-2	12-inch pipe from the north end of HUR Industrial Boulevard to the south end of Wheaton Trail, installed including all valves and fittings	LF	1,460	$147	$214,800	$192	$280,400
W-3	16-inch pipe on New Hope Drive from CR-180 to Ronald Reagan Boulevard with PRV placed east of Arrow Point Road on New Hope Drive, installed including all valves and fittings	LF	12,430	$160	$1,988,800	$208	$2,585,500
W-4	8-inch pipe on Polar Lane crossing Parmer Lane, installed including all valves and fittings	LF	1,540	$132	$203,600	$172	$264,900
W-6	0.5 MG elevated storage tank in Pressure Plane 4 with 16-inch connecting pipe	MG	500,000	$2.23	$1,115,000	$2.90	$1,450,000

Project No.	Description	Cost	City of Cedar Park Allocation	Project Budget
W-5.1	BCRUA Plant Expansion, Phase 1B & C	$23,900,000	26.67%	$6,374,100
W-5.2	BCRUA Deep Water Intake, Phase 2	$165,000,000	27.45%	$45,292,500
	Total Capital Budget			**$56,792,800**

WASTEWATER SYSTEM PLAN

4.1 INTRODUCTION

This chapter contains the wastewater system plan for Cedar Park's FY14 long range plan update. This chapter is divided into the following sections:

- Model Update: This section describes the wastewater model update including collection system basin delineation, dry and wet weather loads, peaking factors and modeling methods.
- Performance Criteria: This section explains the performance criteria that are used in evaluating the wastewater system.
- Wastewater System Evaluations: This section describes the analysis and results of the existing wastewater system evaluation for existing and buildout conditions.
- Capital Improvement Plan: This section contains the capital improvement projects and planning level costs for the capital improvements that have been identified.

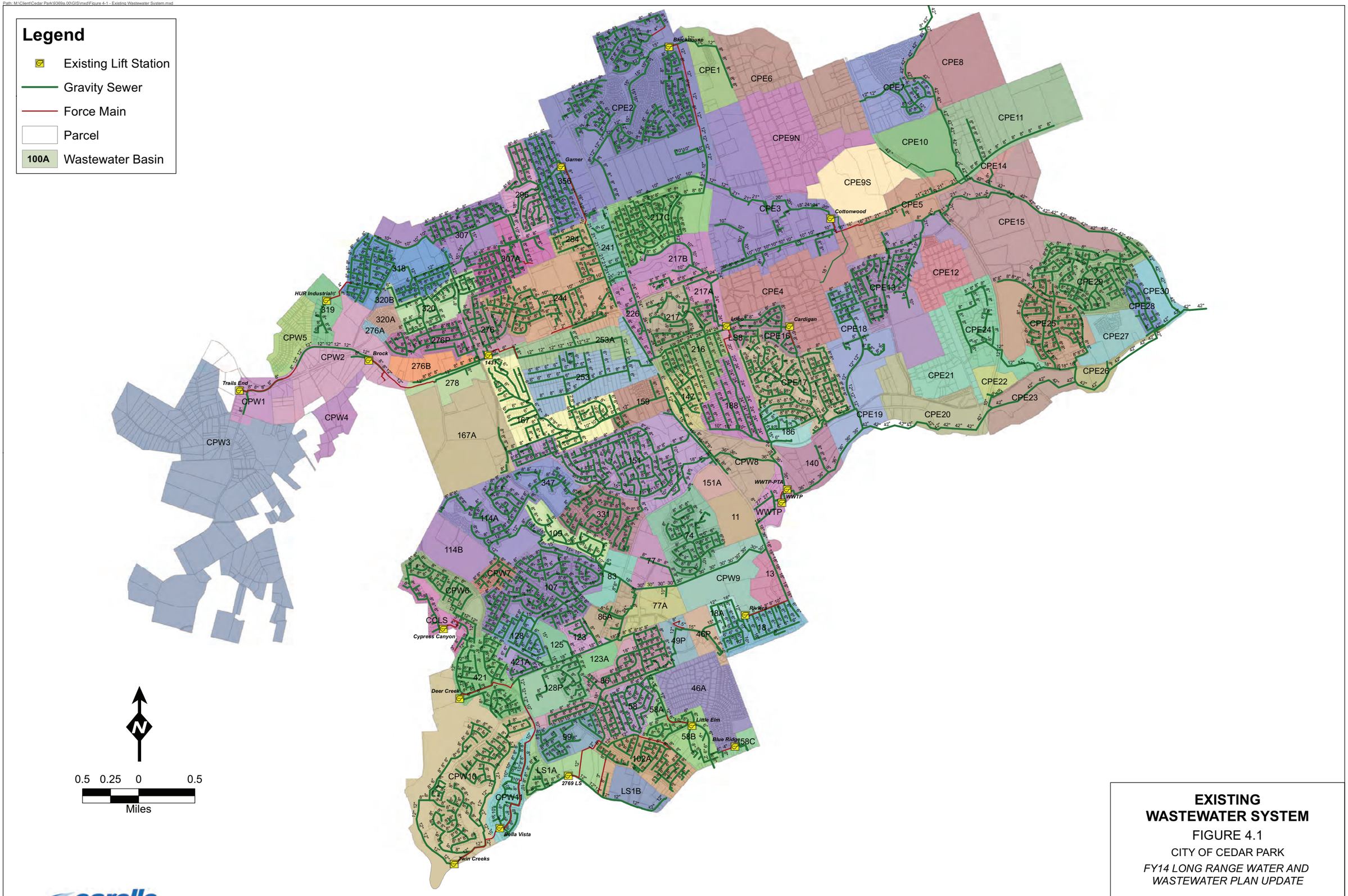
4.2 MODEL UPDATE

The purpose of the model update is to correctly represent the wastewater collection system as it exists today. The City uses a spreadsheet model in Microsoft Excel to evaluate capacity in the City's large, gravity trunk sewers. To achieve this, collection basins are defined that contribute flows to a common downstream point. The model includes a dry weather flow component based on the estimated collection basin population for residential areas and acreage for commercial areas; and a wet weather flow component based on the acreage of each collection basin. The model is configured to sum the total flows from the upstream basins to the pipe to use as the basis for the capacity analysis. Appendix E describes the spreadsheet and explains how to use the spreadsheet model.

4.2.1 Collection Basin Delineation

The existing wastewater collection system is shown in Figure 4.1. Prior to the update the City's wastewater model included approximately 80 collection basins that generally covered the areas west of Bell Boulevard that generate flows that are conveyed to the Cedar Park Water Reclamation Facility (WRF). The areas east of Bell Boulevard that generate flows that are conveyed to the Brushy Creek Regional Wastewater System (BCRWWS) were not included in the original model, and were added as a part of this study.

Path: M:\Client\Cedar Park\9369a.00\GIS\mxd\Figure 4-1 - Existing Wastewater System.mxd



EXISTING WASTEWATER SYSTEM

FIGURE 4.1

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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The City's GIS data was used to review and revise the collection basins in the existing model where appropriate and to delineate basins for the eastern portion of the planning area that outfalls to the BCRWWS. A total of 112 collection basins were delineated throughout the Cedar Park planning area. A wastewater system schematic is shown in Figure 4.2 that illustrates the relationships between the collection basins and how the City's lift stations are connected in the system.

4.2.2 Model Pipes

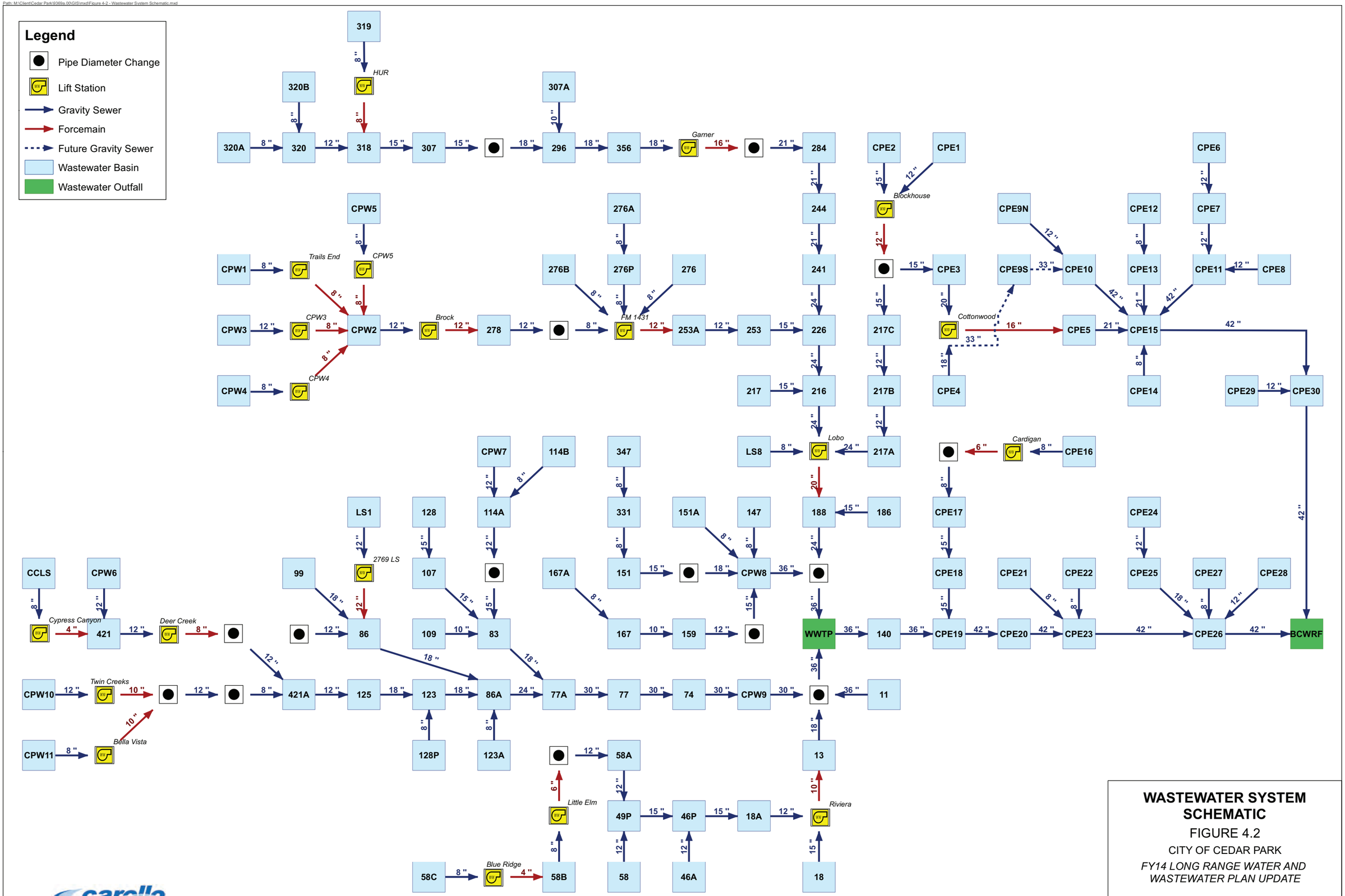
The City's wastewater model includes the primary interceptors that convey flow out of each collection basin. For most basins, this pipe has a single diameter. For basins where the primary interceptor is multiple sizes, there are two pipes included in the model. These pipes are shown in Figure 4.2 on either side of the symbol that depicts a pipe diameter change.

4.2.3 Wastewater Loads

Prior to the update, the City's model included a dry weather flow component and a wet weather flow component. The dry weather flow component for a collection basin was calculated using the number of parcels in each basin, an assumed number of people per parcel and a per-capita wastewater generation rate (gallons per capita per day, or gpcd). The wet weather flow component was calculated using the basin acreage times a wet-weather flow unit load of 800 gallons per acre per day (gpad). For Basin 167 A (Quarry) only the area adjacent to the collection system was used to apply the wet weather flow unit load so that the quarry itself was not included in the wet weather loading calculations.

In the model update, the dry weather flow component was split to include a residential flow contribution and a non-residential (commercial, industrial, etc.) flow contribution. The residential flow contribution is calculated using the number of parcels, the assumed number of people per parcel and the gpcd wastewater generation rate. This method is similar to the way in which dry weather flows were computed previously. However, the gpcd value was adjusted from 100 gpcd to 65 gpcd to account for the residential flow contribution only. The non-residential flow contribution was added to the model in the update and is calculated using the acreage of the non-residential parcels times a unit load factor of 650 gpad.

Wastewater flows to each collection basin in the model are summed so that the total flow in a basin includes the flow generated in that basin plus all of the flows from any upstream basins. A peaking factor is applied to the total dry weather flow in each basin. The total dry weather and wet weather flows are then summed to calculate the peak, wet weather flow. The peak, wet weather flow is then used in the model calculations to estimate pipe capacity. Water levels in each pipe are based on steady state flow conditions using the Manning's Equation.



WASTEWATER SYSTEM SCHEMATIC

FIGURE 4.2

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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4.2.4 Model Calculations and Validation

The City's model uses Manning's Equation to calculate the full pipe flow for the primary interceptor for each collection basin using the pipe diameter and a user defined pipe slope. The peak, wet weather flow for each collection basin is then compared to 90 percent of the full pipe flow of the primary interceptor. Pipes where 90 percent of the full pipe flow exceeds the peak, wet weather flow are considered to have sufficient capacity. Pipes that do not meet this criteria are considered to have insufficient capacity.

4.3 PERFORMANCE CRITERIA

4.3.1 Background

The City's wastewater collection system infrastructure needs to provide acceptable levels of performance and reliability, while being sensitive to the cost of new infrastructure. As new infrastructure is planned, "standards of measurement" or performance criteria established by the City are necessary to evaluate the adequacy of the infrastructure. This section describes the performance criteria that were used to evaluate the existing water system and to determine the capacity requirements of future improvements. This performance criteria comes from the Texas Administrative Code (TAC), the Texas Commission on Environmental Quality (TCEQ), and the City of Austin design standards as adopted by Cedar Park.

4.3.2 Pipe Capacities

Sewer capacities are dependent on many factors. These include pipe roughness, maximum allowable depth of flow, flow velocity constraints and pipe slope. The Continuity Equation and Manning's Equation are used to calculate sewer capacity under steady-flow hydraulic conditions. The Manning's coefficient 'n' is a friction coefficient that varies with respect to pipe material, size of pipe, depth of flow, smoothness of joints, root intrusion and other factors. For gravity sewers, the Manning's coefficient typically ranges between 0.011 and 0.017. For planning purposes, a 'n' value of 0.013 is used for this project.

4.3.3 Flow Depth (d/D)

When designing sewers, it is common practice to adopt variable flow depth criteria for various pipe sizes. This criterion is expressed as a ratio of the maximum depth of flow (d) to the pipe diameter (D). Design d/D ratios typically range from 0.5 to 0.9, with the lower ratios generally used for smaller pipes that may experience flow peaks greater than planned.

The City of Austin design standards specify capacity requirements as a percentage of the capacity of the pipe when flowing full rather than a d/D ratio. For pipes 15 inches in diameter and smaller the peak dry weather flow should be less than 65% of the pipe capacity when flowing full and the peak wet weather flow should be less than 85% of the

pipe capacity when flowing full. For sewer mains 18 inches in diameter and larger, the peak wet weather flow should not exceed 80% of the pipe capacity when flowing full.

4.3.4 Pipe Slope and Velocity

In order to minimize the settlement of solids at the bottom of pipes and promote scouring, it is standard design practice to specify that a minimum velocity of 2 feet per second (fps) be maintained when the pipe is flowing half full. At this velocity, the sewer flow will typically remove deposition at the bottom of the pipe. Due to the hydraulics of circular pipes, the velocity for half pipe flow is the same as the velocity for full pipe flow.

The City of Austin design standards and Texas Administrative Code (TAC) specify pipe velocity requirements. For gravity sewers the minimum design velocity calculated using the peak dry weather flow should not be less than 2 fps. The maximum design velocity calculated using the peak wet weather flow should not exceed 10 fps. Table 4.1 lists the minimum and maximum slopes for pipe design according to the TAC requirements.

Table 4.1 Minimum and Maximum Pipe Slopes (1)
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Pipe Size (inches)	Minimum Slope (%)	Maximum Slope (%)
6	0.50	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	(2)	(2)

Notes:
(1) Table C.1 Texas Administrative Code (TAC) 217.53
(2) For pipes larger than 39 inches in diameter, the slope is determined by Manning's Equation to maintain a velocity greater than 2 feet per second and less than 10 feet per second when flowing full.

4.3.5 Changes in Pipe Size

When a smaller pipe joins a larger pipe, the invert of the pipes should be set to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both pipes at the same elevation.

4.3.6 Lift Stations

A firm capacity equal to the peak hourly flow plus anticipated wet weather flow is often used to determine the size of lift stations. The lift station should be able to provide a “firm” pumping capacity with the largest pump out of service.

4.3.6.1 Pump Operation

Lift station wet well sizing takes into consideration the fill time, based on average flow, and the minimum pump cycle time. The volume of the wet well should provide a retention period of at least 30 minutes of average daily design flow. When selecting the minimum cycle time, Table 4.2 should be utilized. Starting and stopping more than seven times an hour for any one pump is not recommended.

Table 4.2 Minimum Pump Cycle Times
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Pump Horsepower	Minimum Cycle Times (minutes)
< 50	6
50 – 100	10
> 100	15

4.3.6.2 Emergency Operation

The objective of emergency operation is to protect public health by preventing sewer backups and subsequent discharge into streets and other public or private property. The most common collection system emergency would be a power outage at a lift station.

4.3.7 Force Mains

Force mains should have a minimum diameter of 4 inches. The velocity should be between 4 and 6 fps to provide adequate scour velocity, so that any solids deposited while the lift station pumps are off will be re-suspended and transported when the pumps are operating. A Hazen-Williams friction coefficient of 120 is typical for representing the friction losses in force mains.

4.3.8 Gravity Sewer Planning Guidelines

Gravity sewers should be designed and constructed to have a minimum of 6 feet of cover or sufficient depth to serve the planned service area.

Gravity sewers and force mains should have a minimum separation of 9 feet from potable water mains and 3 feet from reclaimed water mains, unless they are encased in concrete or are pressure rated.

Manholes with sewers intersecting at greater than or equal to 90-degree angles should generally be avoided, but if necessary, should provide 0.2 feet of invert drop across the manhole. Other manholes should provide a minimum of 0.1 feet of invert drop.

4.3.9 Inflow and Infiltration

In the Austin area, inflow and infiltration estimates for storm inflows can vary between 100 gpad and 750 gpad. New areas may have very little storm inflow, but inflow increases with age as root intrusion or pipe defects increase. The City uses 800 gpad as a wet weather flow generation rate.

4.3.10 Criteria Summary

Table 4.3 summarizes the performance and design criteria used to evaluate the City's wastewater collection system.

Table 4.3 Wastewater System Performance Criteria Summary
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Pipe Size (inches)	Minimum Slope (%)	Maximum Slope (%)
6	0.50	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	(1)	(1)

Note:
(1) For pipes larger than 39 inches in diameter, the slope is determined by Manning's Equation to maintain a velocity greater than 2 feet per second and less than 10 feet per second when flowing full.

Table 4.3 Wastewater System Performance Criteria Summary FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park	
Maximum Velocity	≤ 9 feet per second
Pipe Capacity Percent of Full Pipe Flow, New Pipes, Diameter ≤ 15-in, Peak Dry Weather Flow Percent of Full Pipe Flow, New Pipes, Diameter ≤ 15-in, Peak Wet Weather Flow Percent of Full Pipe Flow, New Pipes, Diameter ≥ 18-in, Peak Wet Weather Flow Percent of Full Pipe Flow, Existing Pipes, Peak Wet Weather Flow	 65% 85% 80% 90%
Headloss in Existing Pipes Gravity Pipes Force Mains	 Manning's n = 0.013 Hazen Williams C = 120
Changes in Pipe Size When a smaller sewer joins a larger one	 Sewer flowline will be matched
Headloss at Manholes Manholes with pipes intersecting at 90 degrees or greater Manholes with pipes intersecting at less than 90 degrees	 Provide 0.2 ft Invert Drop Provide 0.1 ft Invert Drop
Dry Weather Residential Flow	65 gpcd
Dry Weather Non-Residential Flow	650 gallons/acre/day
Wet Weather Flow (Inflow and Infiltration)	800 gallons/acre/day
Dry Weather Flow Peaking Factor Peaking Factor = $\frac{18 + (0.0144 \text{ x dry flow})^{0.5}}{4 + (0.0144 \text{ x dry flow})^{0.5}}$	Effective Value Range for Cedar Park: 2.2 – 4.5

4.4 WASTEWATER SYSTEM EVALUATIONS

The wastewater collection system was evaluated against the performance criteria using the hydraulic model to determine if there are capacity limitations in the system.

4.4.1 Wastewater Collection System

The hydraulic model estimates that the primary interceptors for nine (9) of the collection basins have capacity limitations. The estimated peak wet weather flows in each of these interceptors is greater than 90% of the full pipe flow. The hydraulic model results are based on full build-out and assumes all basin areas are contributing flows to the collection system.

For planning purposes, it is helpful to understand the upstream/downstream relationship of the collection basins when sizing new sewers as the potential upstream flows impact the capacity requirements of the downstream interceptors. Figure 4.3 shows the location of these undersized pipes schematically and Figure 4.4 shows the location of these pipes geographically.

Because the model is based on design flows and includes only the primary interceptors in the collection system, it is possible that the actual collection system flows and peaks are less than the design values. It is not uncommon for design flows to be higher than actual flows because design flows are generally conservative to address multiple unknowns in development patterns and densities. Further, temporal flow variation in the collection system may attenuate at a different rate than predicted by design peaking factors. Again, this is due to the nature of design values being more conservative to address unknown factors. Because of this, it is recommended that the pipe invert (slope) data be verified through as-builts or in the field for each pipe identified as undersized in the model and that temporary flow meters be installed to verify existing average and peak flows.

