City of Celina

2015 Wastewater Master Plan

STATE OF TEXAS
DORIAN FRENCH
40453
LICENSED
PROFESSIONAL ENGINEER

Brown & Gay Engineers, Inc.
F-1046

6·8·2015

June 2015

BROWN & GAY ENGINEERS

TBPE Registration No. F-1046

700 N. Pearl Street, Suite 2100
Dallas, Texas 75201
469-621-3200

EXECUTIVE SUMMARY

The City of Celina, Texas (City) is located primarily in the far northwest corner of Collin County, with portions of the City in northeast Denton County. The existing City limits encompass approximately 22 square miles. From 2000 to 2010, the U. S. Census population of Celina grew from 1,861 to 6,028 people, a 325 % increase. The ultimate build-out area is expected to be 77 square miles. This correlates to a projected population of 343,267 people.

The City currently collects and treats approximately 320,000 gallons of wastewater per day at the Downtown Wastewater Treatment plant (DWWTP), the only wastewater treatment plant (WWTP) in Celina. Almost all of the larger lot subdivisions utilize individual onsite sewage systems, such as septic and aerobic treatment systems. Other subdivisions that cannot use individual systems and most commercial properties use gravity lines and lift stations to transport wastewater to the DWWTP or to the Doe Branch Line (DBL). The DBL was constructed in 2009 to serve the Doe Branch basin and conveys wastewater to the Upper Trinity Regional Water District (UTRWD) for processing at their Riverbend WWTP.

The analysis and recommended capital improvements for the 2015 Wastewater Master Plan was split into two phases: Phase 1, 2015-2030 and Phase 2, Ultimate Build Out.

For Phase 1 improvements, a lift station is proposed to transfer flows from the Wilson Creek sewershed to the DBL in order to provide treatment to the planned subdivisions. This transfer should only be considered a temporary solution until a contract with North Texas Municipal Water District can be acquired to treat future flows. Additionally, improvements along the DBL to increase capacity will need to start between 2020 and 2025 depending on the timing and distribution of new developments in the Doe Branch and Wilson Creek sewersheds. Flow monitoring along the DBL is recommended to more accurately determine when improvements are needed.

For Phase 2 improvements, two additional WWTP are recommended. Little Elm WWTP is proposed to treat the north-west and central sewersheds: Clark Branch, Celina North, Celina City East, Celina City West, and Little Elm. Gravity lines were proposed to convey the wastewater flows to this WWTP. When the existing DWWTP is decommissioned, the flows should transfer downstream to the Little Elm WWTP. The Long Branch WWTP is proposed to treat the north-east sector sewersheds: Honey Creek East, Honey Creek West, Honey Creek South, Haw Branch, and Long Branch. A combination of gravity lines, lift stations, and force mains are recommended to convey wastewater flows to the treatment plant.

Table of Contents

Executive Summary

Section 1 General Information 1

1.1 Introduction 1
1.2 2003 Wastewater Master Plan 1
1.3 Changes Since 2003 2
1.4 Purpose and Scope 2

Section 2 Methodology 4

2.1 Planning Area 4
2.2 Service Areas 4
2.3 Regional Water Districts 4
2.3.1 Existing Agreement 5
2.4 Land Uses 5
2.5 Population 6
2.6 Design Flows 6
2.7 Projected Flows 7
2.7.1 Phase 1 – Flow Projections 7
2.7.2 Phase 2 – Ultimate Development 8
2.8 Design Criteria 8
2.8.1 Gravity Lines 8
2.8.2 Lift Stations and Force Mains 9
2.8.3 Wastewater Treatment 9

Section 3 Recommended Capital Improvements 10

3.1 General 10
3.1.1 Collection Lines 10
3.1.2 Lift Stations 10
3.1.3 Wastewater Treatment Plants 10
3.2 Phase 1 – 2015 to 2030 11
3.2.1 Wilson Creek Sewershed 11
3.2.2 Doe Branch Sewershed 12
3.2.3 Downtown Celina 13
3.3 Phase 2 – Ultimate Development 13
3.3.1 Wilson Creek Sewershed 13
3.3.2 Doe Branch Sewershed 13
3.3.3 Downtown 14
3.3.4 Little Elm Wastewater Treatment Plant 14
3.3.5 Long Branch Wastewater Treatment Plant 14
3.4 Land Acquisition and Easements 14
3.5 UTRWD Agreements 15