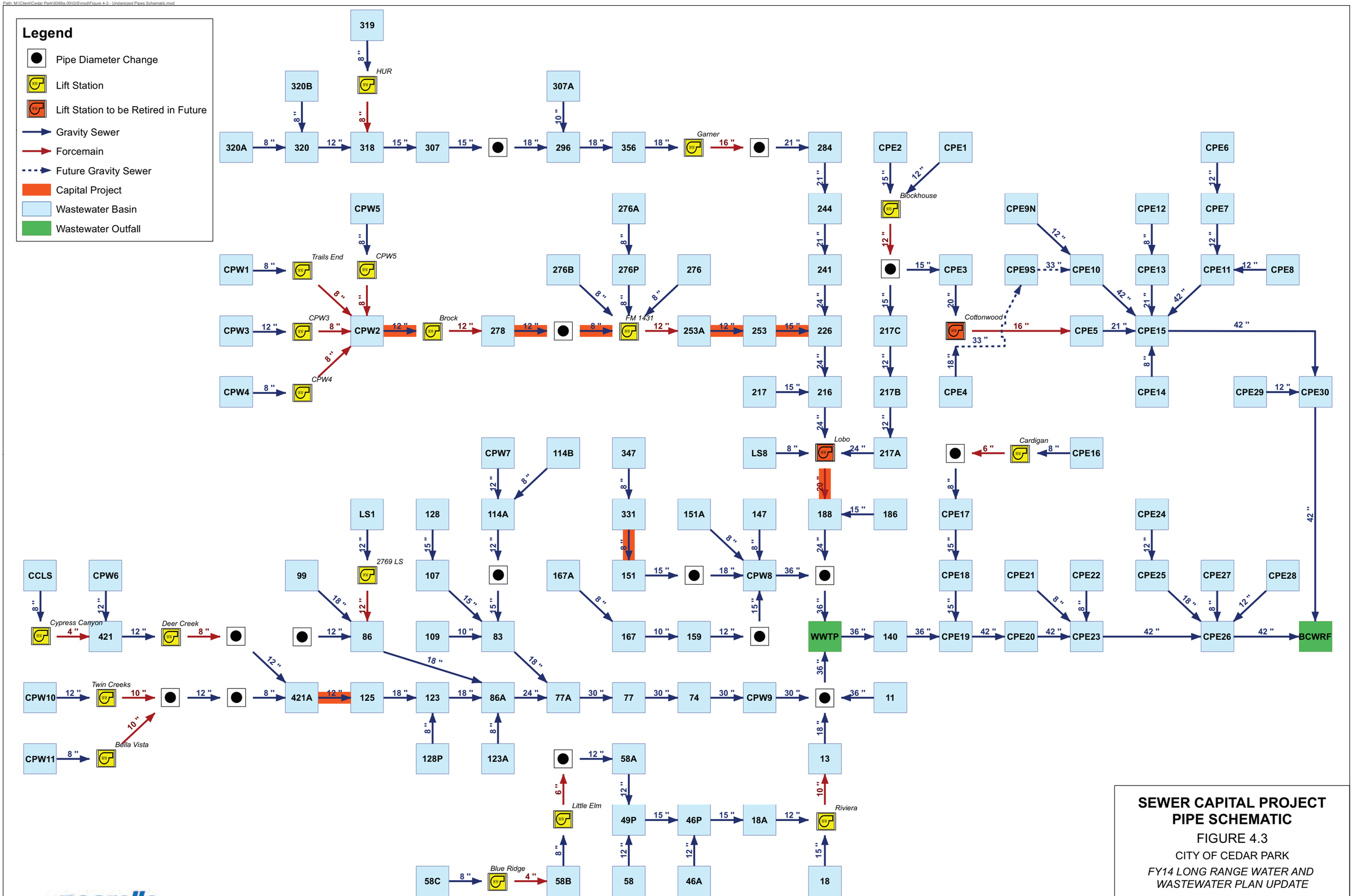
The City has made some efforts to collect data to validate the model results. It is recommended that the City continue to validate GIS data with as-built drawings, conduct surveys, and install temporary flow meters in order to verify the need for each recommended project. If pipe diameters or slopes are found to be different that the values used in the wastewater model, it is possible that some projects may not be required.

Table 4.4 summarizes the recommended sizes for each undersized sewer according to the buildout flows and peaking factors included in the model.

4.4.2 Estimated Flows to Lift Stations

There are seventeen lift stations in the Cedar Park collection system plus private lift stations. The model predicted wastewater flows that would be conveyed to each lift station were summed using the collection system basin configuration assuming the fully developed system and the dry and wet weather wastewater generation rates described previously. Table 4.5 summarizes the peak dry weather and peak wet weather flows estimated by the model to be conveyed to each lift station. All lift stations have sufficient capacity to convey the peak wet weather flow in its service area.

Path: M:\Client\Cedar Park\9369a.00\GIS\mxd\Figure 4-3 - Undersized Pipes Schematic.mxd



SEWER CAPITAL PROJECT PIPE SCHEMATIC

FIGURE 4.3

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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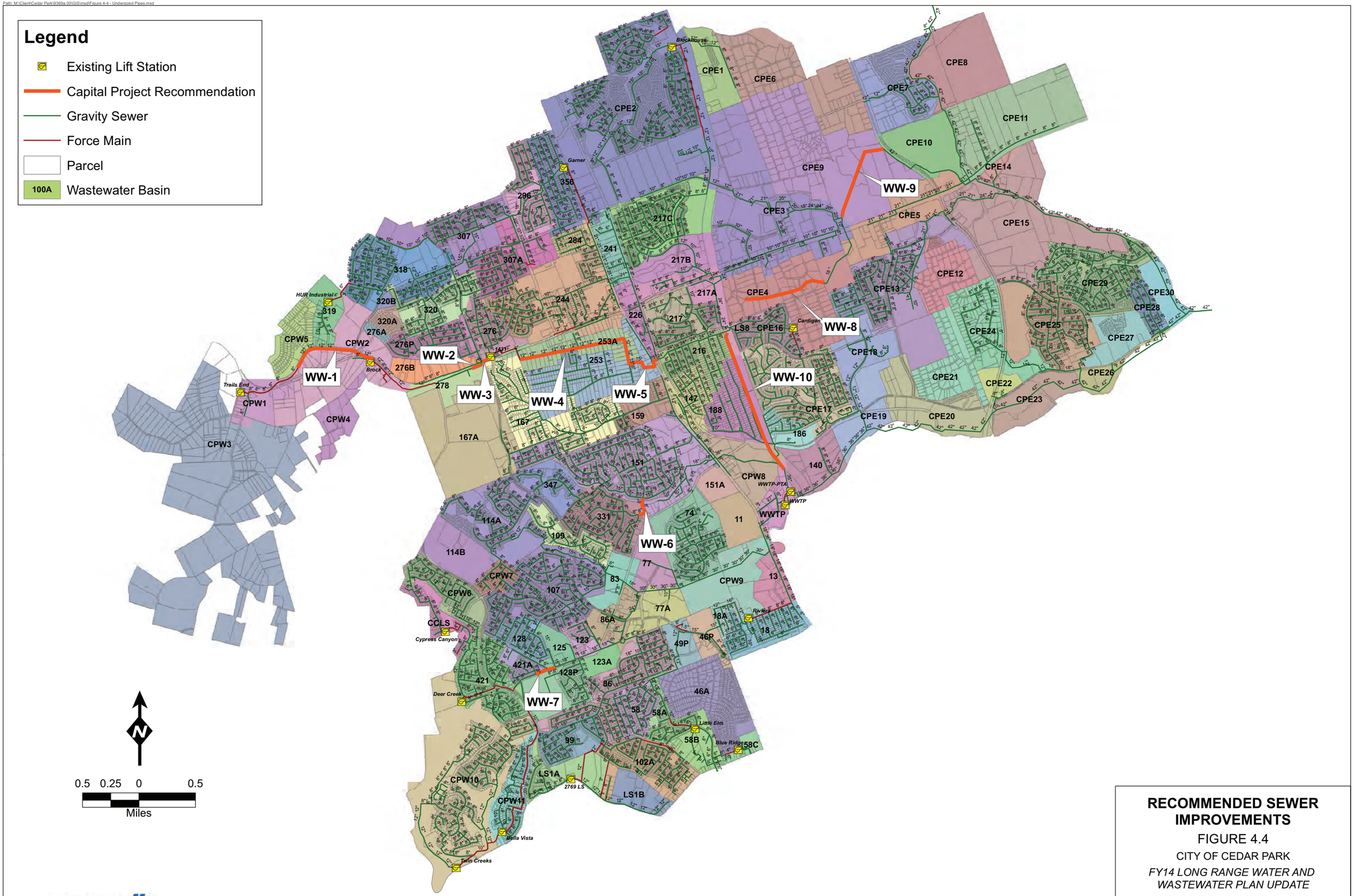
Path: M:\Client\Cedar Park\9369a.00\GIS\mxd\Figure 4-4 - Undersized Pipes.mxd



RECOMMENDED SEWER IMPROVEMENTS

FIGURE 4.4

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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Table 4.4 Wastewater Collection System Capital Project Summary
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Location	Collection Basin	Existing Diameter (in)	Pipe Slope in Model (ft/ft)	Required Slope for Existing Pipe to Meet Capacity Requirement (ft/ft)	Recommended Diameter (in) (1)	Estimated Length (ft)	Considerations / Trigger
WW-1	CPW2	12	0.003	0.0106	18	4,065	Needed if development occurs in Basins CPW3, CPW4 and CPW5.
WW-2	278	12	0.0059	0.011	15	500	Needed if development occurs in Basins CPW3, CPW4 and CPW5. Note: upstream pipe is recommended as 18-inch.
WW-3	278	8	0.0059	0.096	15	321	Pipe into the FM 1431 Lift Station
WW-4	253A	12	0.0062	0.0220	18	5,937	Existing capacity limited
WW-5	253	15	0.004	0.0085	18	2,238	Needed if development occurs in Basins CPW3, CPW4 and CPW5. Note: an 18-inch main would require a steeper slope than the existing 15-inch main.
WW-6	331	8	0.0034	0.0144	12	1,060	Existing capacity limited.
WW-7	421A	12	0.004	0.0161	15	988	Existing capacity limited.
WW-8	CPE4	n/a	n/a	n/a	8 & 12	4,000	Spanish Oaks Wastewater Interceptor Phase II.
WW-9	CPE3 CPE9S	n/a	n/a	n/a	33	4,200	Cottonwood Creek Wastewater Interceptor Phase C.
WW-10	216 217A L58	n/a	n/a	0.0003	42	8,000	Required to avoid sanitary sewer overflows.
WW-11	n/a	n/a	n/a	n/a	n/a	n/a	Required to improve BCRWWS capacity.

Note:
(1) Assumes the same pipe slope as the existing sewer.

Table 4.5 Estimated Wastewater Flows to Lift Stations
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Lift Station	Upstream Basins	Peak Dry Weather Flow (mgd)	Peak Wet Weather Flow (mgd)	Measured Firm Capacity (mgd)(1)	Pumps Required for Firm Capacity (No.)
HUR Industrial	319	0.21	0.28	0.37	1
Garner	320A, 320B, 320, 319, 318, 307, 307A, 296, 356	2.74	3.63	4.23	2
Trails End	CPW1	0.16	0.22	0.62	1
Brock	CPW1, CPW2, CPW4, CPW5	0.65	1.00	2.40	2
FM 1431	CPW1, CPW2, CPW4, CPW5, 278, 276A, 276B, 276P, 276	1.54	2.14	2.40	2
Lobo (to be eliminated)	320A, 320B, 320, 319, 318, 307, 307A, 296, 356, 284, 244, 241, CPW1, CPW2, CPW4, CPW5, 278, 276A, 276B, 276P, 276, 253A, 253, 226, 216, 217, LS8, 217A, 217B, 271C	5.36	8.08	14.16	3
Cypress Canyon	CCLS	0.14	0.20	0.20	2
Deer Creek	CCLS, CPW6, 421	0.86	1.10	1.10	1
2769 LS	LS1	0.36	0.51	0.52	1
Twin Creeks	CPW10	0.61	1.13	1.47	1
Bella Vista	CPW11	0.27	0.35	0.56	1
Blue Ridge	58C	0.08	0.10	0.12	1
Little Elm	58C, 58B	0.28	0.40	0.81	1
Riviera	58C, 58B, 58A, 58, 49P, 46A, 46P, 18A, 18	0.40	0.51	2.81	2
Cardigan	CPE16	0.25	0.30	0.40	2
Blockhouse	CPE1, CPE2	2.14	2.98	4.04	2
Cottonwood	CPE1, CPE2, CPE3	2.80	4.00	4.00	1

Note:
(1) Values provided by the City of Cedar Park and represent estimated pumped flows measured from wet well draw down tests.

4.4.3 Future Service Areas

As service expands in the Cedar Park collection system, new pipes will be required to convey flow to the existing interceptors. A conceptual model of future sewer extensions is provided in Figure 4.5. Table 4.6 summarizes the diameter and length of these new sewers and the collection basin they are associated with. Development engineering will take place in the future as each of these locations is connected to the collection system, therefore this exhibit and tabulation of future pipes is provided to estimate the scale and extent of future wastewater extensions within the City. The actual wastewater extensions may be more or less than the estimate presented here depending on future circumstances.

In the future the City may elect to provide wastewater service to the northwestern ETJ area within collection basin CPW3. Currently this area includes pockets of contiguous large lot residential developments as well as scattered residential homes. The approximate elevation range for collection basin CPW3 is from 720 feet at the southwest corner of the basin to 1,050 feet at the north end of the basin adjacent to collection basin CPW1. In order to provide wastewater service to collection basin CPW3, a series of gravity sewers and lift stations would be required to collect wastewater from the low elevation areas and convey it to the Cedar Park collection system. The City prefers to avoid low pressure wastewater systems.

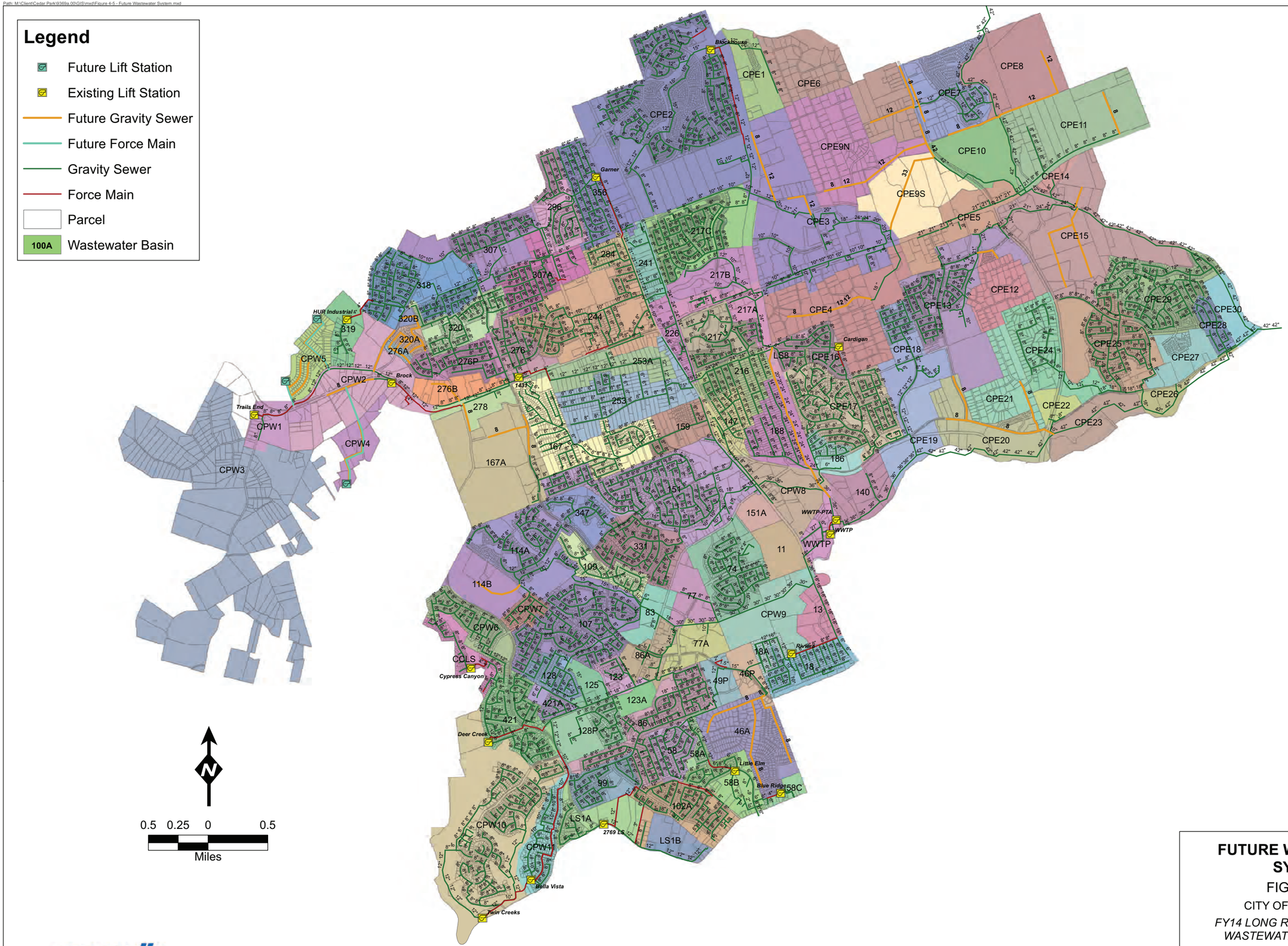
One suggested solution would be to pump the CPW3 flows directly to the 12-inch gravity sewer in Woodall Drive at the same outfall location as the existing force main from the Trails End lift station. This configuration would require approximately 4,000 additional feet of force main (distance from the beginning of the 8-inch gravity sewer north of North Rim Drive to the 12-inch gravity sewer in Woodall Drive) but would avoid routing the CPW3 flows through the Trails End lift station. This would allow the Trails End lift station to serve the CPW1 basin area as it is currently designed.

4.4.4 Other Capital Projects

As a part owner, the City will need to participate in the improvements needed to re-rate and/or expand the BCRWWS plant.

To avoid the possibility of sanitary sewer overflows, the Lobo lift station and force main is going to be abandoned. It will be replaced with an 8,000-foot, 42-inch diameter tunnel. The City also has future wastewater interceptor projects planned including the Spanish Oak Wastewater Interceptor Phase II and the Cottonwood Creek Wastewater Interceptor Phase C.

Path: M:\Client\Cedar Park\9369a.00\GIS\mxd\Figure 4-5 - Future Wastewater System.mxd



FUTURE WASTEWATER SYSTEM

FIGURE 4.5

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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Table 4.6 Future Wastewater Pipes for System Expansion [1]
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Collection Basin	Description	Pipe Diameter (in)	Length (ft)
CPW5	Gravity Sewer	8	7,000
	Force Main	6	4,240
	Lift Station 1	NA	NA
	Lift Station 2	NA	NA
CPW2	Gravity Sewer	8	4,190
CPW4	Gravity Sewer	8	1,375
	Force Main	6	5,100
	Lift Station	NA	NA
320A	Gravity Sewer	8	4,470
320B	Gravity Sewer	8	1,100
276A	Gravity Sewer	8	1,700
276P	Gravity Sewer	8	1,550
278	Gravity Sewer	8	1,200
167A	Gravity Sewer	8	3,560
114B	Gravity Sewer	8	2,180
46A	Gravity Sewer	8	10,500
CPE3	Gravity Sewer	12	4,760
CPE6	Gravity Sewer	8	1,940
		12	2,030
CPE8	Gravity Sewer	12	4,900
CPE9N	Gravity Sewer	8	800
		12	4,290
CPE10	Gravity Sewer	8	2,380
CPE11	Gravity Sewer	8	1,960
CPE12	Gravity Sewer	8	1,060
CPE15	Gravity Sewer	8	7,750
CPE20	Gravity Sewer	8	6,950
CPE21	Gravity Sewer	8	2,350

Note:
(1) Represents engineer's opinion of probable development scenarios. Actual wastewater extensions may be more or less than summarized here.

4.5 CAPITAL IMPROVEMENT RECOMMENDATIONS

4.5.1 Cost Development

Costs have been developed for the recommended capital improvements for this long-range water and wastewater plan update. These costs were developed with planning level information, which is not as detailed as design level cost estimates. This cost estimate was prepared in accordance with the guidelines of the AACE International (the Association for the Advancement of Cost Engineers) for a Class 5 estimate. According to the definitions of AACE International, the Class 5 estimate is defined as:

> *"CLASS 5 ESTIMATE. Generally prepared based on very limited information, where little more than proposed plant type, its location, and the capacity are known. Strategic planning purposes, such as but not limited to, market studies, assessment of viability, evaluation of alternative schemes, project screening, location and evaluation of resource needs and budgeting, long range capital planning, etc. Some examples of estimating methods used would be estimating methods such as cost/capacity curves and factors, scale up factors, parametric and modeling techniques. Typically, very little time is expended in the development of this estimate. The typical expected accuracy range for this class estimate is -20 percent to -50 percent on the low side and +30 percent to + 100 percent on the high side."*

Table 4.7 lists the unit costs that have been used to calculate construction costs. These costs are conservatively based on compiled bid tabulations for similar projects constructed in the South and Central Texas region, including West Harris County, City of Houston, City of Austin, and the City of Windermere. Recent bid results received by the City of Cedar Park for the CR180 CR185 project, which included water and sanitary sewer lines were referenced specifically. To obtain project costs, a factor of 1.3 is applied to the construction cost to account for engineering design, construction management, and a contingency. Costs are based on the Engineering News-Record 20-City Average Construction Cost Index (ENR CCI). The October 2013 ENR CCI is 9689.

4.5.2 Capital Plan

Table 4.8 summarizes the recommended wastewater system capital improvements. Appendix F contains CIP project maps that describe capital improvement.

Projects WW-3, WW-4 and WW-6 through WW-7 are estimated to be needed to address existing capacity limitations. These projects are recommended to be completed in the 2013 – 2018 time frame. This would require a CIP budget of approximately $375,000 per year if flow monitoring determined that the entire length of each main needed to be upsized. Additional flow monitoring is recommended to determine specifically what length of pipe would need to be upsized. Projects WW-1, WW-2 and WW-5 are growth related improvements and are therefore placed in the "buildout" time frame. If growth in these areas occurs sooner than anticipated, these projects may need to be completed earlier.

Table 4.7 Wastewater Infrastructure Unit Costs
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Wastewater Pipelines

Diameter (in)	Material	Pipe Cost ($/LF)	Excavation & Backfill 5 - 10 ft Deep ($/LF)	Paving and Sidewalk Replacement ($/LF)	General Requirements(1) ($/LF)	Manholes and Appurtenances ($/LF)	Contractor Overhead and Profit (15%) ($/LF)	Total Pipe Construction Cost ($/LF) [$/dia-in-ft]	Engineering, Construction Management, Administration (30%) ($/LF)	Total Pipe Project Budget ($/LF)
8	PVC/ASTM D3034	$25.00	$49.00	$38.00	$6.25	$9.00	$11.85	$138 [$17.25]	$41	$180
10	PVC/ASTM D3034	$32.00	$49.00	$38.00	$6.25	$9.00	$11.85	$146 [$14.6]	$44	$190
12	PVC/ASTM D3034	$40.00	$49.00	$38.00	$6.25	$9.00	$13.05	$155 [$12.91]	$47	$202
15	PVC/ASTM D3034	$50.00	$49.00	$38.00	$6.25	$9.00	$14.55	$167 [$11.12]	$50	$217
18	PVC/ASTM F679	$57.00	$49.00	$38.00	$6.25	$9.00	$15.60	$175 [$9.72]	$52	$228
27	PVC/ASTM F679	$65.00	$49.00	$38.00	$6.25	$9.00	$16.80	$184 [$6.81]	$55	$240
33	PVC/ASTM F679	$85.00	$49.00	$38.00	$6.25	$9.00	$19.80	$207 [$6.27]	$62	$270

Note:
(1) General Requirements includes reinforced filter fabric fence, inlet protection barriers, traffic control and trench safety.

Table 4.8 Recommended Wastewater Improvements Cost Summary
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Project No.	Description	Units	Quantity	Unit Cost - Construction	Construction Cost	Unit Cost - Project	Project Budget
Wastewater Pipelines							
WW-1	Basin CPW2: Replace 12-inch sewer with an 18-inch gravity sewer, installed including manholes	LF	4,065	$175	$710,800	$228	$926,900
WW-2	Basin 278: Replace 12-inch sewer with a 15-inch gravity sewer, installed including manholes	LF	500	$167	$83,400	$217	$108,500
WW-3	Basin 278: Replace 8-inch sewer with a 15-inch gravity sewer, installed including manholes	LF	321	$167	$53,600	$217	$69,700
WW-4	Basin 253A: Replace 12-inch sewer with an 18-inch gravity sewer, installed including manholes	LF	5,937	$175	$1,038,100	$228	$1,353,700
WW-5	Basin 253: Replace 15-inch sewer with an 18-inch gravity sewer, installed including manholes	LF	2,238	$175	$391,400	$228	$510,300
WW-6	Basin 331: Replace 8-inch sewer with a 12-inch gravity sewer, installed including manholes	LF	1,060	$155	$164,700	$202	$214,200
WW-7	Basin 421A: Replace 12-inch sewer with a 15-inch gravity sewer, installed including manholes	LF	988	$167	$164,800	$217	$214,400
WW-8	Spanish Oaks Wastewater Interceptor Phase II	LF	4,000	$138/$155	$584,000	$180 / $202	$760,500
WW-9	Cottonwood Creek Wastewater Interceptor Phase C	LF	4,200	$207	$869,700	$270	$1.134.000
WW-10	Lobo Tunnel: Replace the Lobo lift station and force main	LF	8,000	$813	$6,500,000	$1,028	$8,225,000

Project No.	Description	Cost	City of Cedar Park Allocation	Project Budget
WW-11	BCRWWS East Plant Re-rate Improvements	$4,000,000	14.61%	$584,400
Total				**$14,101,600**

APPENDIX A – CEDAR PARK HISTORICAL AND PROJECTED POPULATION, WATER FLOWS, AND WASTEWATER FLOWS

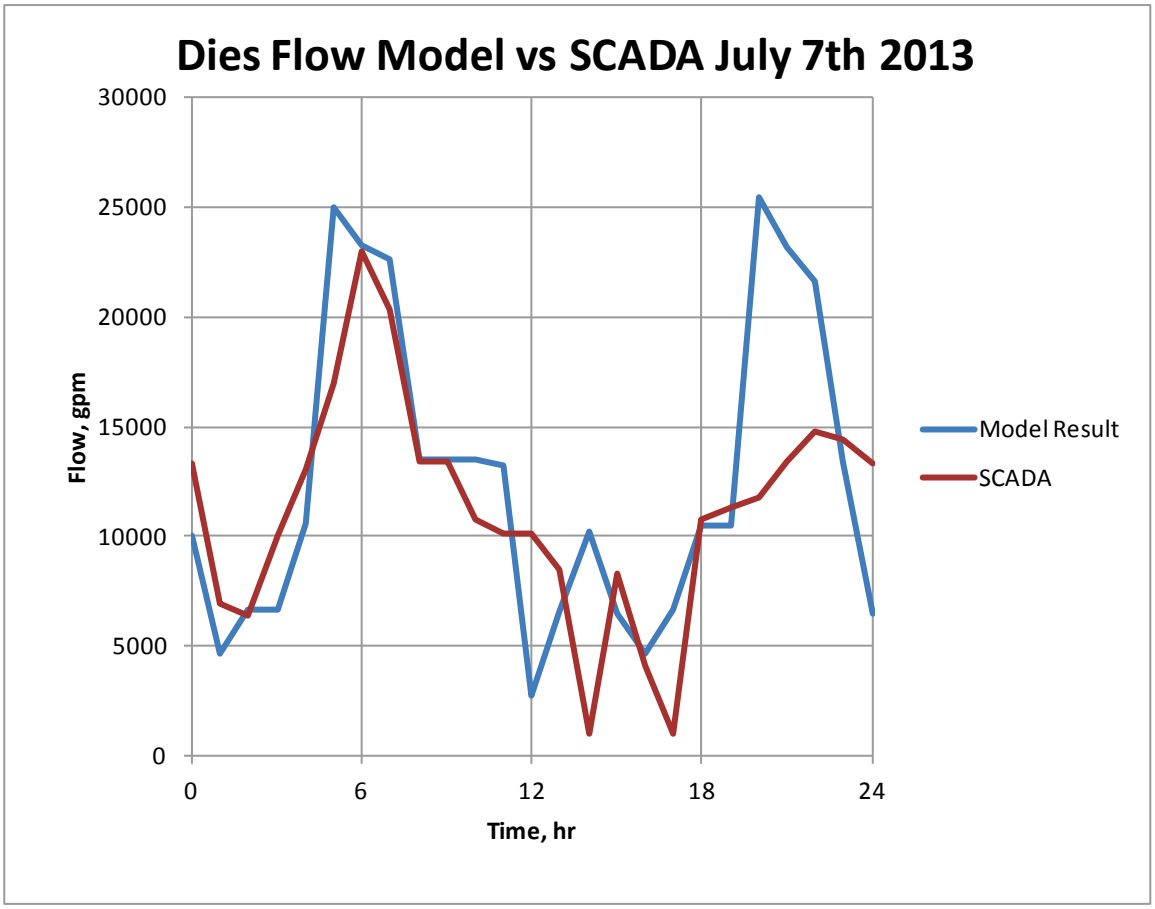
Year	Total Utility Service Area Population			daily avg mgd	max day mgd	Total System Water Production			max gpcd	Year	Water Treatment Plant Production						Wastewater Production		Flows to CP & BCRWWS	
											Supplied from CP WTP			Supplied from BCRUA WTP			Total WW Production			
	HH Pop Water	HH Pop Sewer	Growth Rate			ac-ft per year	mgy	avg gpcd			daily avg mgd	max day mgd	mgy	daily avg mgd	max day mgd	mgy	daily avg mgd	mgy treated	CP Plant	BCR WWS
1994	17,599	15,595		2.87	5.37	3,214	1,047	163	305	1994	2.87	5.37	1,047	0.00	0.00	0	1.04	381	1.04	
1995	19,911	17,907	3.79%	3.25	6.07	3,636	1,185	163	305	1995	3.25	6.07	1,185	0.00	0.00	0	1.20	438	1.20	
1996	23,023	21,019	7.88%	3.75	7.02	4,204	1,370	163	305	1996	3.75	7.02	1,370	0.00	0.00	0	1.41	514	1.41	
1997	27,447	25,443	6.99%	4.47	8.37	5,012	1,633	163	305	1997	4.47	8.37	1,633	0.00	0.00	0	1.70	622	1.70	
1998	31,422	29,418	6.50%	5.12	9.58	5,738	1,869	163	305	1998	5.12	9.58	1,869	0.00	0.00	0	1.97	719	1.97	
1999	36,478	34,474	6.08%	5.95	11.13	6,661	2,170	163	305	1999	5.95	11.13	2,170	0.00	0.00	0	2.31	843	2.31	
2000	41,265	39,261	13.12%	7.46	13.50	8,357	2,723	181	327	2000	7.46	13.50	2,723	0.00	0.00	0	2.63	960	2.25	0.38
2001	44,109	42,105	6.89%	7.68	15.00	8,603	2,803	174	340	2001	7.68	15.00	2,803	0.00	0.00	0	2.82	1,030	2.25	0.57
2002	46,613	44,609	5.68%	8.42	14.90	9,432	3,073	181	320	2002	8.42	14.90	3,073	0.00	0.00	0	2.99	1,091	2.25	0.74
2003	52,699	50,695	13.06%	7.32	15.00	8,200	2,672	139	285	2003	8.05	15.73	2,937	0.00	0.00	0	3.40	1,240	2.25	1.15
2004	56,535	54,531	7.28%	8.92	18.50	9,992	3,256	158	327	2004	9.65	19.23	3,521	0.00	0.00	0	3.65	1,334	2.25	1.40
2005	63,555	61,551	12.42%	10.30	21.20	11,538	3,760	162	334	2005	11.03	21.93	4,025	0.00	0.00	0	4.12	1,505	2.25	1.87
2006	66,939	64,935	5.00%	12.49	21.80	13,992	4,559	187	326	2006	13.22	22.53	4,824	0.00	0.00	0	4.35	1,588	2.25	2.10
2007	72,267	70,263	5.00%	10.02	17.60	11,225	3,657	139	244	2007	10.75	18.33	3,923	0.00	0.00	0	4.71	1,718	2.25	2.46
2008	74,131	72,127	3.75%	12.76	23.30	14,294	4,657	172	314	2008	13.49	24.03	4,923	0.00	0.00	0	4.83	1,764	2.25	2.58
2009	76,386	74,382	2.00%	13.25	24.00	14,843	4,836	173	314	2009	13.98	24.73	5,101	0.00	0.00	0	4.98	1,819	2.25	2.73
2010	78,599	76,595	2.75%	11.79	22.20	13,207	4,303	150	282	2010	12.52	22.93	4,569	0.00	0.00	0	5.13	1,873	2.25	2.88
2011	80,760	78,756	2.75%	15.81	25.56	17,711	5,771	196	316	2011	15.81	25.56	5,771	0.00	0.00	0	5.28	1,926	2.25	3.03
2012	82,779	80,775	2.50%	12.76	23.89	14,294	4,657	154	289	2012	10.09	21.22	3,683	2.67	2.67	975	5.41	1,975	2.25	3.16
2013	84,642	82,638	2.25%	11.58	20.95	12,972	4,227	137	305	2013	11.13	23.15	4,061	2.67	2.67	975	5.54	2,021	2.25	3.29
2014	86,335	84,331	2.00%	14.07	26.33	15,764	5,136	163	305	2014	12.07	24.33	4,406	2.00	2.00	730	5.65	2,062	2.25	3.40
2015	87,630	85,626	1.50%	14.28	26.73	16,001	5,214	163	305	2015	12.28	23.40	4,484	2.00	3.33	730	5.74	2,094	2.25	3.49
2016	88,506	86,502	1.00%	14.43	26.99	16,161	5,266	163	305	2016	12.43	23.40	4,536	2.00	3.59	730	5.80	2,115	2.25	3.55
2017	89,391	87,387	1.00%	14.57	27.26	16,322	5,318	163	305	2017	13.24	23.40	4,833	1.33	3.86	485	5.85	2,137	2.25	3.60
2018	90,285	88,281	1.00%	14.72	27.54	16,486	5,372	163	305	2018	13.39	23.40	4,886	1.33	4.14	485	5.91	2,159	2.25	3.66
2019	90,737	88,733	0.50%	14.79	27.67	16,568	5,398	163	305	2019	13.46	23.40	4,913	1.33	4.27	485	5.95	2,170	2.25	3.70
2020	91,190	89,186	0.50%	14.86	27.81	16,651	5,425	163	305	2020	13.53	23.40	4,940	1.33	4.41	485	5.98	2,181	2.25	3.73
2021	91,646	89,642	0.50%	14.94	27.95	16,734	5,452	163	305	2021	13.61	23.40	4,967	1.33	4.55	485	6.01	2,192	2.25	3.76
2022	92,104	90,100	0.50%	15.01	28.09	16,818	5,480	163	305	2022	13.68	23.40	4,994	1.33	4.69	485	6.04	2,203	2.25	3.79
2023	92,565	90,561	0.50%	15.09	28.23	16,902	5,507	163	305	2023	13.76	23.40	5,022	1.33	4.83	485	6.07	2,215	2.25	3.82
2024	93,028	91,024	0.50%	15.16	28.37	16,986	5,535	163	305	2024	13.83	23.40	5,049	1.33	4.97	485	6.10	2,226	2.25	3.85
2025	93,493	91,489	0.50%	15.24	28.52	17,071	5,562	163	305	2025	13.91	23.40	5,077	1.33	5.12	485	6.13	2,237	2.25	3.88
2026	93,960	91,956	0.50%	15.32	28.66	17,157	5,590	163	305	2026	13.99	23.40	5,105	1.33	5.26	485	6.16	2,249	2.25	3.91
2027	94,430	92,426	0.50%	15.39	28.80	17,243	5,618	163	305	2027	14.06	23.40	5,133	1.33	5.40	485	6.19	2,260	2.25	3.94
2028	94,902	92,898	0.50%	15.47	28.95	17,329	5,646	163	305	2028	14.14	23.40	5,161	1.33	5.55	485	6.22	2,272	2.25	3.97
2029	95,377	93,373	0.50%	15.55	29.09	17,415	5,674	163	305	2029	14.22	23.40	5,189	1.33	5.69	485	6.26	2,283	2.25	4.01
2030	95,854	93,850	0.50%	15.62	29.24	17,503	5,703	163	305	2030	14.29	23.40	5,217	1.33	5.84	485	6.29	2,295	2.25	4.04
2040	110,000	107,996	14.76%	17.05	33.55	19,100	6,223	155	305	2040	13.90	26.00	5,074	3.15	5.89	1150	7.24	2,643	2.25	4.99

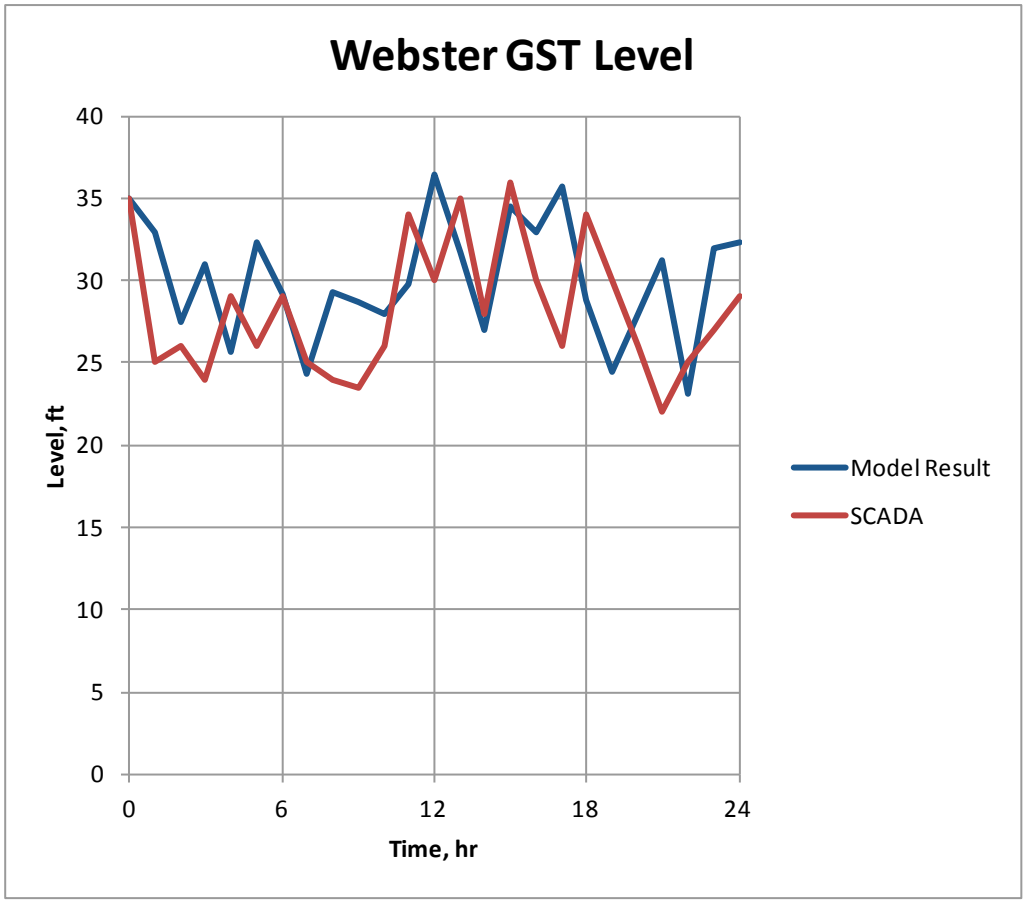
APPENDIX B – PUMP OPERATIONAL AND CONTROL DATA

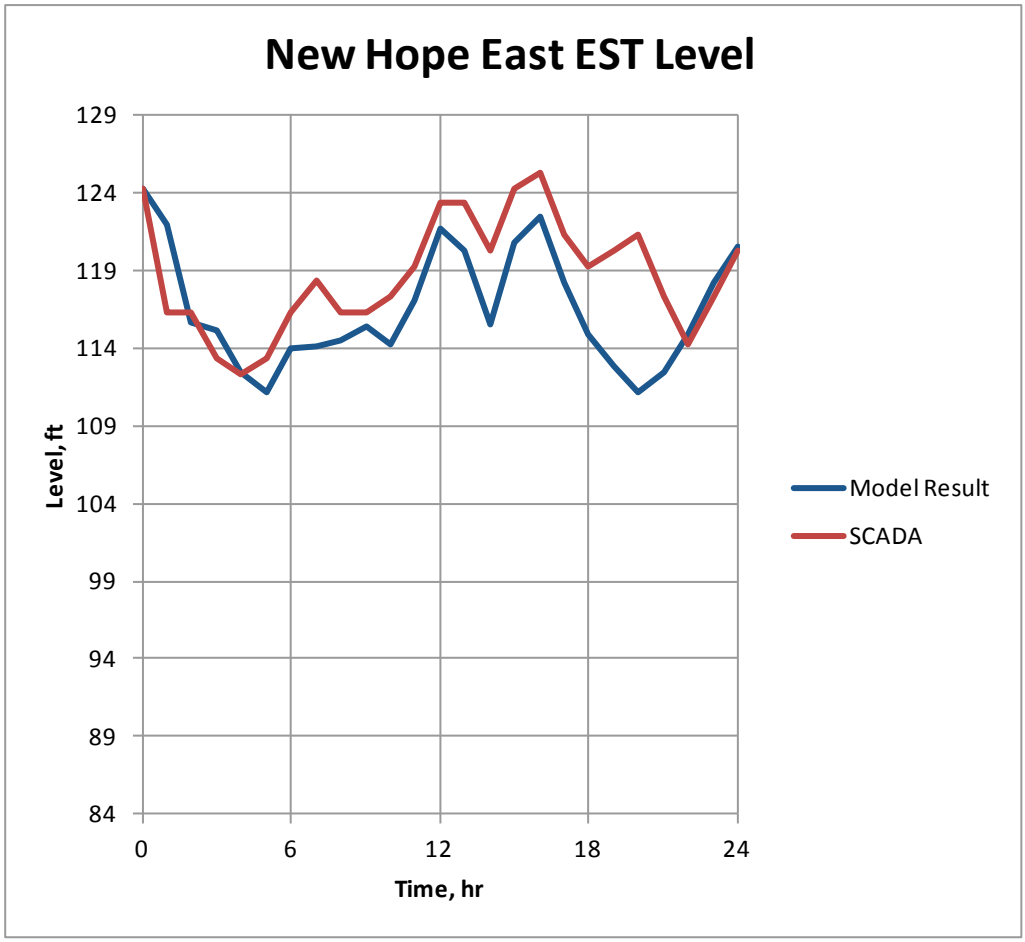
Table B.1 Pump Operational and Control Data FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park			
Pump ID	**Pump Location**	**Control Description**	**Priority**
Web 1	Webster Pump Station	If water level at Webster EST < 1214.0 ft turn ON	1
		If water level at Webster EST > 1219.0 ft turn OFF	2
Web 2	Webster Pump Station	If water level at Webster EST < 1208.0 ft turn ON	1
		If water level at Webster EST > 1217.0 ft turn OFF	2
Dies 1	Dies Pump Station	If water level at New Hope East EST < 1102.27 ft turn ON	1
		If water level at Webster GST < 1112.40 ft turn ON	2
		If water level at New Hope East EST > 1117 ft turn OFF	3
		If water level at Webster GST > 1114.40 ft turn OFF	4
Dies 2	Dies Pump Station	If water level at New Hope East EST < 1098.27 ft turn ON	1
		If water level at Webster GST < 1112.20 ft turn ON	2
		If water level at New Hope East EST > 1117 ft turn OFF	3
		If water level at Webster GST > 1113.40 ft turn OFF	4
Dies 3	Dies Pump Station	If water level at New Hope East EST < 1106 ft turn ON	1
		If water level at Webster GST < 1106.4 ft turn ON	2
		If water level at New Hope East EST > 1117 ft turn OFF	3
		If water level at Webster GST > 1116.90 ft turn OFF	4
Dies 4	Dies Pump Station	If water level at New Hope East EST < 1105.27 ft turn ON	1
		If water level at Webster GST < 1105.4 ft turn ON	2
		If water level at New Hope East EST > 1112.27 ft turn OFF	3
		If water level at Webster GST > 1116.60 ft turn OFF	4
Dies 5	Dies Pump Station	If water level at New Hope East EST < 1106 ft turn ON	1
		If water level at Webster GST < 1107.40 ft turn ON	2
		If water level at New Hope East EST > 1117 ft turn OFF	3
		If water level at Webster GST > 1114.90 ft turn OFF	4