TABLES

Table 2-1 City of Frisco Land Use Summary (Adapted from Table 4-1, City of Frisco 2006 Comprehensive Plan) 5

Table 2-2 Average Number of People per Household (Adapted from the Community Facts from the 2010 U.S. Census) 6

Table 2-3 Average Daily Unit Flows 6

Table 2-4 DWU Wastewater Peaking Factors 7

Table 2-5 Total Projected Connections for Future Celina Developments 7

Table 2-6 Ultimate Development Wastewater Projections by Service Area 8

EXHIBITS

Exhibit 1 Wastewater System Map

Exhibit 2 Doe Branch Sewer Line Capacity Exceedance with Wilson Creek Transfer

APPENDIX

Table A1 Doe Branch Existing Sewer Capacity versus Projected Connections for Doe Branch Developments and Wilson Creek Transfer

Section 1
General Information

1.1 Introduction

The City of Celina, Texas (City) is located primarily in the far northwest corner of Collin County, with portions of the City in northeast Denton County. The existing City limits encompass approximately 22 square miles. From 2000 to 2010, the U. S. Census population of Celina grew from 1,861 to 6,028 people, a 325 % increase.

According to the City of Celina 2013 Comprehensive Plan, the ultimate build-out area is expected to be 78.5 square miles. However, a revised western boundary line to reflect the Pilot Point boundary agreement that was received in December 2013 after the Comprehensive Plan was adopted has reduced the ultimate build-out area to 77 square miles. This correlates to a projected population of 343,267 people.

The City currently collects and treats approximately 320,000 gallons of wastewater per day at the Downtown Wastewater Treatment plant (DWWTP). This is the only wastewater treatment plant (WWTP) in Celina. Almost all of the larger lot subdivisions (residential lots greater than one acre) utilize individual onsite sewage systems, such as septic and aerobic treatment systems. Other subdivisions that cannot use individual systems (residential lots less than one acre) and most commercial properties use gravity lines and lift stations to transport wastewater to the DWWTP or to the Doe Branch Line (DBL). The DBL was constructed in 2009 to serve the Doe Branch basin and conveys wastewater to the Upper Trinity Regional Water District (UTRWD) for processing at their Riverbend WWTP.

Several new subdivisions and retail and commercial businesses are being planned and will be constructed in the immediate future in Celina. This 2015 Wastewater Master Plan (2015 WWMP) will be used to determine how the existing and future wastewater systems will be managed for the City.

1.2 2003 Wastewater Master Plan

In 2003, a wastewater master plan was developed for the City, titled “2003 Wastewater Collection System Master Plan Report” (2003 WWMP). At that time, it was anticipated that the majority of the City’s future wastewater would be transported to regional treatment facilities outside of the City, and the existing treatment plant would be expanded to 2.0 million gallons per day (MGD). A temporary 6.0 MGD treatment plant was also proposed along Doe Branch, west of the projected Dallas North Tollway. The plan also included elimination of a number of existing lift stations, construction of new wastewater collection lines, and the construction of some additional lift stations.

The 2003 WWMP used a service area of 69,000 acres (108 square miles) and an estimated population of 335,000 at build-out. The recommendations and findings were used in preparing

the 2003 Capital Improvement Plan (CIP) and accompanying 2003-2013 Water and Wastewater Impact Fee Update, for calculating impact fees, which was completed in August 2003.

1.3 Changes Since 2003

There have been many changes and improvements to the City and its wastewater system since 2003. The strong population increases have been previously mentioned. Several large subdivisions have also been planned inside the City limits and in the extra territorial jurisdiction (ETJ). In addition, the DBL sewer line was constructed to serve approximately 12,000 acres in the southern area of the City. This line discharges into the UTRWD Doe Branch Phase II Interceptor, located at the intersection of Parvin and Good Hope in Denton County, where it is metered. According to design information provided from the UTRWD, the pipeline at the existing point of entry can handle a peak flow of 24 MGD.