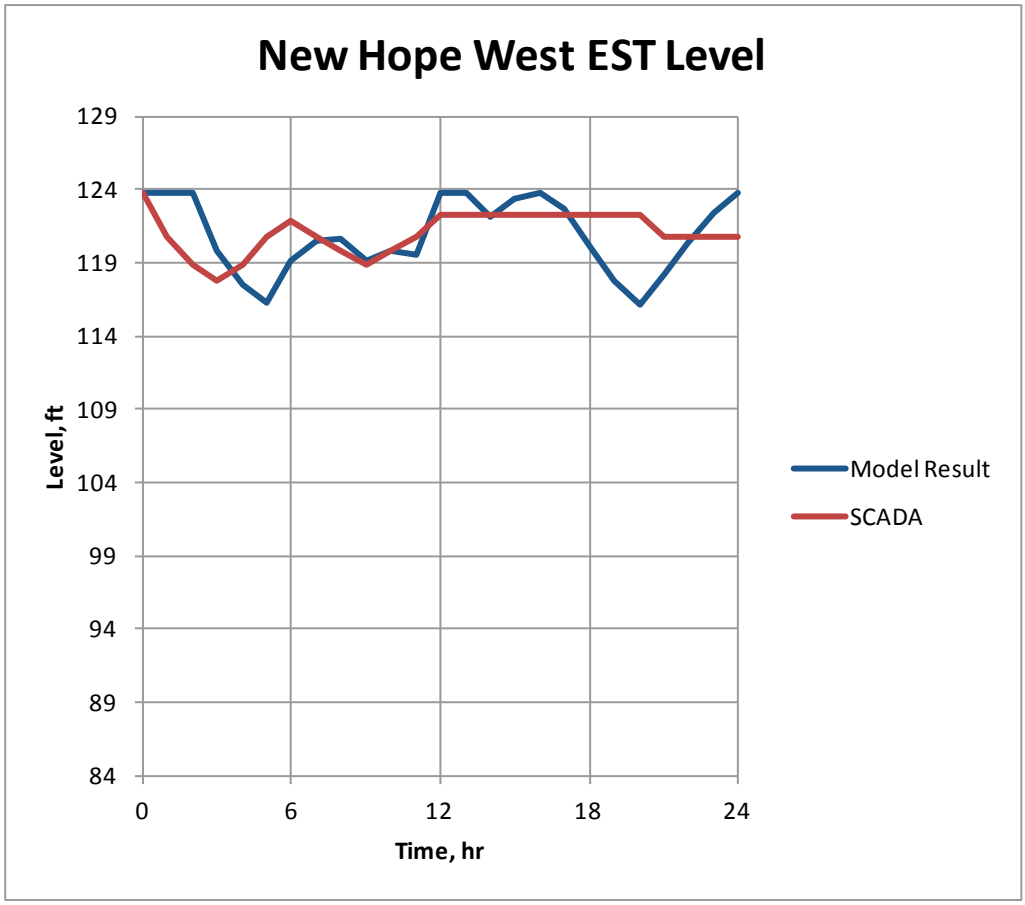
Table B.1 Pump Operational and Control Data FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park			
Pump ID	**Pump Location**	**Control Description**	**Priority**
Dies 6	Dies Pump Station	If water level at New Hope East EST < 1105 ft turn ON	1
		If water level at Webster GST < 1103.90 ft turn ON	2
		If water level at New Hope East EST > 1117 ft turn OFF	3
		If water level at Webster GST > 1115.40 ft turn OFF	4
Dies 7	Dies Pump Station	If water level at New Hope East EST < 1106 ft turn ON	1
		If water level at Webster GST < 1103.90 ft turn ON	2
		If water level at New Hope East EST > 1117 ft turn OFF	3
		If water level at Webster GST > 1114.40 ft turn OFF	4
Dies 8	Dies Pump Station	If water level at New Hope East EST < 1106 ft turn ON	1
		If water level at Webster GST < 1103.90 ft turn ON	2
		If water level at New Hope East EST > 1117 ft turn OFF	3
		If water level at Webster GST > 1114.40 ft turn OFF	4
Dies 9	Dies Pump Station	If water level at New Hope East EST < 1102.77 ft turn ON	1
		If water level at Webster GST < 1103.90 ft turn ON	2
		If water level at New Hope East EST > 1113.77 ft turn OFF	3
		If water level at Webster GST > 1114.40 ft turn OFF	4
Dies 10	Dies Pump Station	If water level at New Hope East EST < 1102.77 ft turn ON	1
		If water level at Webster GST < 1103.90 ft turn ON	2
		If water level at New Hope East EST > 1113.67 ft turn OFF	3
		If water level at Webster GST > 1114.40 ft turn OFF	4
Dies 11	Dies Pump Station	If water level at New Hope East EST < 1102.57 ft turn ON	1
		If water level at Webster GST < 1103.90 ft turn ON	2
		If water level at New Hope East EST > 1112.27 ft turn OFF	3
		If water level at Webster GST > 1114.40 ft turn OFF	4

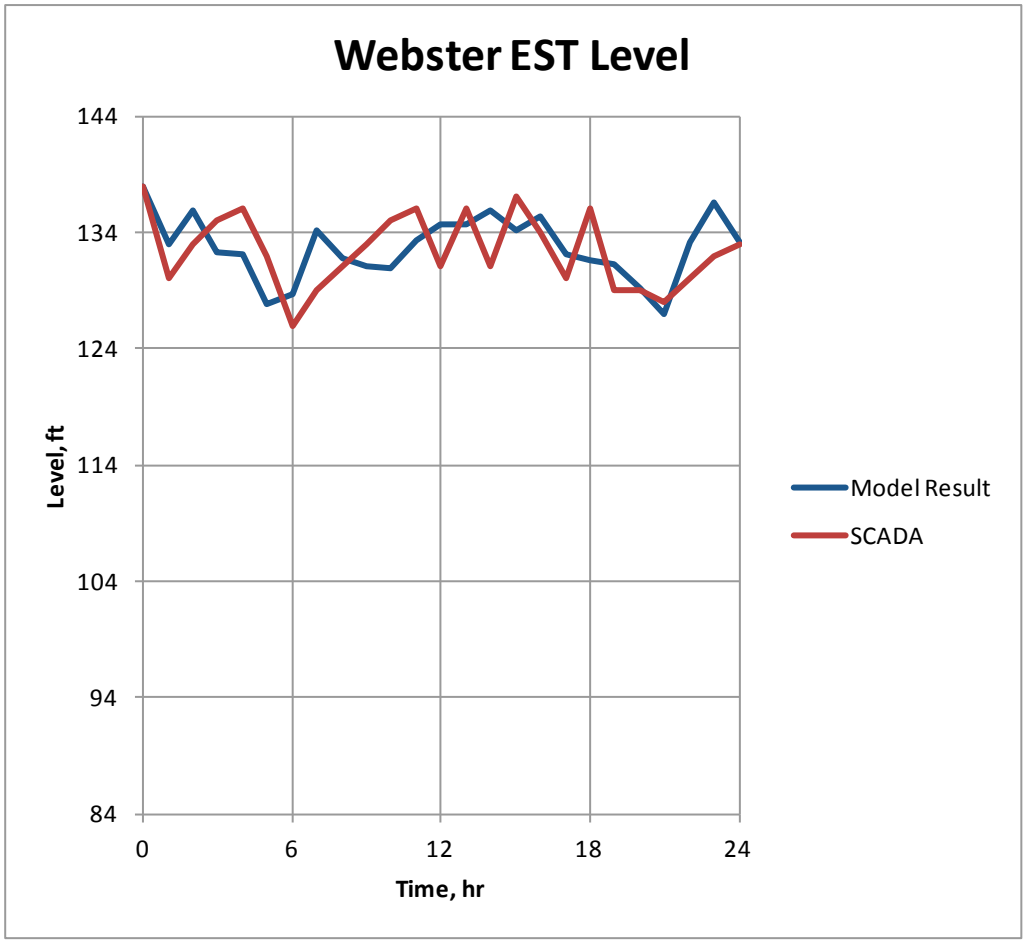
APPENDIX C – MODEL VALIDATION GRAPHS

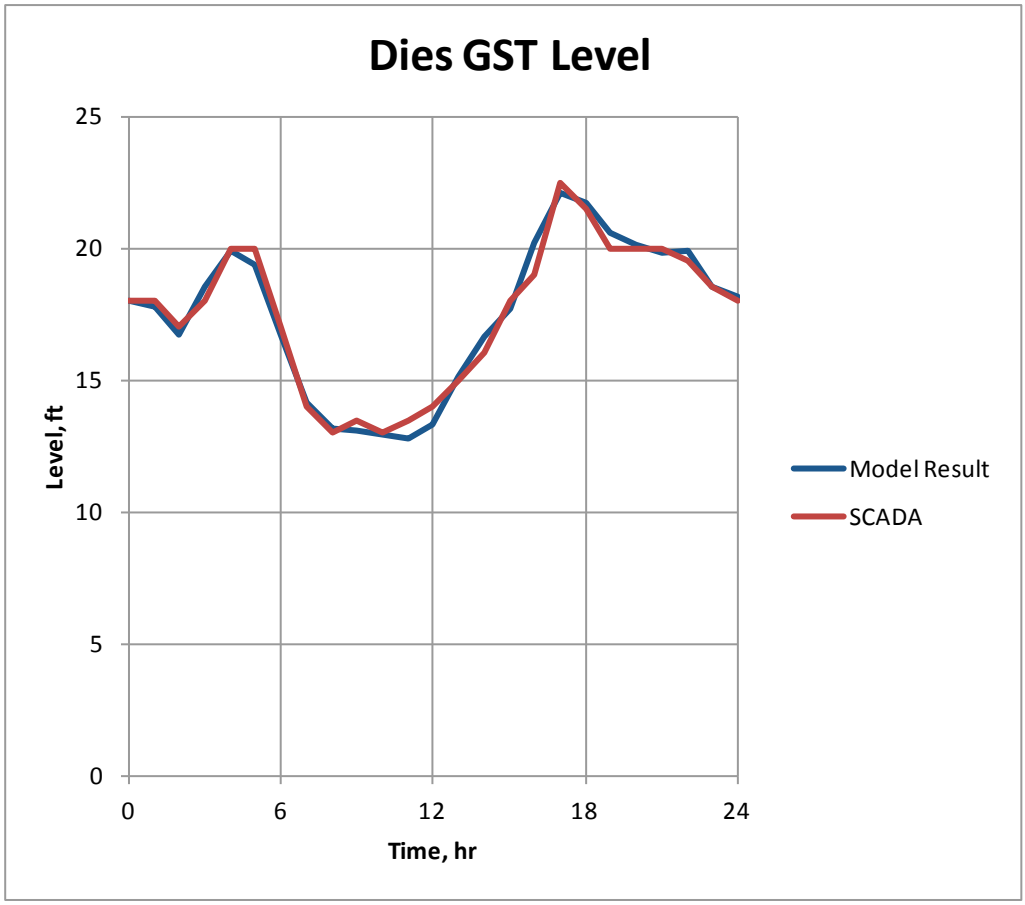

Dies Flow Model vs SCADA July 7th 2013
30000
25000
20000
15000
10000
5000
0
Flow, gpm
0
6
12
18
24
Time, hr
Model Result
SCADA


Webster GST Level
40
35
30
25
20
15
10
5
0
Level, ft
0
6
12
18
24
Time, hr
Model Result
SCADA


New Hope East EST Level
129
124
119
114
109
104
99
94
89
84
Level, ft
0
6
12
18
24
Time, hr
Model Result
SCADA


New Hope West EST Level
129
124
119
114
109
104
99
94
89
84
Level, ft
0
6
12
18
24
Time, hr
Model Result
SCADA


Webster EST Level
144
134
124
114
104
94
84
Level, ft
0
6
12
18
24
Time, hr
Model Result
SCADA


Dies GST Level
25
20
15
10
5
0
Level, ft
0
6
12
18
24
Time, hr
Model Result
SCADA

APPENDIX D – WATER SYSTEM CIP MAPS

Project Number: CIP -W-1

Planning Period: 5 Years

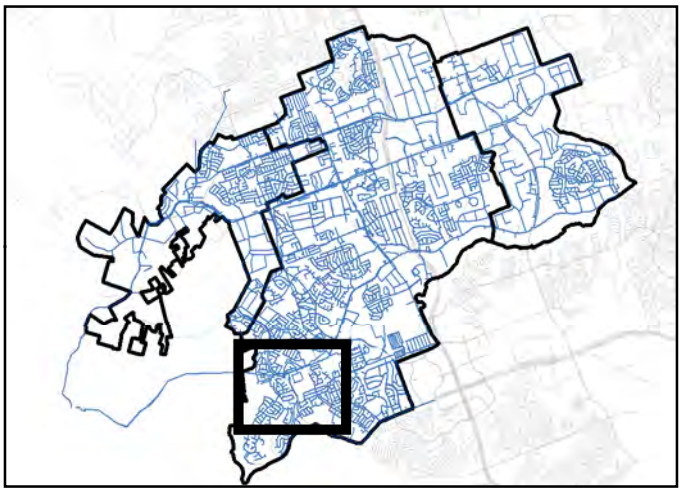
Description: W-1.1 New 16 in. on Timberwolf Trail from Cypress Creek Rd to Dies EST. New 16 in. from Dies EST south along Anderson Mill Rd to connection with existing 12 in. 420 ft north of Old Mill Rd.
W-1.2 New 12 in from south connection of the proposed 16 in. pipe on Anderson Mill Rd to adjacent 12 in. pipe heading south along Anderson Mill Rd.

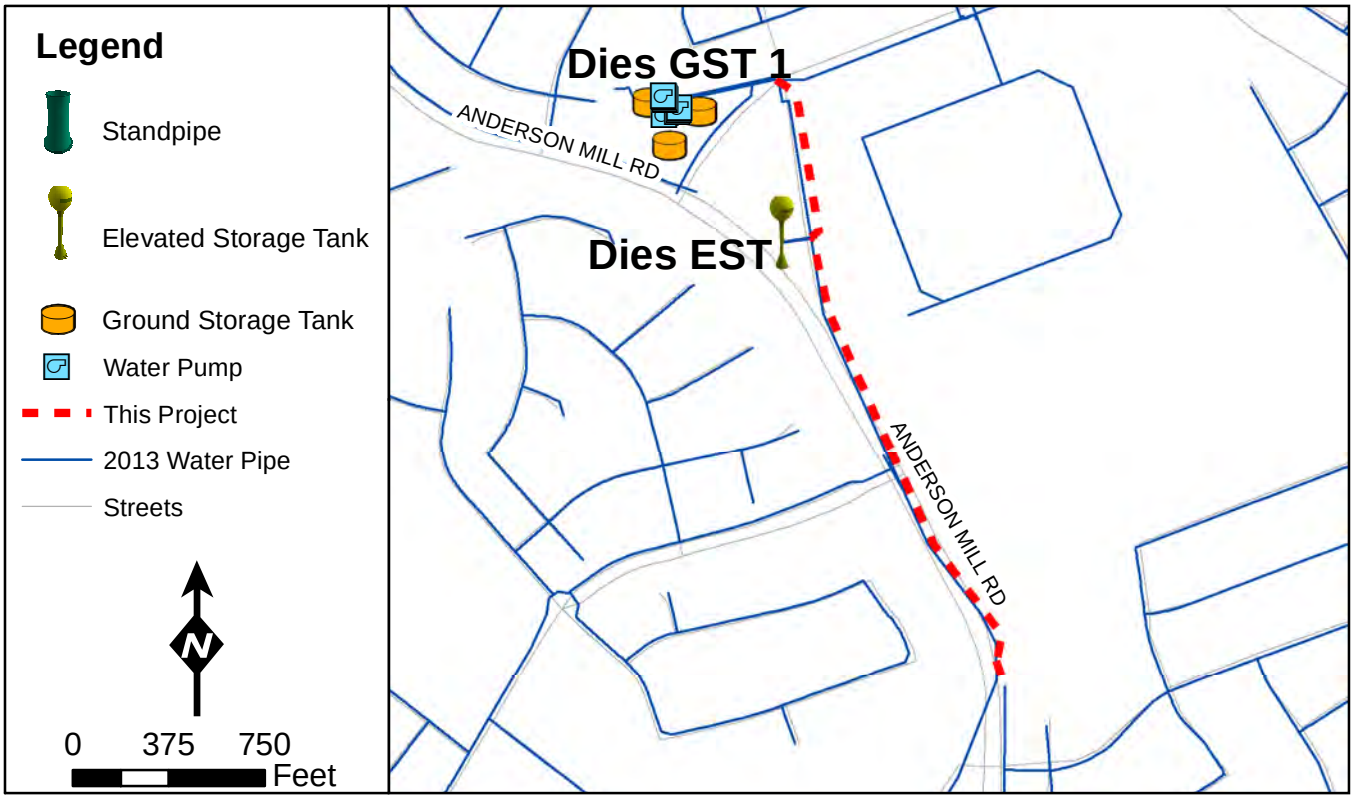
Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
W-1.1	16	2520	$160	$402,600	$208	$524,200
W-1.2	12	110	$147	$16,200	$192	$21,200

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project will increase peak hour pressures at the Pressure Plane 2 high point on Anderson Mill Rd, and reduce pipe velocities near the Dies EST.





Project Number: CIP -W-2

Planning Period: 10 Years

Description: New 12 in. pipe from the north end of HUR Industrial Blvd to the south end of Wheaton Trail.

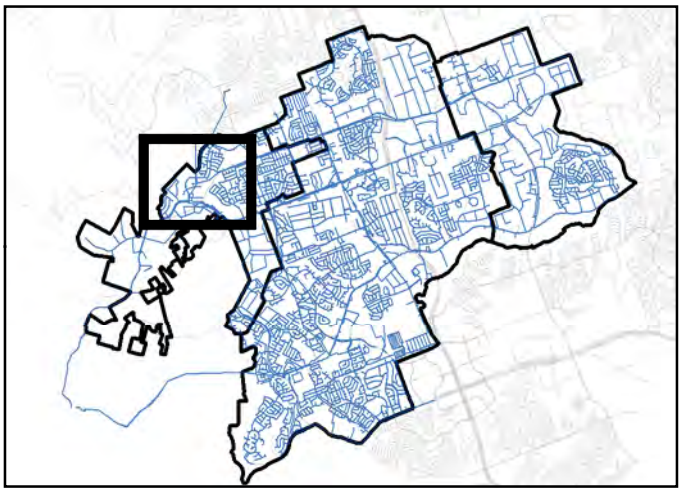
Planning Level Cost:

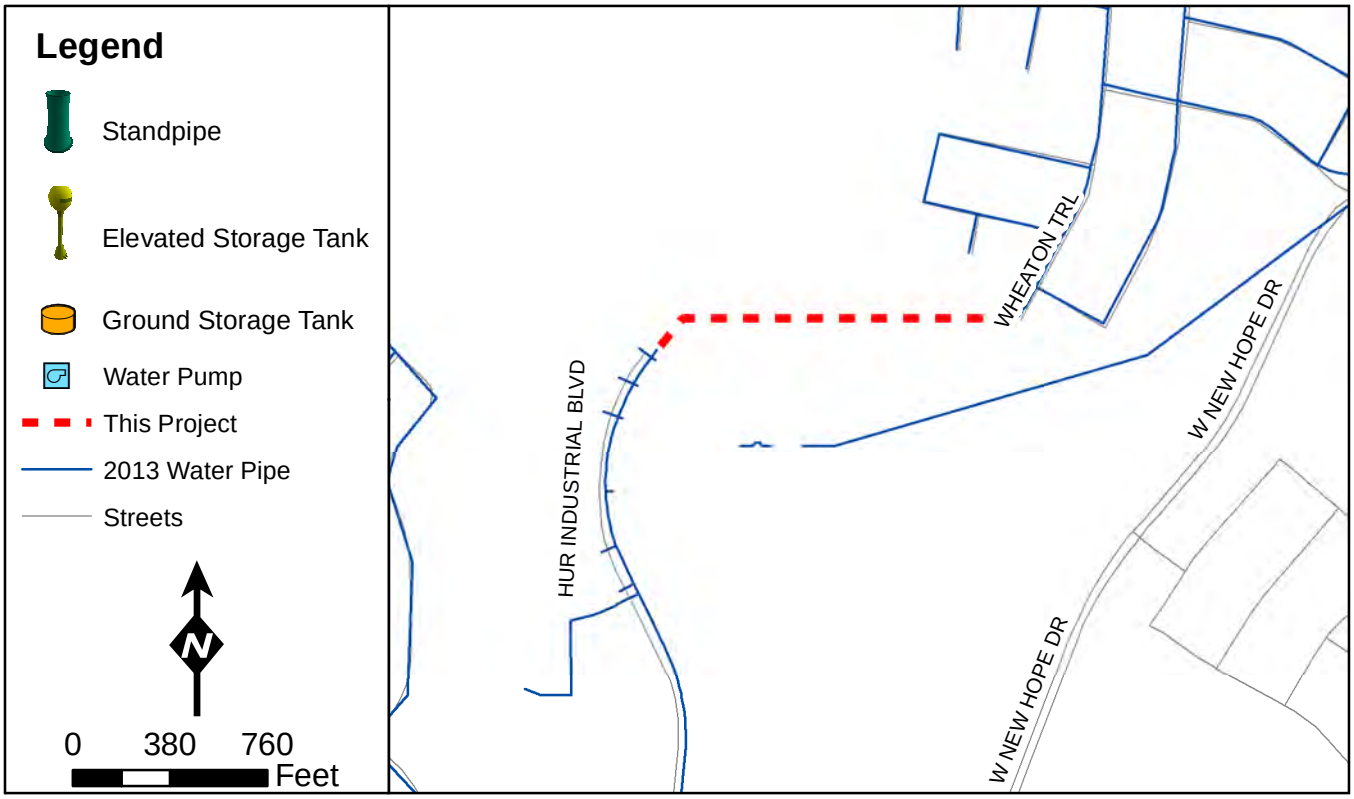
Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
W-2	12	1,460	$147	$214,800	$192	$280,400

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:

This project will facilitate looping in the distribution system and help provide adequate fire flows.





Project Number: CIP -W-3

Planning Period: 10 Years

Description: New 16 in. on New Hope Dr from CR-180 to Ronald Reagan Blvd with PRV placed east of Arrow Point Rd on Nes Hope Dr.

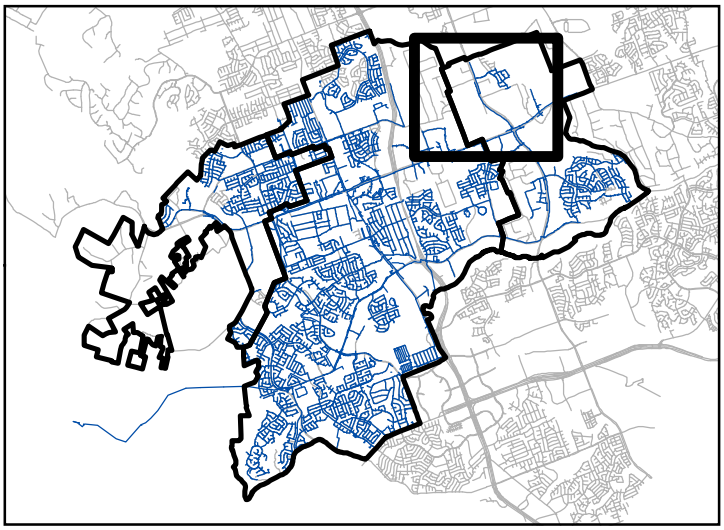
Planning Level Cost:

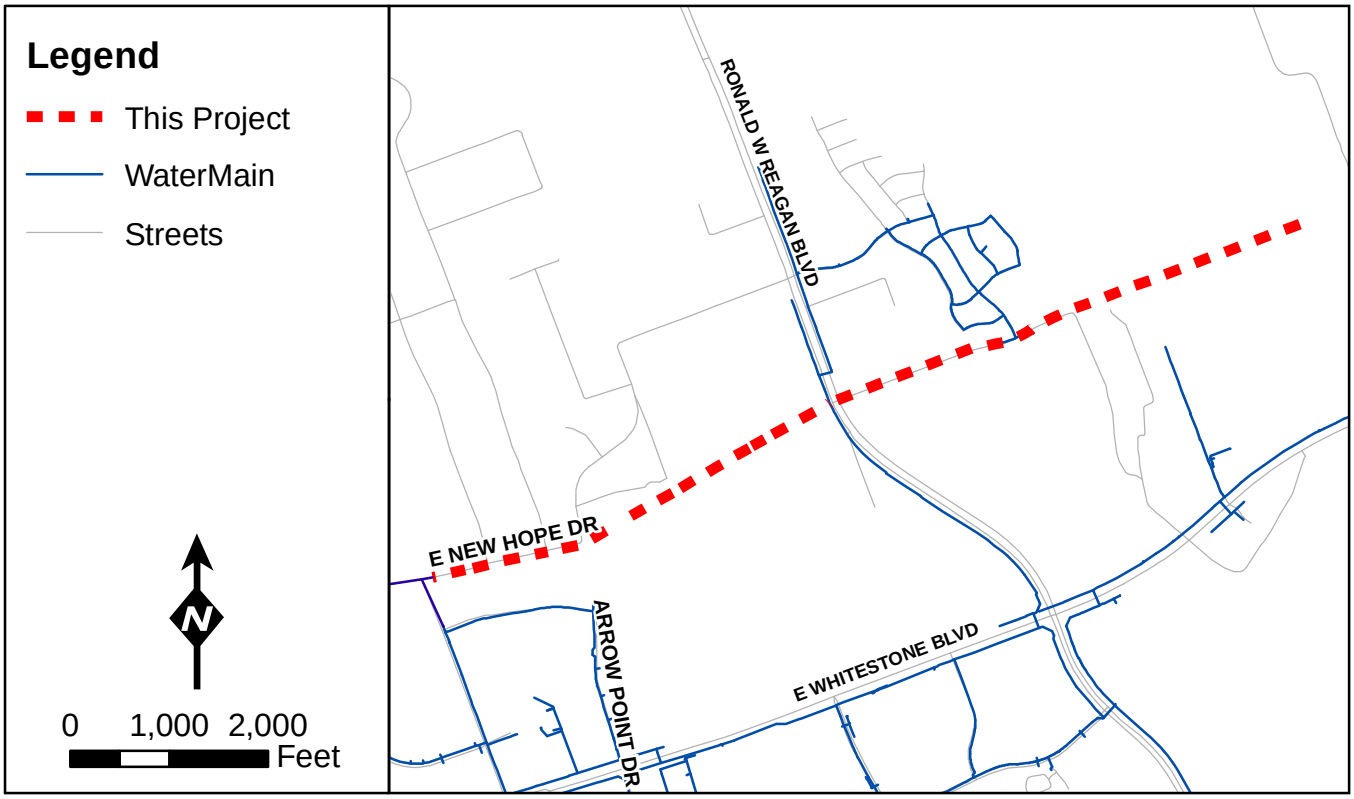
Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
W-3	16	12,430	$160	$1,988,800	$208	$2,585,500

***Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.**

Justification:

This project prepare for future development in Pressure Plane 2 and provide looping to reduce velocities in Pressure Plane 4.





Project Number: CIP -W-4

Planning Period: 2040

Description: New 8 in. pipe on Polar Ln crossing Parmer Ln.

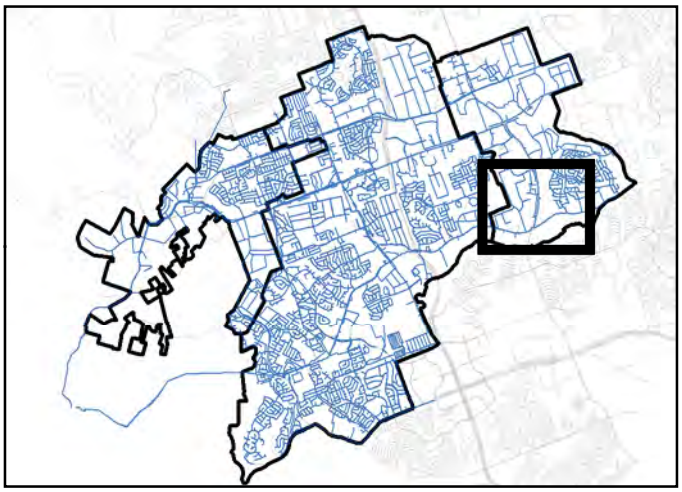
Planning Level Cost:

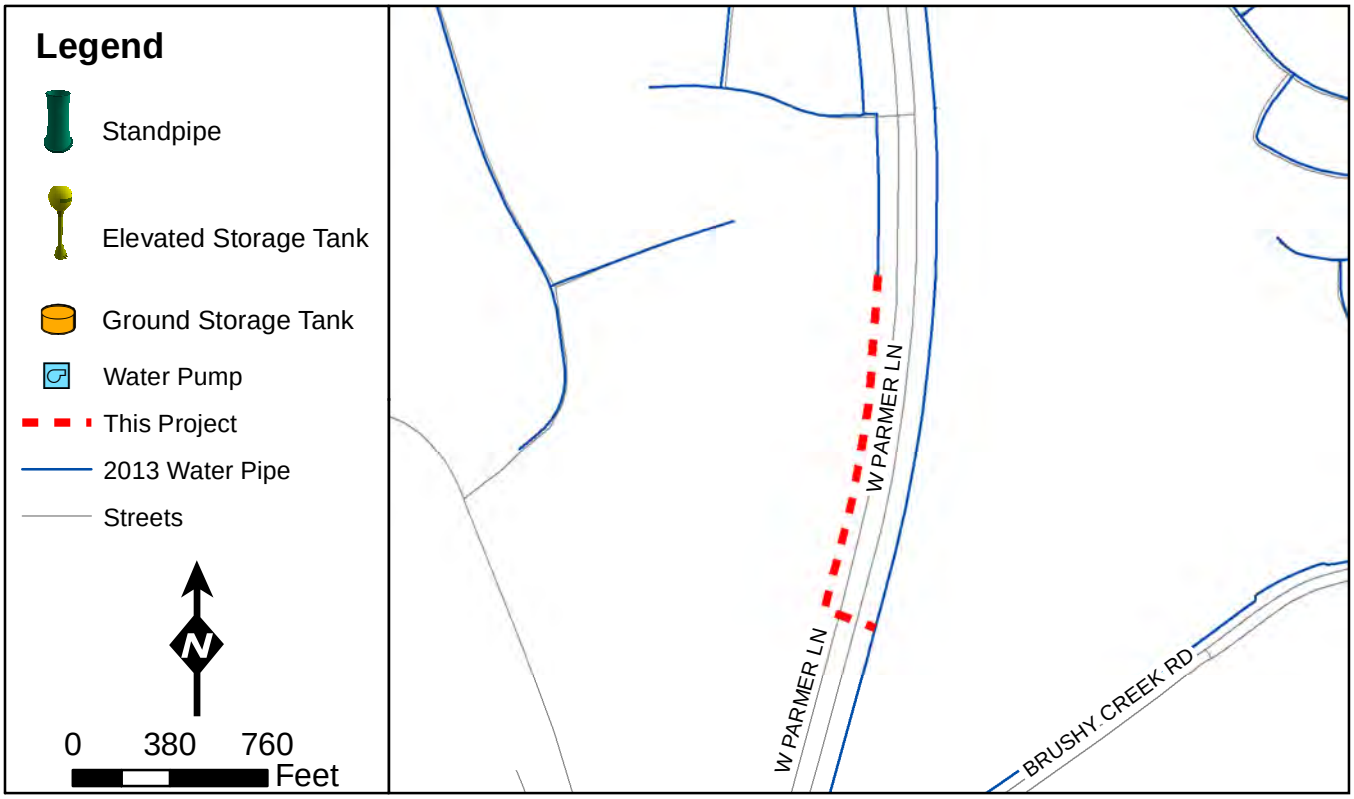
Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
W-4	8	1,540	$132	$203,600	$172	$264,900

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:

This project will facilitate looping in the distribution system and help provide adequate fire flows.





Project Number: CIP -W-5

Planning Period:

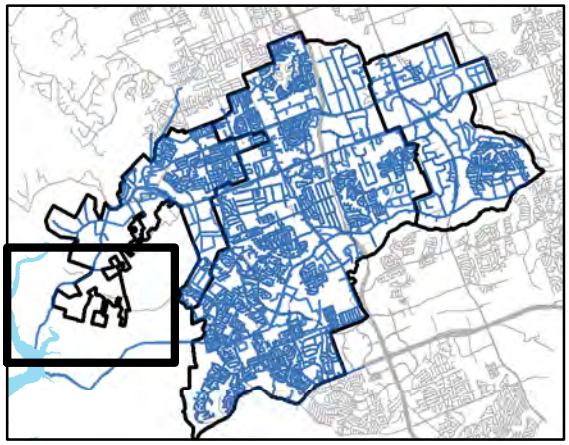
Description: Brushy Creek Regional Utility Authority Phase 1B, 1C and Phase 2 Water Treatment Plant Improvements.

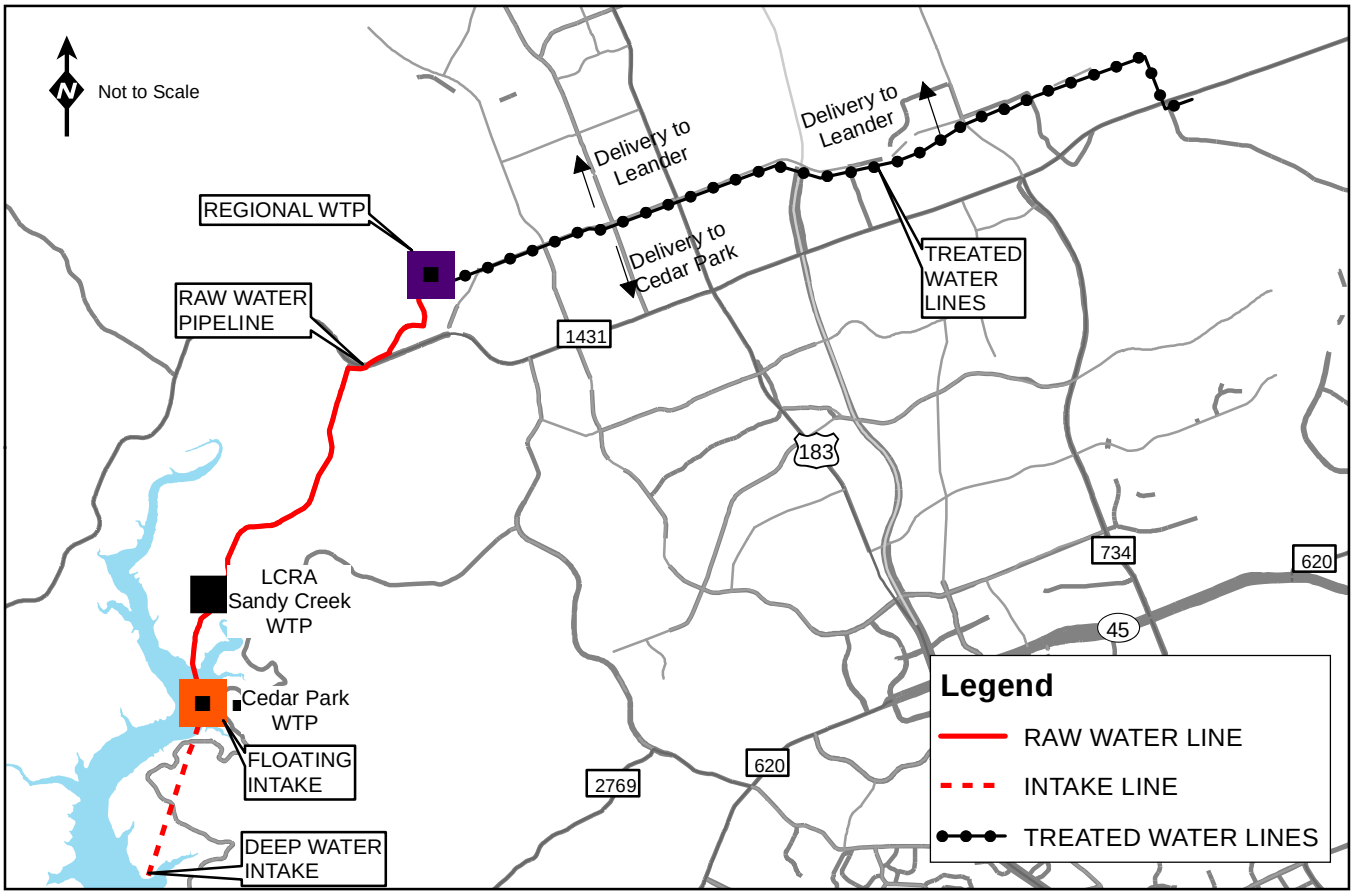
Planning Level Cost:

Project #	Description	Cost	City of Cedar Park Allocation	Project Cost*
W-5.1	Phases 1B & 1C	$23,900,000	26.67%	$6,374,130
W-5.2	Phase 2	$165,000,000	27.45%	$45,292,500

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project implements planned improvements to interlocal facility.





Project Number: CIP -W-6

Planning Period: 2040

Description: New Pressure Plane 4 elevated storage tank and 16-in water main near fire station 4 on Church Park Road.

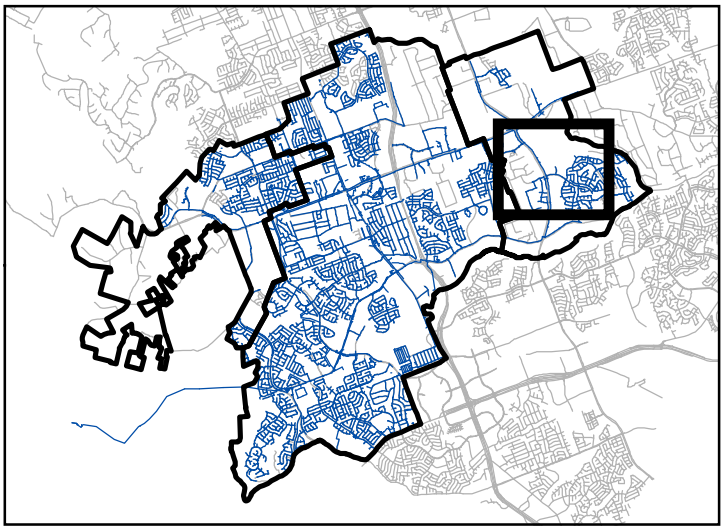
Planning Level Cost:

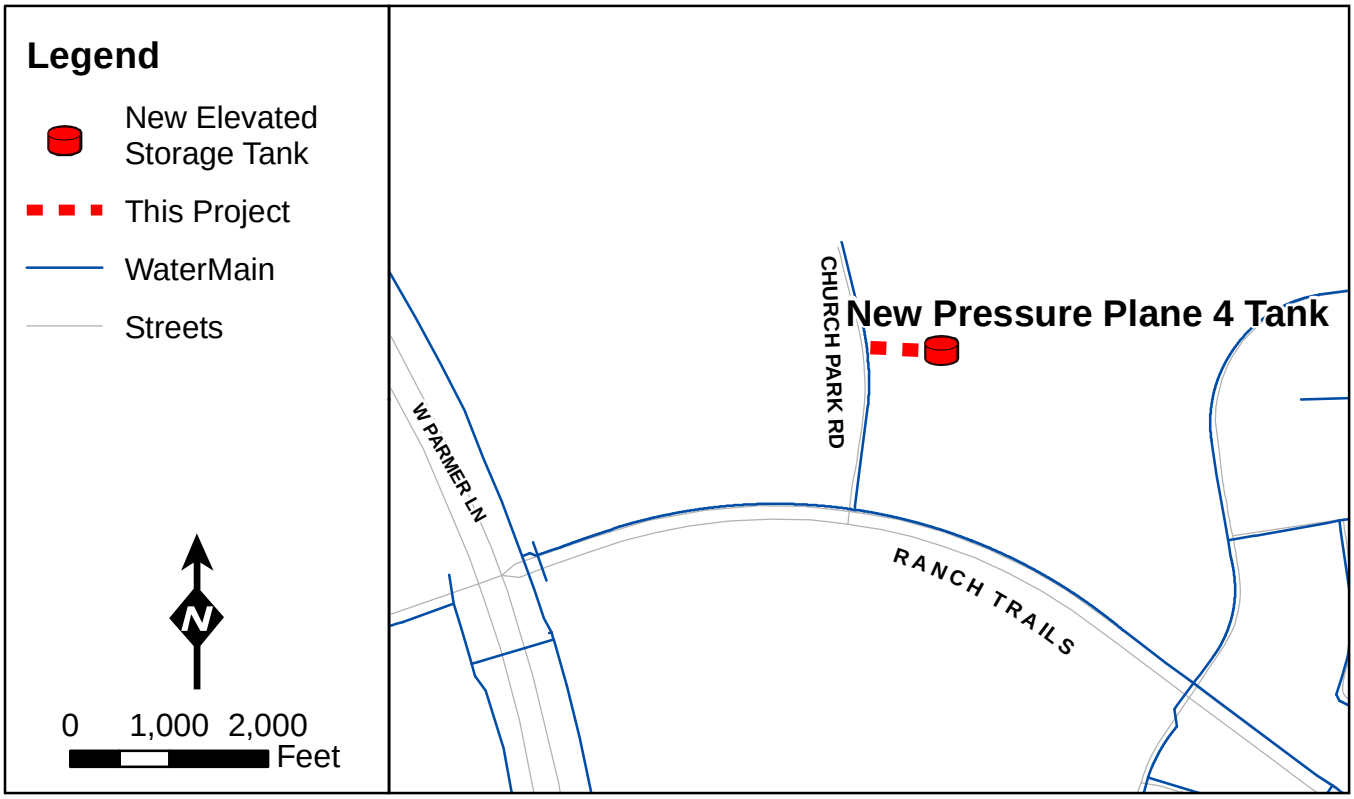
Project #	Volume, MG	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
W-6	0.5	$2.23	$1,115,000	$2.90	$1,450,000

***Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.**

Justification:

This project provides elevated storage in Pressure Plane 4.





APPENDIX E – COLLECTION SYSTEM MODEL USERS GUIDE

APPENDIX E – COLLECTIVE SYSTEM MODEL USERS GUIDE

INTRODUCTION

The City of Cedar Park, Texas has a wastewater collection system model, developed in the early 2000s, in Microsoft Excel that is used to evaluate the capacity requirements of the major gravity sewers in the City's collection system. The model was originally developed by identifying the primary interceptors in the collection system and then delineating the collection basins that sent flows to each of them. The original model accounts for accumulated flows from upstream basins being conveyed to downstream basins and uses a per capita wastewater generation rate for dry weather flows and calculates wet weather flows on a per acre basis. At the time the model was first developed, undeveloped areas were included by identifying future collection basins and making assumptions for the dry and wet weather flows.

The model was recently updated to include areas in Cedar Park's collection system that have developed since the model was first created in order to conduct a capacity evaluation as part of the FY 14 Long range Water and Wastewater Plan Update. In this update, the collection basins and major interceptors were reviewed to correlate with the City's latest GIS data. Several enhancements were added to the model so that future updates to loads, collection basin boundaries or capacity evaluation criteria could be done efficiently and to provide flexibility for City staff as they continue to use the model in capacity evaluations. The purpose of this user guide is to describe how the updated model is set up and how to make changes to it including loads, collection basin boundaries, upstream-downstream relationships, and evaluation criteria.

MODEL UPDATE AND ENHANCEMENTS

The primary purpose of the model update was to complete a capacity analysis of the Cedar Park collection system. In order to do this it was necessary to review and revise collection basin boundaries using the City's GIS. In this process, over 30 new collection basins were defined. The majority of these basins are in the eastern portion of the system, located generally east of Bell Boulevard. An updated GIS layer with the sewer collection basins was developed in this process, which provides the framework for extracting the parcel acreages and total acreages that are used in the model's flow calculations.
Several enhancements were made to the model to configure it to allow efficient changes to input values. These changes include:

Creating cell references to common variables in formulas rather than embedding them in formulas

Adding dry weather, non-residential wastewater loads for each collection basin

Adding dry and wet weather capacity evaluation criteria for new pipes to be used as a basis for new designs

Adding conditional formatting to highlight pipes with insufficient capacity based on the evaluation criteria

Adding a matrix that contains the upstream downstream relationship between the collection basins that is used to sum acreages and parcel counts for the flow calculations.
The following sections describe each of these enhancements and how changes should be made in the model in the future.

CELL REFERENCES

Cell references were established for common variables in formulas rather than having the variable embedded in the formula. For example, a cell reference was created to hold the value for the gallon per capita per day (gpcd) wastewater generation rate, which is referenced by the dry weather flow formula. This allows the user to change the gpcd value easily without having to modify the formula. Figure E.1 illustrates the cell reference for the Dry Weather flow calculation.

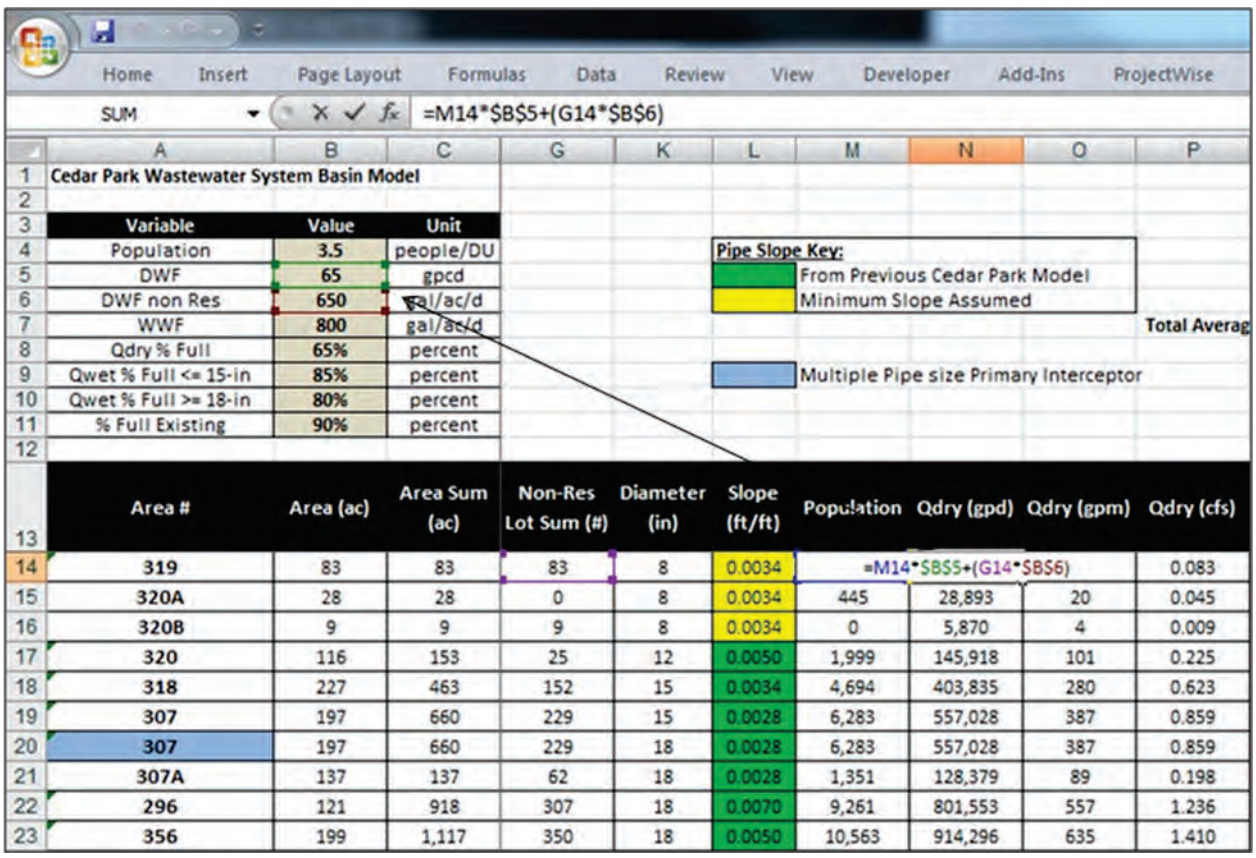


Figure E.1 Cell Reference for Dry Weather Flow Calculation

Cell references were added for the several variables found on the “Updated Model” tab in Cells B4 through B11. These cells are formatted in a tan color to indicate they are a user defined variable and can be changed. Table E.1 describes each of the cell reference variables and identifies which formulas they are referenced by.