In December of 2006, Celina became a participating member in the Northeast Regional Water Reclamation System which is owned and controlled by the UTRWD, for the purpose of treating wastewater. The contract between Celina and the UTRWD describes the terms and conditions whereby the UTRWD provides wastewater treatment for the flows in the DBL and other future lines in Celina.

On November 5, 2013, the UTRWD presented their plan to the City of Celina to construct the Doe Branch Wastewater Treatment Plant (DBWWTP), which is planned to be operational in late 2015. The City is currently evaluating the need to participate in this project at this time with the costs presented by UTRWD. The DBWWTP is proposed to be a 2 MGD initially, and serve Celina, Prosper, Mustang Special Utility District (Mustang) and Denton Fresh Water Supply District No. 10. Ultimate design is 5.225 MGD.

1.4 Purpose and Scope

The primary purpose of this report is to provide an update to the 2003 WWMP suitable for infrastructure planning and budgeting purposes. The 2015 Wastewater Master Plan (2015 WWMP) is expected to be utilized as the basis for the wastewater projects proposed for the 2015 Capital Improvement Program (CIP). Phase 1 analyzes the growth for the planned development, primarily south of Downtown, through 2030. Phase 2 considers the ultimate development for the extents of the City's wastewater collection system under complete build out.

The following steps outline the major scope items for this plan update:

- review of the 2003 WWMP
- review of changes to the wastewater system since 2003
- receive and analyze planned changes to the existing system from discussions with City staff
- evaluate the existing wastewater systems to determine flow capacity and potential capacity problems
- prepare a revised wastewater master plan map for ultimate development

- model future wastewater flows from the land use assumptions and population projections in the 2013 Comprehensive Plan
- provide preliminary sizes and facility recommendations for the CIP and the possible phasing for these improvements
- provide input for establishing revised wastewater impact fees

This information will be the guide for all future analysis and design of the wastewater system for the next ten years and for the ultimate build-out of all wastewater systems for the City.

Section 2
Methodology

2.1 Planning Area

The current ultimate growth boundary for Celina is 77 square miles, which includes the existing City limits, ETJ, and future City land that is based upon current and proposed boundary line agreements with adjacent cities. This boundary was obtained from the 2013 Comprehensive Plan and revised as mentioned in Section 1.1 of this report.

To accommodate adjacent gravity sewer, wastewater basins outside of the ultimate growth boundary were included in the planning area for this study. The planning area shown on Exhibit 1, the Wastewater System Map, is approximately 87.6 square miles.

2.2 Service Areas

It is important to note the difference between the definitions for service area and wastewater basins (sewershed). Sewersheds for each wastewater system were determined using the existing topography and natural drainage divides. Service areas may be smaller or larger than the sewershed due to collection systems that have been constructed or will be constructed with lift stations or deep gravity lines that cross natural basin divide lines.

Each sewershed boundary was based on 2-ft contour data purchased from the North Central Texas Council of Governments data base. ArcGIS software and ArcHydro tools from the software company ESRI were used to determine drainage divides based on this topography. Virtual walls, or boundaries, were created in the model at the downstream City limits to ensure all flow was captured. The same was done for most of the upstream end of the Little Elm Creek basin to reflect the assumption that the areas in Gunter will treat their own wastewater.

Exhibit 1 shows the wastewater planning area and service areas used in this report. The service areas were named to be generally consistent with the 2003 WWMP.

2.3 Regional Water Districts

The City is currently only contracted with the UTRWD, as discussed in Section 1.1, but has the opportunity to be served by both the North Texas Municipal Water District (NTMWD) and the UTRWD. The NTMWD currently serves 850,000 people in north central Texas for wastewater and operates four regional WWTPs. They also provide treated drinking water to over 1.5 million people in the 60 cities, towns, special utility districts, and water supply corporations. Currently they have communicated to Celina that they have no facilities or capacity to serve Celina with treated water or wastewater treatment until after 2021. It is highly recommended that for Celina to continue to work towards becoming a member of the NTMWD as soon they are allowed to join.