Another way to view the cell references and their associated formulas is through the “Trace Dependents” feature in Microsoft Excel. To activate this feature, select the cell in the worksheet to trace than select the “Formulas” tab in the Excel menu ribbon then select “Trace Dependents”. This will result in arrows being drawn from the traced cell to the cells containing formulas that reference it. To remove the arrows select “Remove Arrows” from the “Formulas” tab in the Excel menu ribbon.

Table E.1 Cell Reference Variable Summary
FY 14 Long Range Water and Wastewater Plan Update
City of Cedar Park

Variable Name	Description	Unit	Associated Formula
Population	Number of people per home	people/dwelling unit (DU)	Population (Column M)
DWF	Residential dry weather flow	gallons per capita per day	Qdry (Column N)
DWF non Res	Non-residential dry weather flow	gallons per acre per day	Qdry (Column N)
WWF	Wet weather flow	gallons per acre per day	I/I (Column R)
Qdry % Full	Percent of full pipe flow allowed for peak, dry weather flow conditions for design of new sewers	percent	Qdry % Full (Column Z)
Qwet % Full <= 15-in	Percent of full pipe flow allowed for peak, wet weather flow conditions for design of new sewers 15-in and smaller	percent	Qwet % Full (Column AA)
Qwet % Full >= 18-in	Percent of full pipe flow allowed for peak, wet weather flow conditions for design of new sewers 18-in and larger	percent	Qwet % Full (Column AA)
% Full Existing	Percent of full pipe flow allowed for peak, wet weather flow conditions for existing sewers	percent	Qwet % Full (Column AH)

DRY WEATHER LOADS

The dry weather flows were updated to include the portion assigned to the residential component of flow and the non-residential component of flow. Both the residential and non-residential flow components rely on a parcel count within each collection basin. The City's GIS parcel data was associated with the updated collection basin GIS layer described previously. Aerial photography and the City's land use plan was used to determine if a parcel was classified as residential or non-residential for the purposes of calculating dry weather flows.

The "ParcelModelBasin11" tab in the model contains the summarized results of the GIS analysis for each collection basin. For each collection basin the total acreage, number of residential lots and number of non-residential lots were calculated. The "ParcelModelBasin11" tab provides the reference for acreages and lot counts in the model calculations, meaning that changes made in this tab will change the model calculations. Future updates to the basin boundaries that affect total acreages and lot counts can be copied into the "ParcelModelBasin11" tab, to provide updated values for the flow calculations.

DRY AND WET WEATHER PIPE CAPACITY CRITERIA

The evaluation criteria in the model was expanded to include the peak, dry weather flow and peak, wet weather flow capacity requirements for new sewers. Cell references were provided for these values as described previously and summarized in Table 1. These criteria are intended to provide the City with an additional level of analysis for evaluating new sewers. Existing sewers are still evaluated based on the 90% of full pipe flow criteria. Although it is possible for the user to change the capacity criteria for new sewers, it is not recommended since these values are from the Texas Administrative Code. If changes to these values are required, the user can change cells D6 through D10, as appropriate.

Note, the values in Cells D8 through D10 are referenced by a lookup table on the "Reference" tab, which is used to determine which factor the capacity evaluation formulas should use in Columns Z, AA and AH.

DISPLAYING RESULTS AND CONDITIONAL FORMATTING

Conditional formatting was added to the cells that compare the full pipe flow capacity criteria with the estimated wastewater load from each basin. When capacity requirements are met, the cells are formatted green and state "o.k.". When capacity requirements are not met, the cells are formatted red and state "full".

A summary of results is also provided in the updated model. The number of existing undersized pipes (criteria is 90% of the full pipe flow for peak, wet weather flow), the total average annual daily residential and non residential flows and total wet weather flow are provided. Figure E.2 shows the model results summarized at the top of the display and the conditional formatting applied to the capacity evaluation criteria cells.

ectWise Acrobat

P	Q	R	S	T	U	V	W	X	Y	Z	AA	AH	AI	AJ	AK	AL	AM	AN
		Number of Existing Undersized Pipes			17													
		Total Average Annual Daily Residential Flow			5.8	mgd												
		Total Average Annual Daily Commercial Flow			3.0	mgd												
Total Average Annual Daily Residential & Commercial Flow					8.8	mgd												
			Total Wet Weather Flow		14.8	mgd												
										% Full Criteria			Design For New Pipes				Existing Pipes	
										65%	85%-80%	90%	Dry Weather Flow		Wet Weather Flow		Wet Weather Flow	
Qdry (cfs)	PF	I/I (gpd)	Qwet (gpd)	Qwet (gpm)	Qwet (cfs)	Qdry (mgd)	Qwet (mgd)	Qfull (mgd)	Qfull (gpm)	Qdry % Full (mgd)	Qwet % Full (mgd)	Qwet % Full (mgd)	Capacity	% Full	Capacity	% Full	Capacity	% Full
0.083	3.96	66,354	279,695	194	0.43	0.21	0.28	0.46	316	0.30	0.39	0.41	o.k.	47%	o.k.	61%	o.k.	61%
0.045	4.09	22,259	140,296	97	0.22	0.12	0.14	0.46	316	0.30	0.39	0.41	o.k.	26%	o.k.	31%	o.k.	31%
0.009	4.30	7,560	32,802	23	0.05	0.03	0.03	0.46	316	0.30	0.39	0.41	o.k.	6%	o.k.	7%	o.k.	7%
0.225	3.69	122,463	660,636	459	1.02	0.54	0.66	1.63	1,130	1.06	1.38	1.46	o.k.	33%	o.k.	41%	o.k.	41%
0.623	3.33	370,632	1,715,250	1,191	2.65	1.34	1.72	2.43	1,690	1.58	2.07	2.19	o.k.	55%	o.k.	70%	o.k.	70%
0.859	3.20	528,309	2,311,470	1,605	3.58	1.78	2.31	2.21	1,534	1.44	1.88	1.99	full	81%	full	105%	full	105%
0.859	3.20	528,309	2,311,470	1,605	3.58	1.78	2.31	3.59	2,494	2.33	2.87	3.23	o.k.	50%	o.k.	64%	o.k.	64%
0.198	3.73	109,380	587,904	408	0.91	0.48	0.59	3.59	2,494	2.33	2.87	3.23	o.k.	13%	o.k.	16%	o.k.	16%
1.236	3.05	734,324	3,178,602	2,207	4.92	2.44	3.18	5.68	3,943	3.69	4.54	5.11	o.k.	43%	o.k.	56%	o.k.	56%

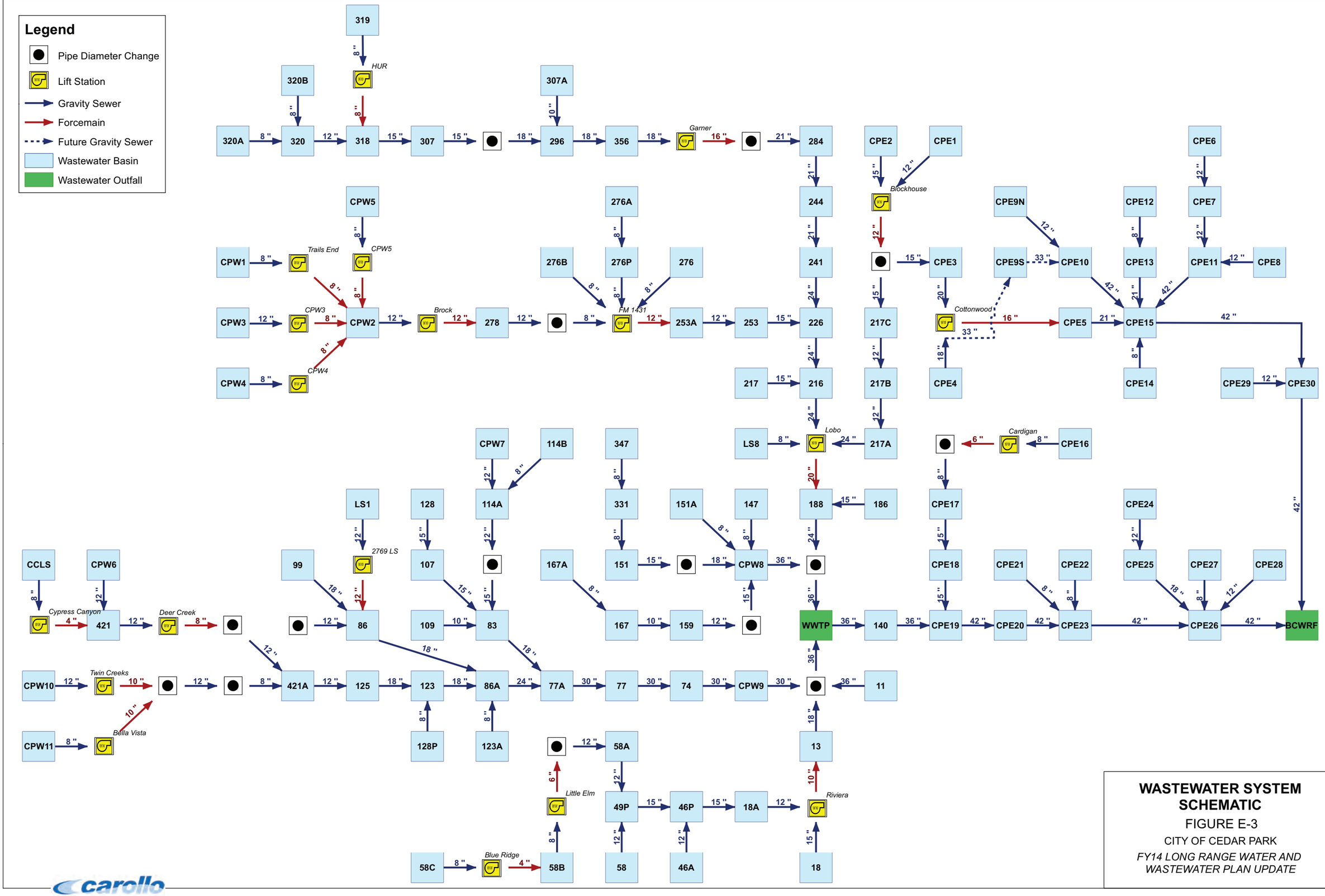
Figure E.2 Model Results and Conditional Formatting

COLLECTION SYSTEM BASIN CONNECTIVITY

After the model update, the City's collection system was delineated into 112 collection basins. Some of these basins have multiple basins upstream and the flows from these basins must be considered in the capacity evaluations. A system schematic was developed that describes the upstream/downstream relationship between the collection basins as shown in Figure E.3. The purpose of the schematic is to illustrate basin connectivity and was used to update the connectivity in the model.

The "Basin Data" tab contains a matrix that identifies all basins upstream of a given basin. Column A lists all of the collection basins in the model and represents the basin as a downstream basin. Row 3 also lists all the collection basins in the model but represents the basin as an upstream basin. For each basin in column A, the user enters a "1" into the column in Row 3 that contains an upstream basin. Each basin is considered to be "upstream" of itself, meaning that each basin will have at least one "upstream" basin. Conditional formatting is used to identify the basin number (green cells) and associated upstream basins (blue cells). Figure E.4 shows a portion of the collection basin matrix.

Path: M:\Client\Cedar Park\9369a.00\GIS\mxd\Figure 4-2 - Wastewater System Schematic.mxd



WASTEWATER SYSTEM SCHEMATIC

FIGURE E-3

CITY OF CEDAR PARK

FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE

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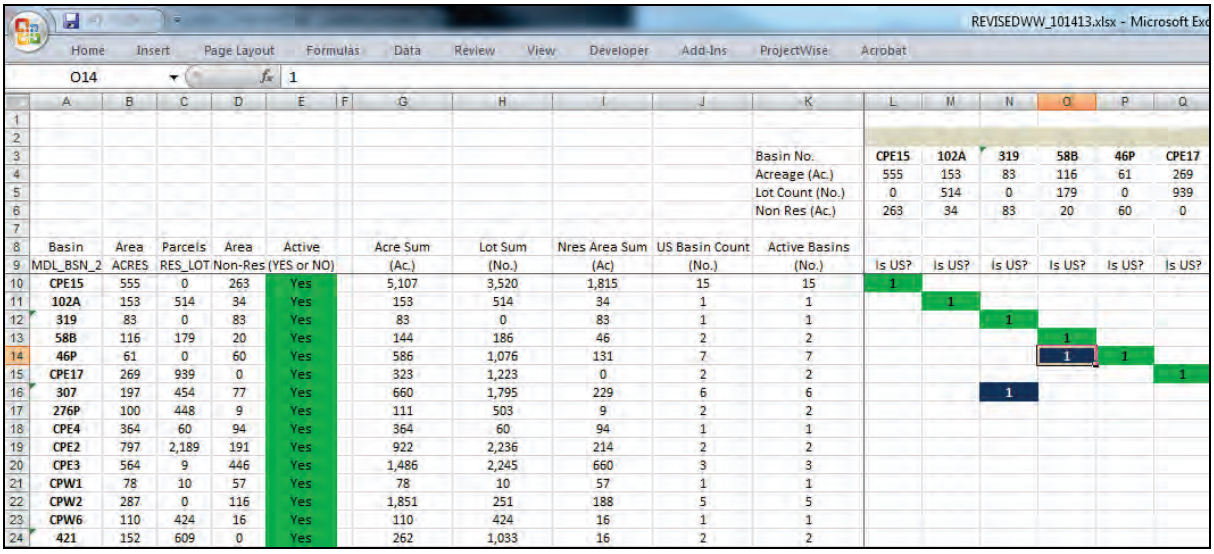

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O14 | 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2																	
3											Basin No.	CPE15	102A	319	58B	46P	CPE17
4											Acreage (Ac.)	555	153	83	116	61	269
5											Lot Count (No.)	0	514	0	179	0	939
6											Non Res (Ac.)	263	34	83	20	60	0
7																	
8	Basin	Area	Parcels	Area	Active		Acre Sum	Lot Sum	Nres Area Sum	US Basin Count	Active Basins						
9	MDL_BSN_2	ACRES	RES_LOT	Non-Res	(YES or NO)		(Ac.)	(No.)	(Ac)	(No.)	(No.)	Is US?	Is US?	Is US?	Is US?	Is US?	Is US?
10	CPE15	555	0	263	Yes		5,107	3,520	1,815	15	15	1					
11	102A	153	514	34	Yes		153	514	34	1	1		1				
12	319	83	0	83	Yes		83	0	83	1	1			1			
13	58B	116	179	20	Yes		144	186	46	2	2				1		
14	46P	61	0	60	Yes		586	1,076	131	7	7				1	1	
15	CPE17	269	939	0	Yes		323	1,223	0	2	2						1
16	307	197	454	77	Yes		660	1,795	229	6	6			1			
17	276P	100	448	9	Yes		111	503	9	2	2						
18	CPE4	364	60	94	Yes		364	60	94	1	1						
19	CPE2	797	2,189	191	Yes		922	2,236	214	2	2						
20	CPE3	564	9	446	Yes		1,486	2,245	660	3	3						
21	CPW1	78	10	57	Yes		78	10	57	1	1						
22	CPW2	287	0	116	Yes		1,851	251	188	5	5						
23	CPW6	110	424	16	Yes		110	424	16	1	1						
24	421	152	609	0	Yes		262	1,033	16	2	2						

Figure E.4 Collection System Basin Matrix

The total number of upstream basins is summed in the “US Basin Count” field (Column J). The user has the option to turn a basin on or off using the drop down menu in the “Active” field (Column E). This field was added to allow the user to turn off basins that will develop in the future to see the impacts downstream with and without the basin active. **However, this feature must be used with caution to make certain that the basin configuration is realistic**. For example, referring to Figure E.3, it would not be realistic to turn off Basin 320 but not Basins 320 A and 320B since Basin 320 is an existing area. It would be, however, appropriate to turn off Basins 320A and 320B since they are a future development and have no other upstream basins.

The basins listed in Column A are used to lookup values from the GIS analysis summary in the “ParcelModelBasin11” tab. The individual lot acreages and parcel counts are shown in Columns B through D. The “1’s” in the matrix are used to sum the acreages and parcel counts for the upstream basins and are shown in Columns G through I.

If a basin is selected as inactive (“No” selected in Column E), then the formulas adjust the acreages and parcel counts accordingly by removing the acreages and parcel counts for that particular basin.

In the “Updated Model” tab, lookup functions are used to extract the acreages and parcel counts (Columns B though D and G though I) from the “Basin Data” tab.

MODEL UPDATES

There are several ways in which the City may need to use the model that may involve making changes or updates. Table E.2 lists common tasks that the City may need to perform using the updated model and the steps to complete each tasks.

Table E.2 Approach to Common Tasks using the City's Wastewater Model FY 14 Long Range Water and Wastewater Plan Update City of Cedar Park	
Task	**Approach**
Revise population	Adjust cell "B4" (people per dwelling unit) to increase or decrease the number or people per home
Revise residential dry weather flow	Adjust cell "B5"
Revise non-residential dry weather flow	Adjust cell "B6"
Revise wet weather flow	Adjust cell "B7"
Revise capacity requirements for new sewers	Adjust cells "B8 through B10" as appropriate.
Revise capacity requirement for existing sewers	Adjust cell "B9"
Revise pipe diameter	Change appropriate row in Column K
Revise pipe slope	Change appropriate row in Column L
Add a second pipe for a basin	• Insert a row in the "Updated Model" tab below the basin number the pipe is to be added to. • Copy the values from the basin the pipe is to be added to and paste them into the row created for the new pipe. • Make certain the basin number is the same for both pipes (no extra spaces, match capitalization, etc.). • Change the pipe diameter and slope as appropriate.
Revise basin connectivity	• Open the "Basin Data" tab. • Locate the row for the basin that is to be changed in Column A. • Make changes as appropriate for each column in Row 3 the selected basin is down stream of. • Once changes are made in the "Basin Data" tab, the acreage and parcel count summaries (Columns G through I) will update automatically and these changes will be reflected in the "Updated Model" tab. • Recommend referencing the wastewater system schematic as changes are made.
Update Acreages and/or Parcel Counts	• For changes requiring GIS analysis that do not split, combine or delete basins, make appropriate boundary changes in GIS and intersect parcel centroids with the collection basins GIS layer. • Export to Excel and summarize acreages and parcel counts by basin. • Update table in "ParcelModelBasin11" tab. • Once changes are made in the "ParcelModelBasin11" tab, the acreages and parcel counts will be passed through to the "Basin Data" and "Updated Model" tabs.

APPENDIX F – WASTEWATER SYSTEM CIP MAPS

Project Number: CIP -WW-1

Planning Period: 2040

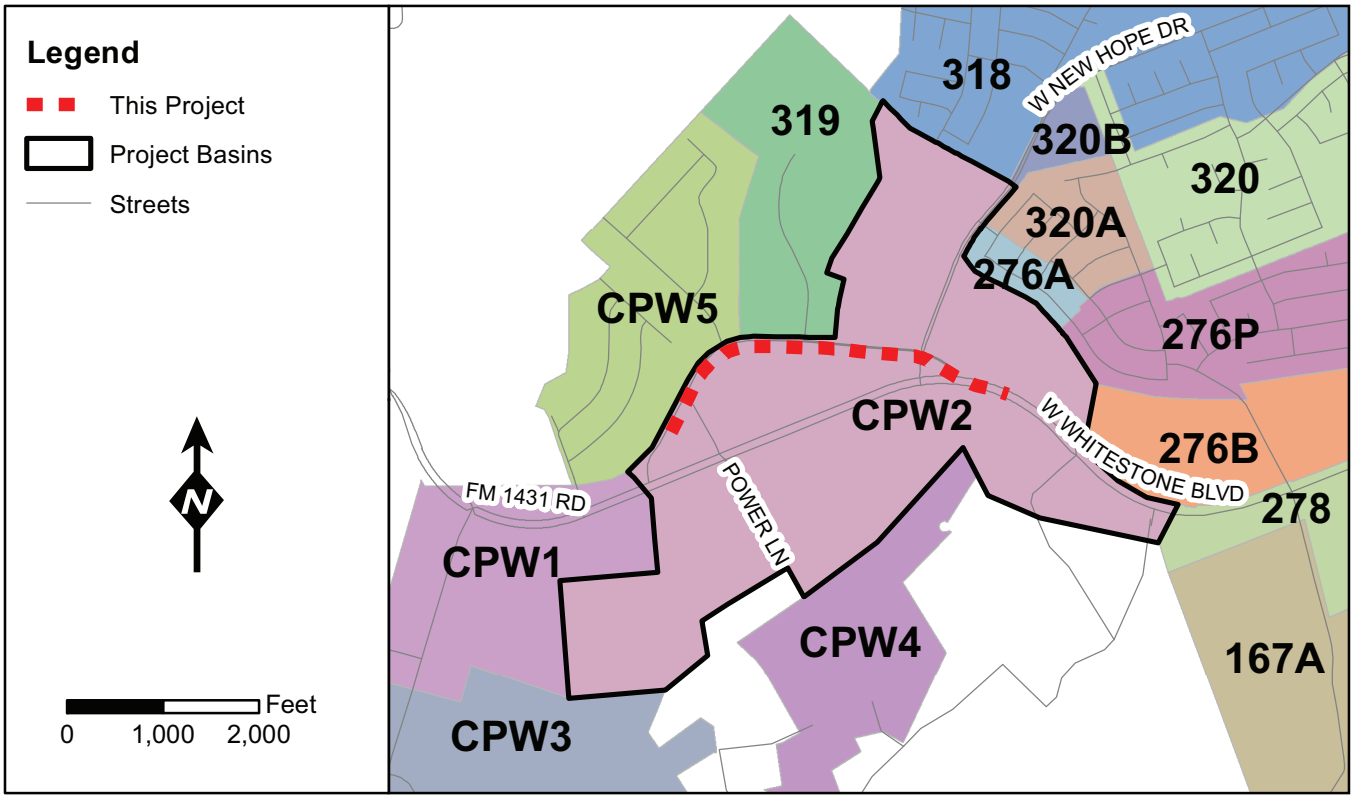
Description: New 18 in. wastewater line in collection basin CPW2 to replace 12 in. sewer, along Woodall Dr from Whitestone Blvd to SW of Power Ln.

Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW - 1	18	4065	$175	$710,800	$228	$926,900

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project will provide additional capacity for future needs.



Project Number: CIP -WW-2

Planning Period: 2040

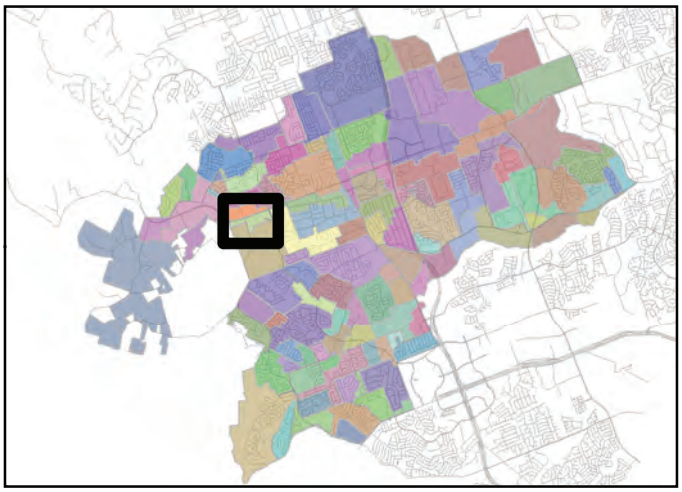
Description: New 15 in. wastewater line in collection basin 278 to replace 12 in. sewer along Whitestone Blvd from Anderson Mill Rd to N Lakeline Blvd.

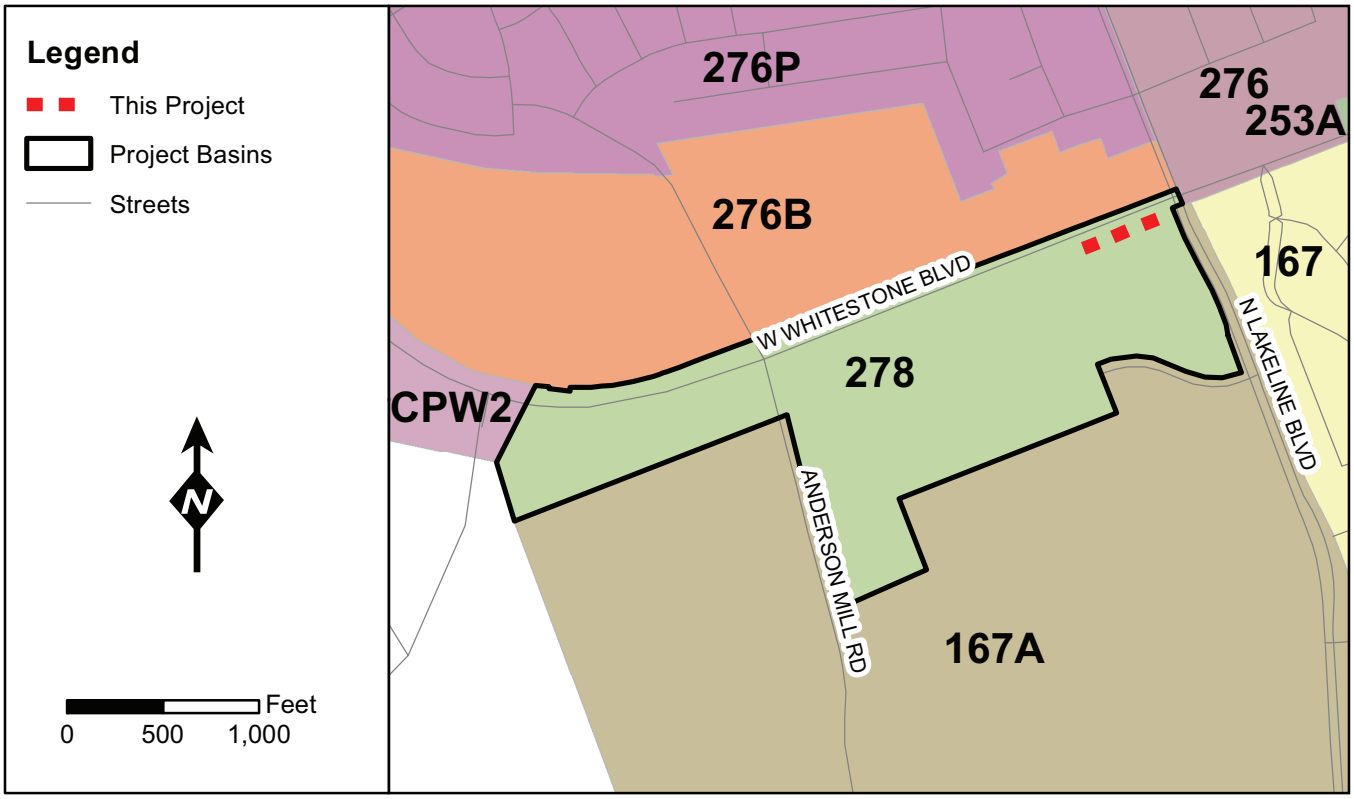
Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW - 2	15	500	$167	$83,400	$217	$108,500

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project will provide additional capacity for future needs.





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Project Number: CIP -WW-3

Planning Period: 2013 - 2018

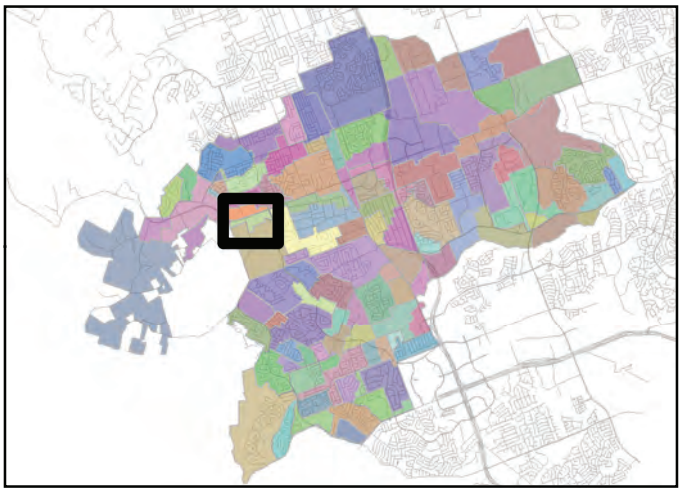
Description: New 15 in. wastewater line in collection basin 278 to replace 8 in. sewer along N Lakeline Blvd into lift station.

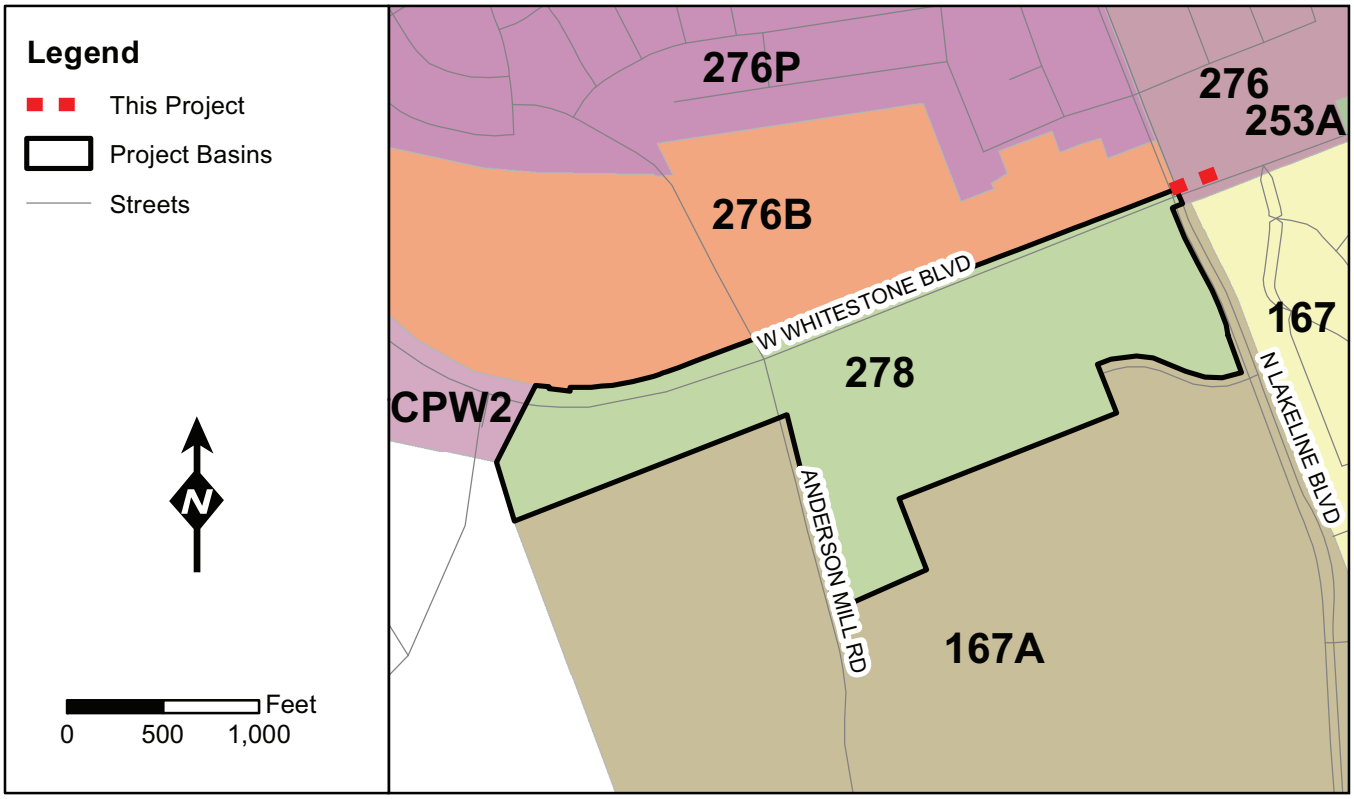
Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW - 3	15	321	$167	$53,600	$217	$69,700

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project will provide additional capacity for current/future needs.





Project Number: CIP -WW-4

Planning Period: 2013 - 2018

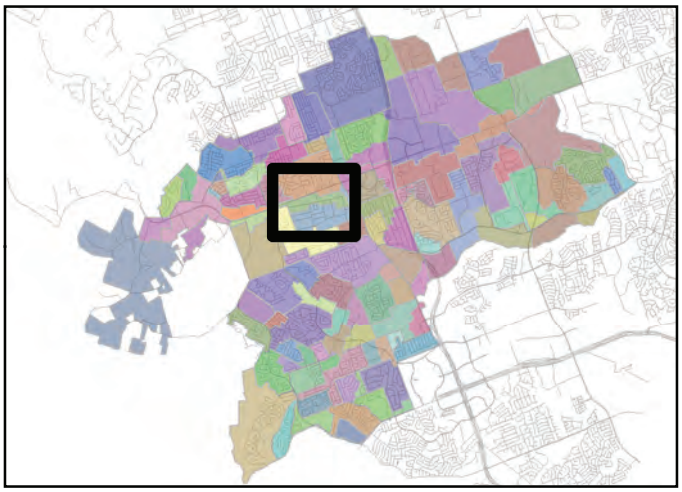
Description: New 18 in. wastewater line in collection basin 253A to replace 12 in. sewer along Lone Star Dr to Marquis Ln.

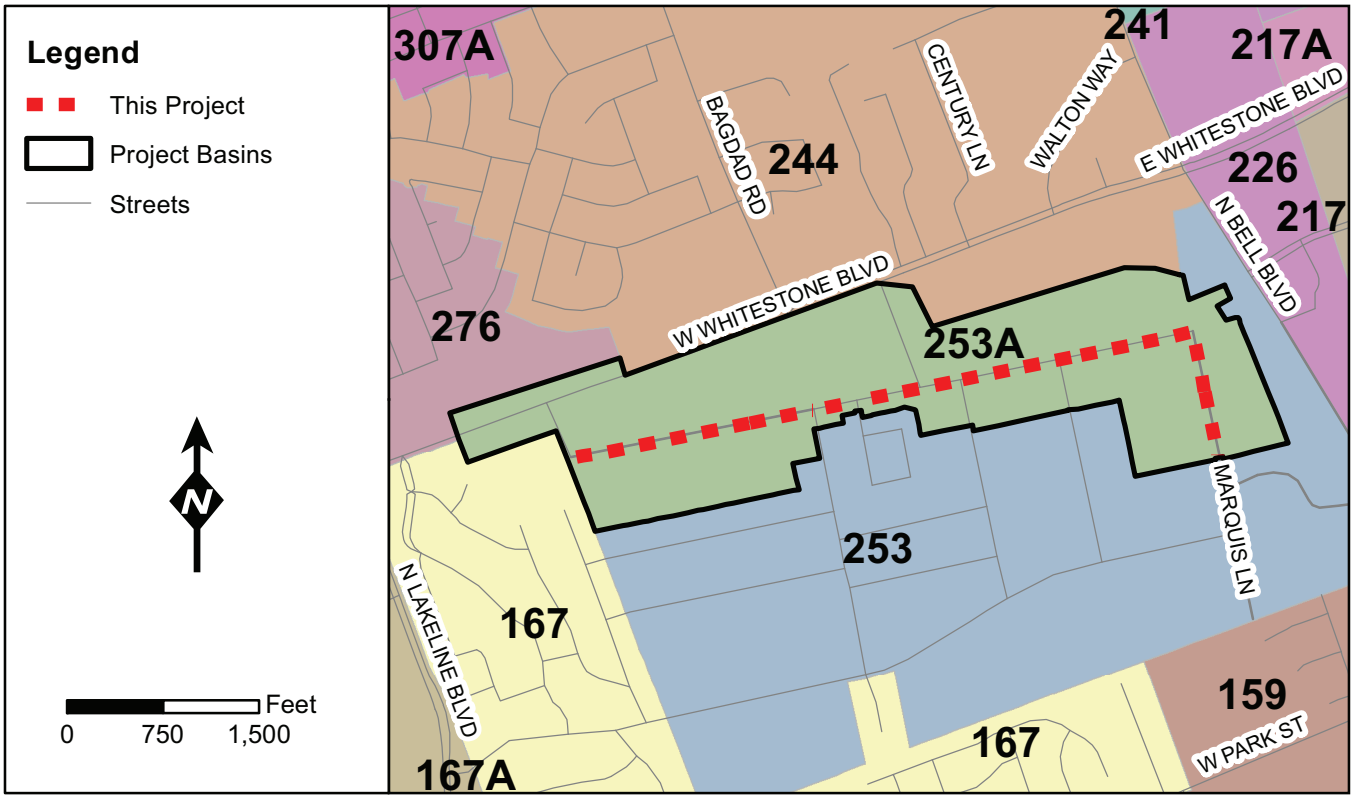
Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW - 4	18	5937	$175	$1,038,100	$228	$1,353,700

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project will provide additional capacity for current/future needs.





Project Number: CIP -WW-5

Planning Period: 2040

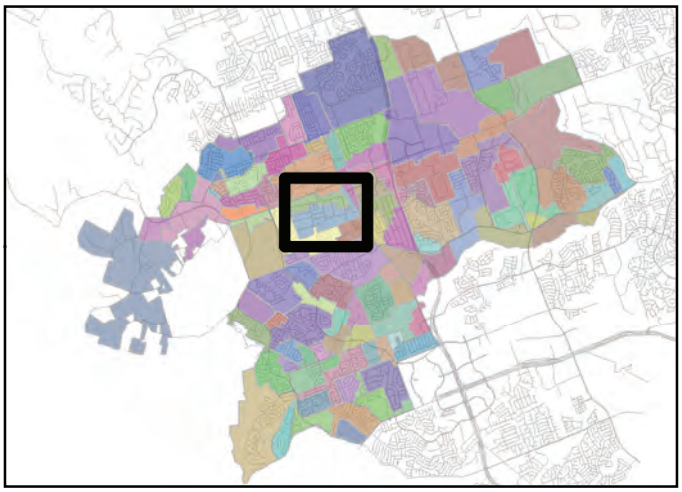
Description: New 18 in. wastewater line in collection basin 253 to replace 15 in. sewer along Cedar Park Dr from Marquis Ln to N Bell Blvd.

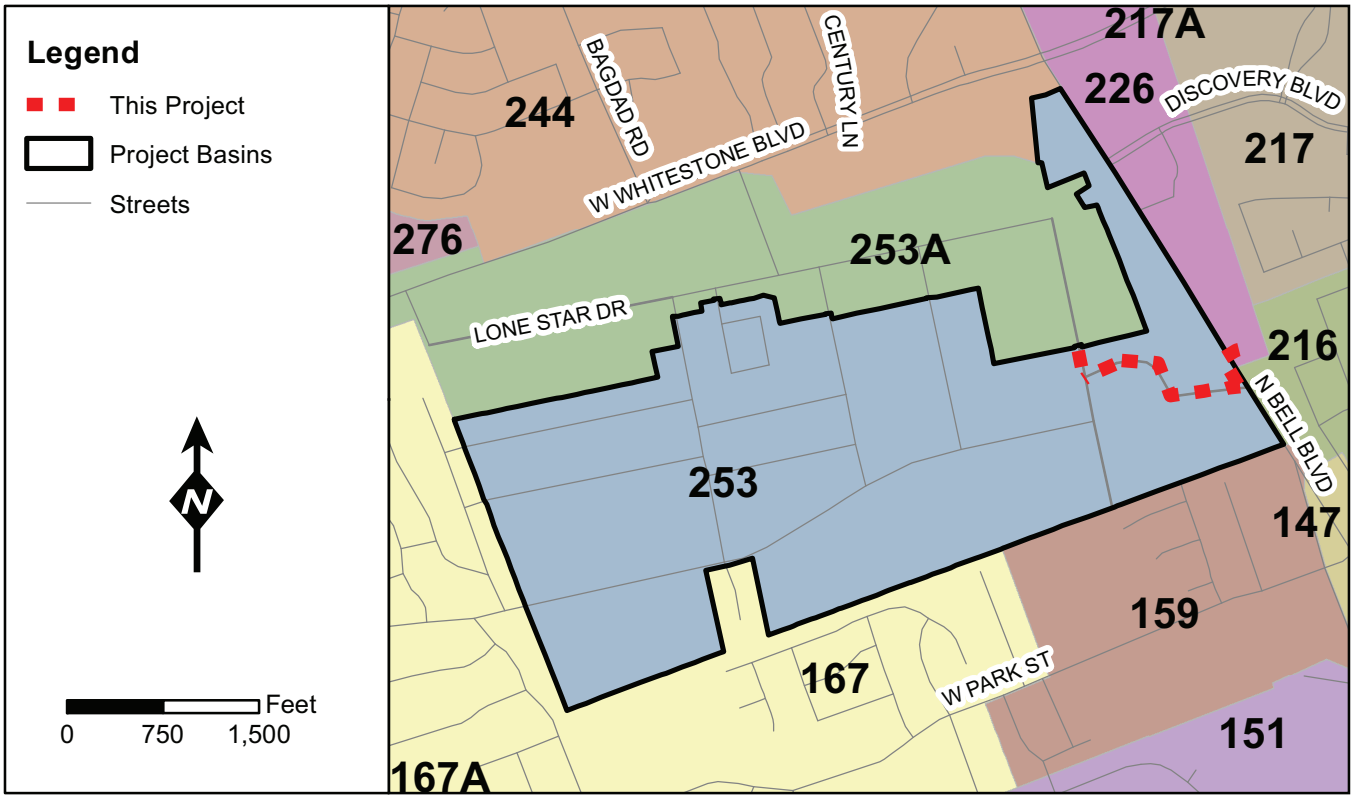
Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW - 5	18	2238	$175	$391,400	$228	$510,300

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project will provide additional capacity for future needs.





Project Number: CIP -WW-6

Planning Period: 2013 - 2018

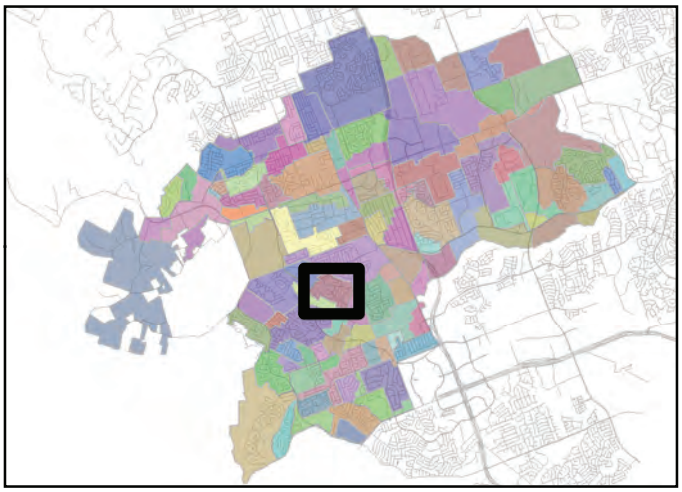
Description: New 12 in. wastewater line in collection basin 331 to replace 8 in. sewer along Rambling Trail between Woodhollow Ln and Cluck Creek Trl.

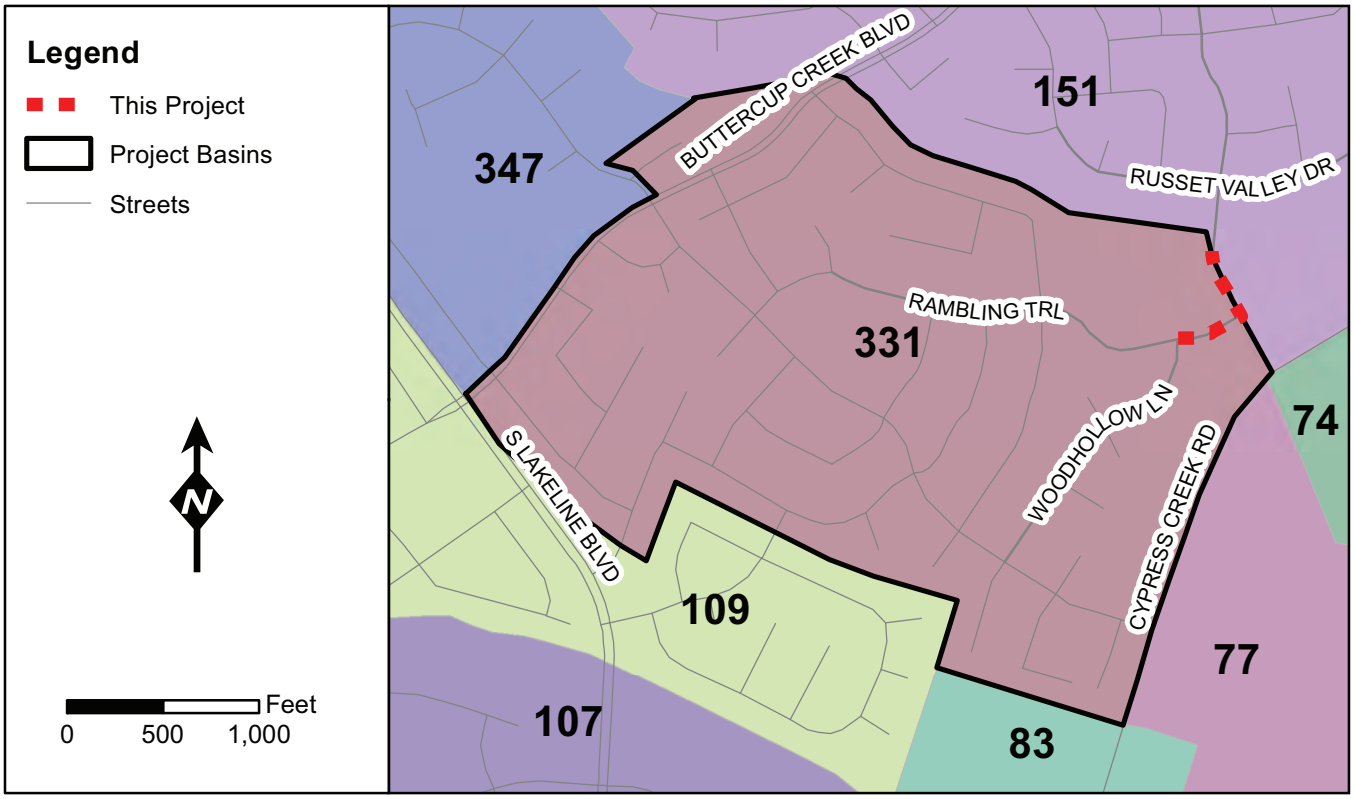
Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW - 6	12	1060	$155	$164,700	$202	$214,200

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project will provide additional capacity for current/future needs.





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Printing Date: February 11, 2014
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Project Number: CIP -WW- 7

Planning Period: 2013 - 2018

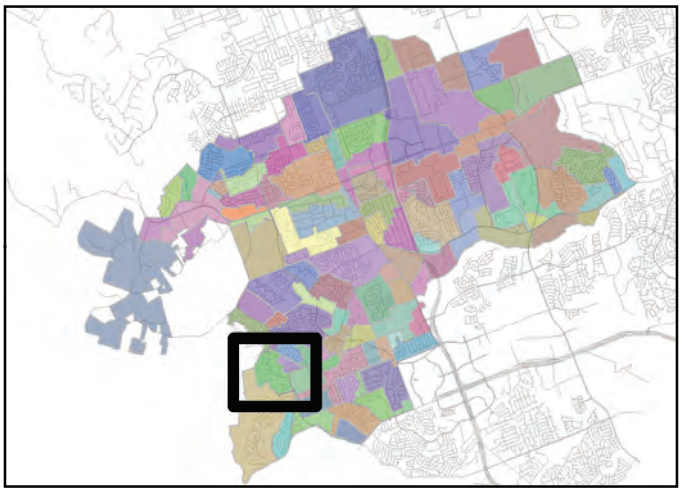
Description: New 15 in. wastewater line in collection basin 421A to replace 12 in. sewer along Cypress Creek Rd between Timberwolf Trl and Anderson Mill Dr.

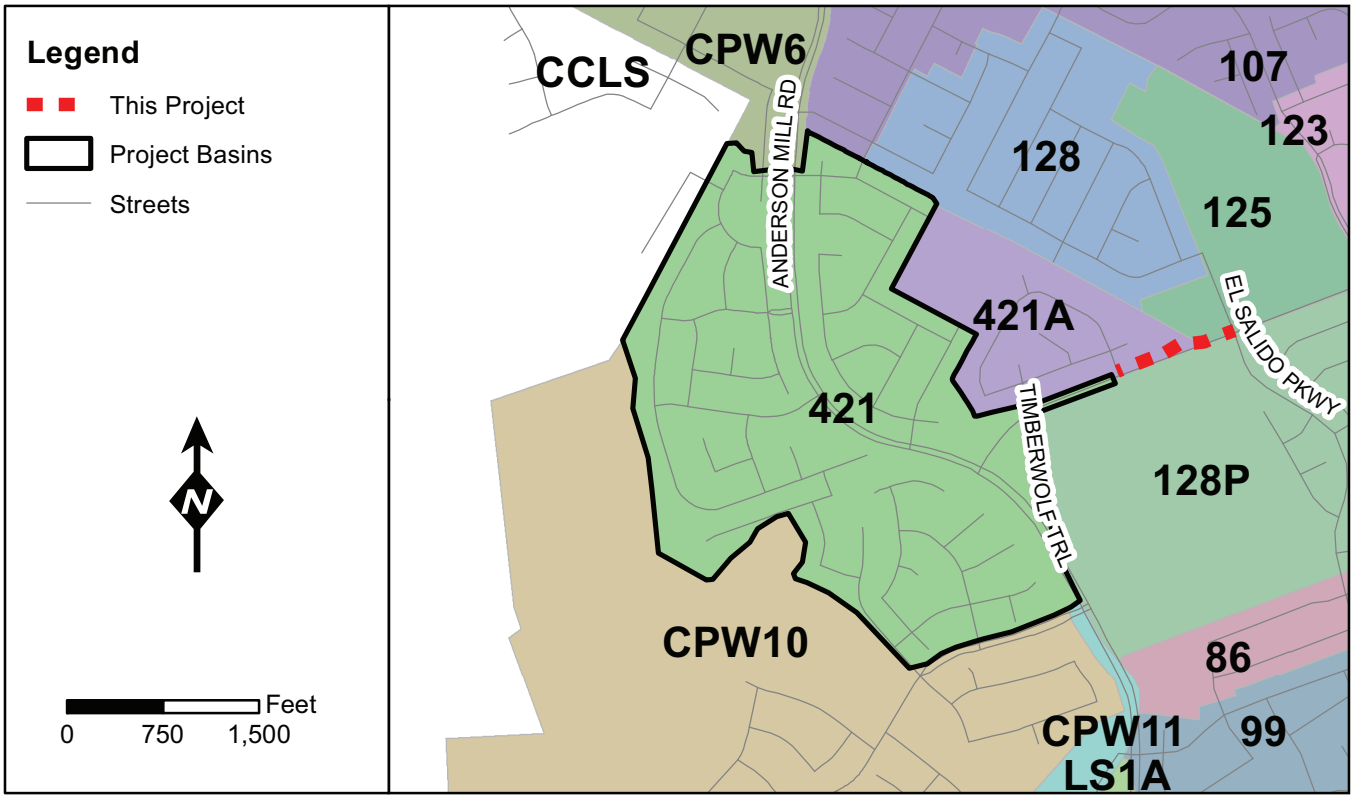
Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW - 7	15	988	$167	$164,800	$217	$214,400

*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

Justification:
This project will provide additional capacity for current/future needs.





Project Number: CIP -WW-8

Planning Period: 2019

Description: Spanish Oaks Wastewater Intercepter Phase II.

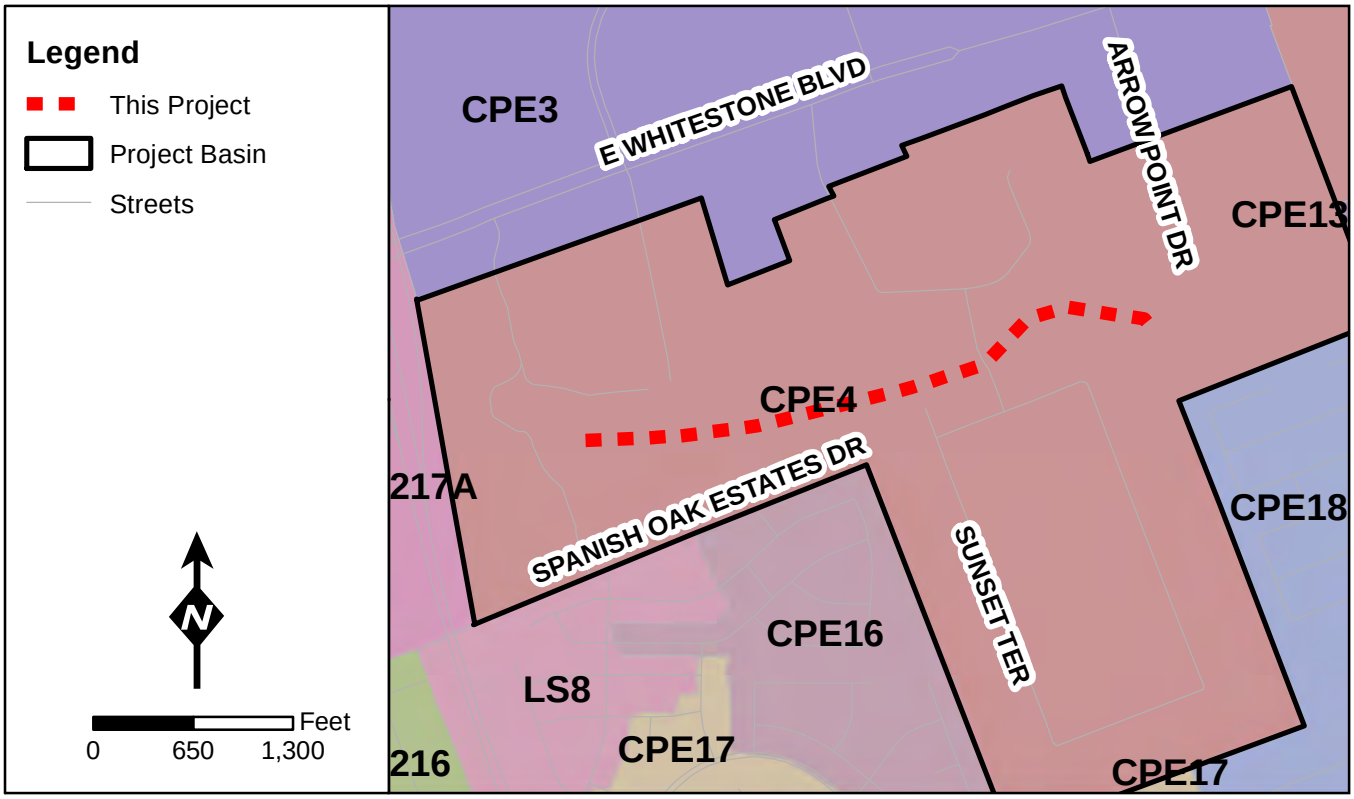
Planning Level Cost:

Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW-8	8	2,160	$138	$298,000	$180	$388,800
WW-8	12	1,840	$155	$286,000	$202	$371,700

***Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.**

Justification:

This project will provide additional capacity for current/future needs.



Project Number: CIP -WW-9

Planning Period: 2019

Description: Cottonwood Creek Wastewater Intercepter Phase C.

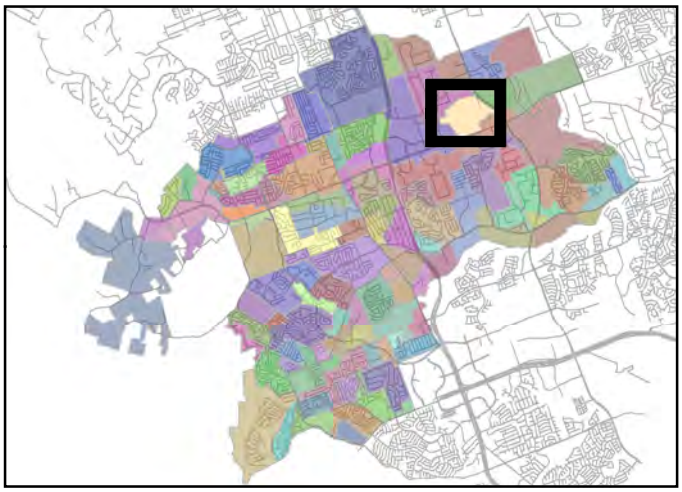
Planning Level Cost:

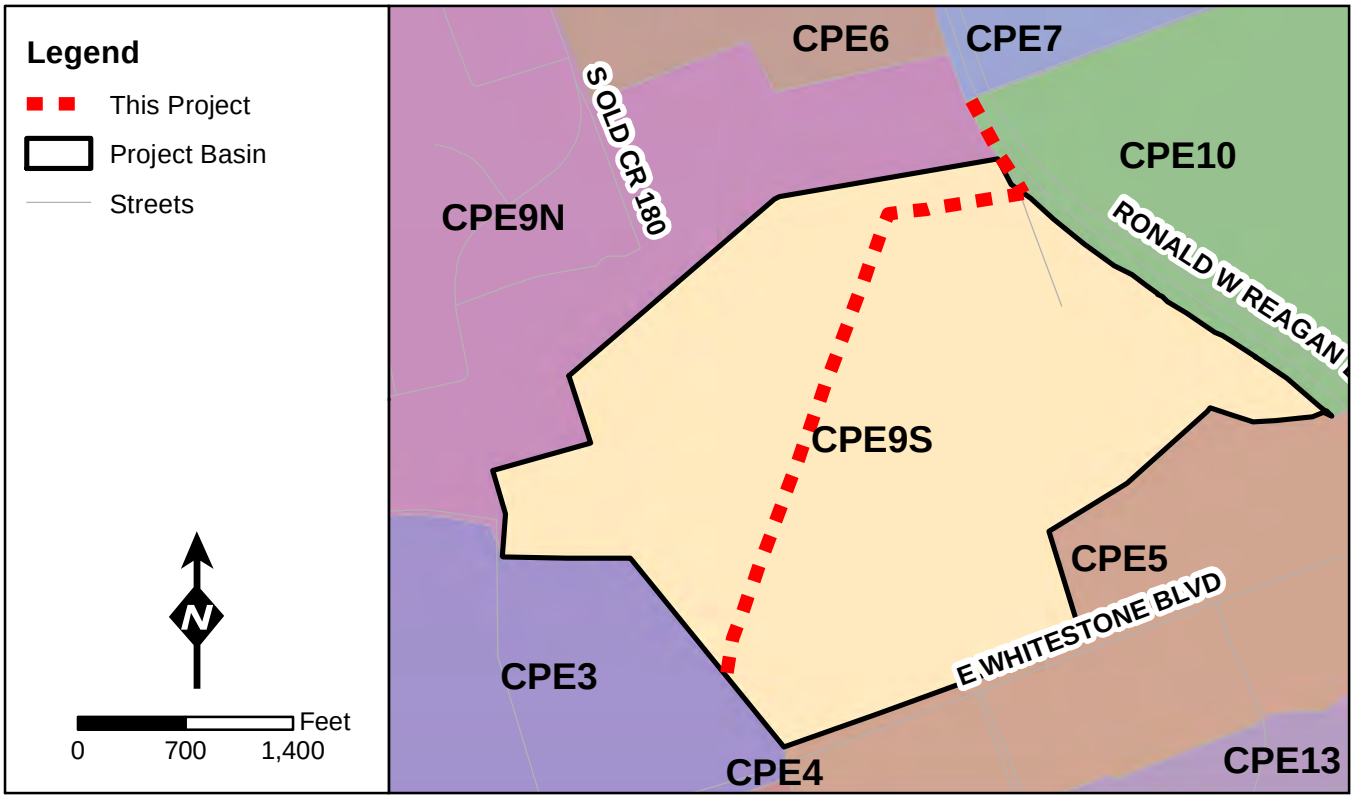
Project #	Diameter (in):	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW- 9	33	4,200	$207	$869,700	$270	$1,134,000

***Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.**

Justification:

This project will provide additional capacity for current/future needs.





Project Number: CIP -WW-10

Planning Period: 2013 - 2018

Description: The Lobo Tunnel is an 8,000 foot 42" diameter tunnel to eliminate the 6000 GPM Lobo lift station.

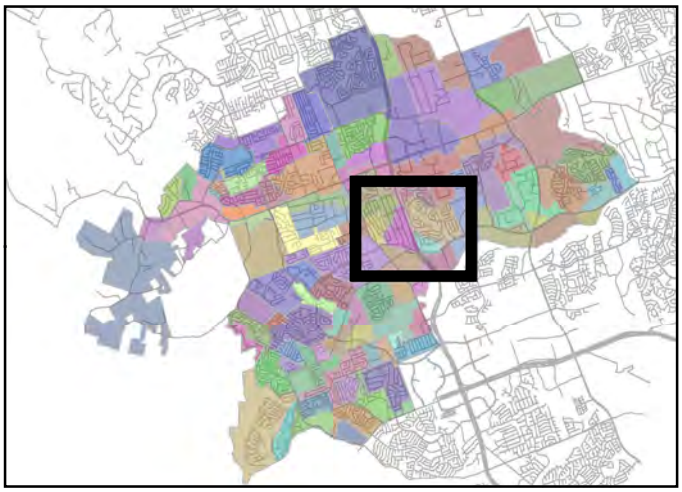
Planning Level Cost:

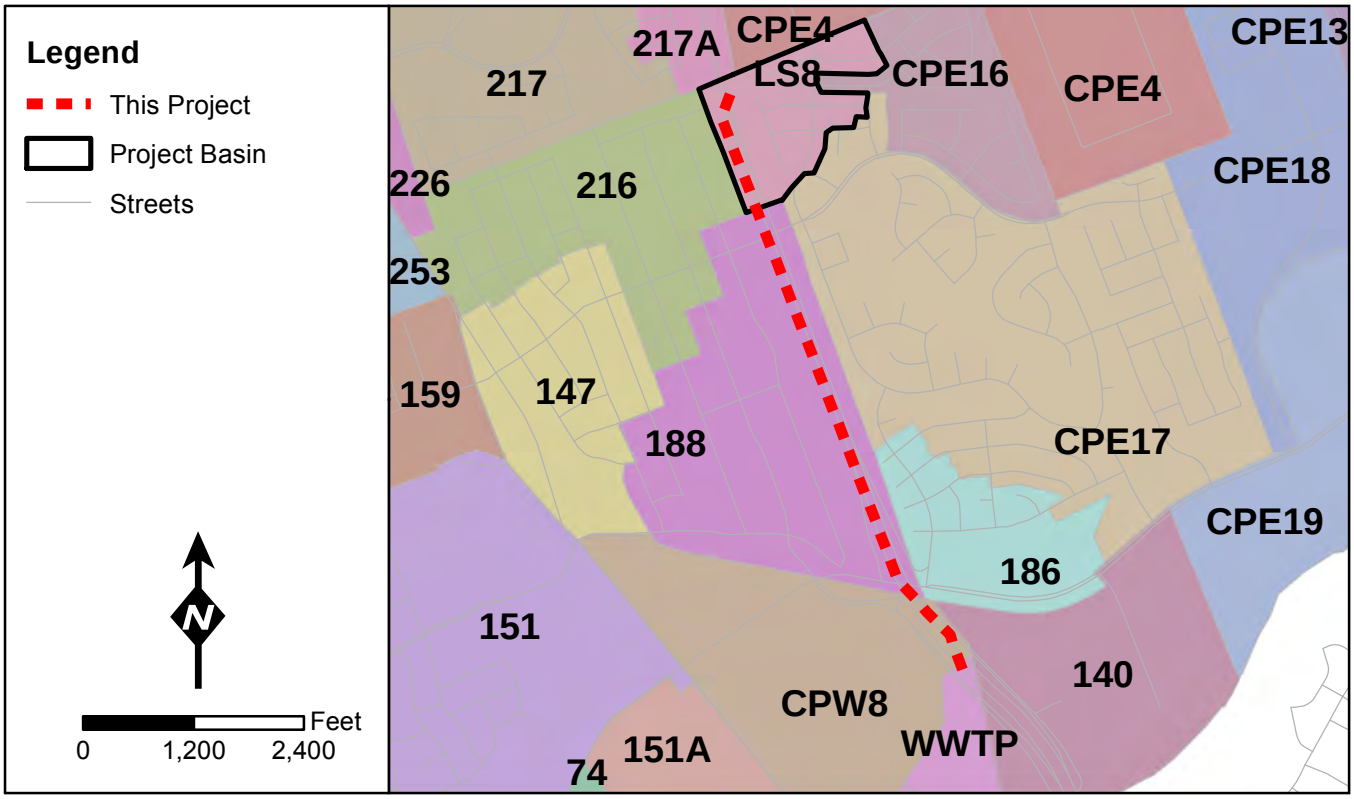
Project #	Diameter, in	Quantity, LF	Unit Price - Construction	Construction Cost	Unit Price - Project Cost	Project Cost*
WW-10	42	8,000	$813	$6,500,000	$1,028	$8,225,000

*** Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.**

Justification:

This project reduces maintenance and operation costs, and overflow liability by taking the Lobo lift station off line. The primary purpose of this project is to reduce potential sanitary sewer overflows (SSOs) at the existing Lobo lift station.



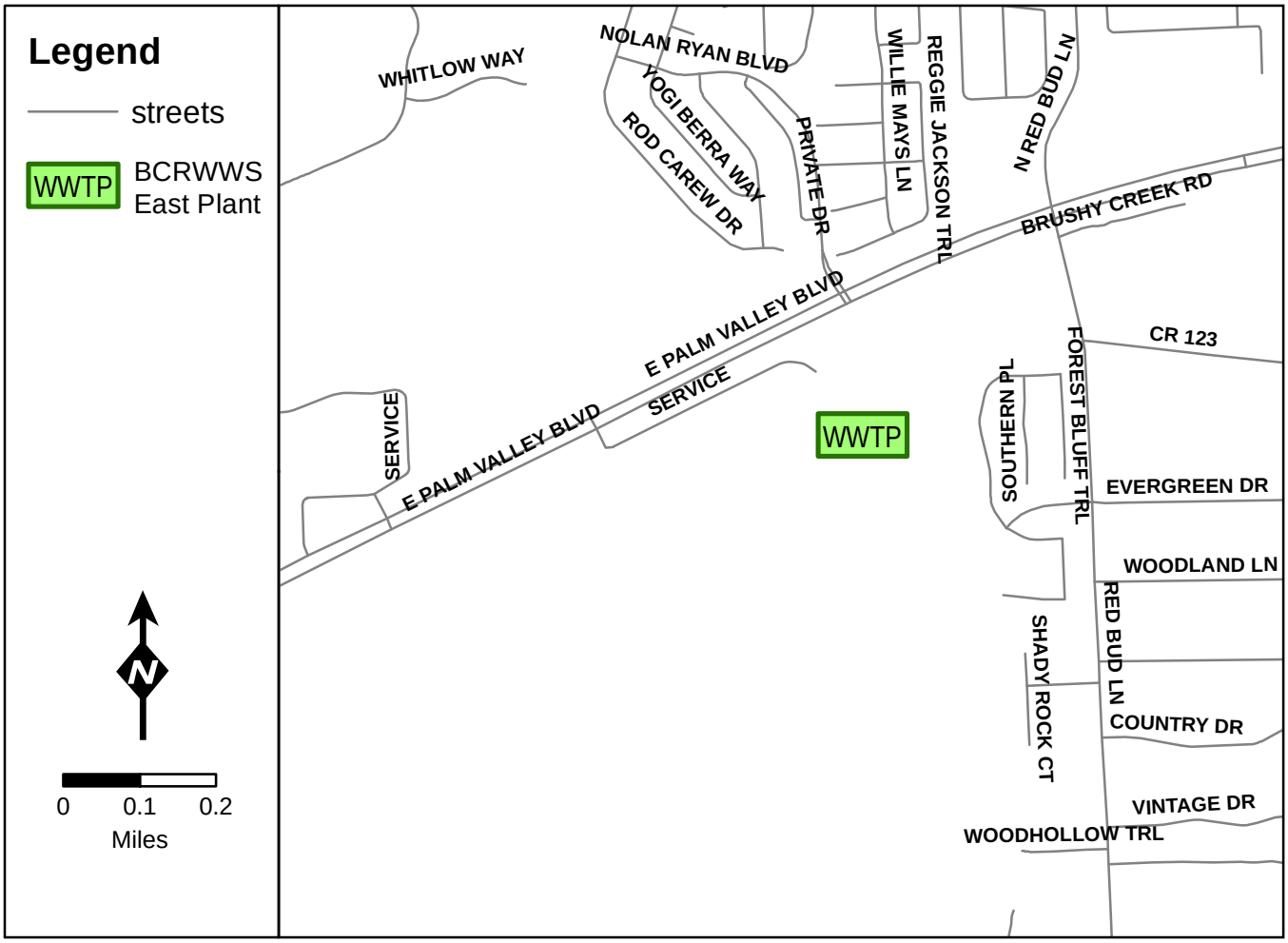


Project Number: CIP -WW-11

Planning Period: 2013-2018

Description: BCRWWS East Treatment Plant Re-rate Improvements

Planning Level Cost:

Project #	Description	Total Project Cost	Cedar Park Allocation	Cedar Park Project Cost
WW-11	BCRWWS East Plant re-rate improvements	$4,000,000	14.61%	$584,440

Justification: This project implements planned improvements to this interlocal facility.