2.3.1 *Existing Agreement*

Celina currently has an agreement with the UTRWD for treatment of wastewater and supply of treated water. One entry point for wastewater is currently operational for the Doe Branch basin at the outlet of the DBL. According to the plan and profile sheet provided by UTRWD, this entry point is sized to receive a peak flow of 24 MGD.

Transfer of flows from other basins into the Doe Branch basin is not recommended as a long term plan because this entry point is already expected to be undersized for the ultimate flows from the Doe Branch basin. Celina has the option to consider additional WWTPs in the Little Elm Creek and Doe Branch basins if they choose to not add future additional flow to the UTRWD.

As development increases within the Doe Branch basin, UTRWD should be notified to ensure that this system will have adequate capacity. The City is required to update the UTRWD on items, such as future demands, on an annual basis per the agreement.

2.4 Land Uses

Land use data was collected from multiple sources to compile the input to the wastewater model. The first source is the current Zoning Map of the City of Celina, which shows existing zoning and planned developments. Anticipated future land uses were taken from the Future Land Use Plan exhibit in the 2013 Comprehensive Plan. Floodplain locations were input from the Collin and Denton County FEMA Digital Floodplain Maps (DFIRMs). The spatial data were overlaid and analyzed. If there was overlapping boundaries between future land use and existing zoning, the land use type that would result in the highest flow was chosen in the model. It was assumed that no development would occur in the floodplain.

These land uses include areas that are generally incidental to development such as parks and open space, public land, utilities, and right-of-way (ROW). The percentages of these uses were estimated based on existing land uses from the City of Frisco's 2006 Comprehensive Plan, as shown in Table 2-1.

Table 2-1 City of Frisco Land Use Summary (Adapted from Table 4-1, City of Frisco 2006 Comprehensive Plan)

Land Use	Percentage
Residential	45.6
Commercial	12.0
Parks and Open Space	5.6
Public	15.6
Utilities	0.2
Right-of-Way	21.0
Total	100.0

The land use densities for residential housing vary and are based on the existing land use taken from zoning files and ordinances, plats and construction plans. For future land uses of properties

that are not zoned or within existing planned developments, densities were calculated based on the 2013 Comprehensive Plan. Unit densities were applied to the land area remaining after parks and open space, public land, and utilities were deleted.

2.5 Population

Population densities for Celina are expected to change as more development occurs. The densities from the cities of Frisco and Plano were used to estimate the number of people per household at ultimate growth. Data from the 2010 U.S. Census was utilized to determine the average number of people per household, as shown in Table 2-2. It was assumed that single-family units would be equivalent to the census' owner-occupied units, while the multi-family units would be equivalent to the renter-occupied units. Population estimates were determined by multiplying the number of units by the number of people per household.

Table 2-2 Average Number of People per Household (Adapted from the Community Facts from the 2010 U.S. Census)

Average Household Size	Plano	Frisco	Average
Owner-occupied units (assumed for single-family)	2.8	3.1	3.0
Renter-occupied units (assumed for multi-family)	2.2	2.4	2.3

For this study, 3.0 people per household for single family and 2.3 people per household for multi-family were used for projecting the ultimate build-out numbers.

2.6 Design Flows

Average daily unit design flows vary depending on the land use. The unit flows shown in Table 2-3 include the design flows used to calculate average daily unit flows used in the 2015 WWMP.

Table 2-3 Average Daily Unit Flows

Land Use/ Flow Type	Unit Flow
Residential	102 Gal/Person/Day
Commercial, Industrial, and Public	1500 Gal/Ac/Day

Wastewater flows vary significantly throughout the day. Residential areas have two peaks, generally in the morning and evening, when people are most likely to be at home. Commercial areas generally peak during the lunch hour. Industrial and other uses can vary widely. The mathematical relationship between the peak flow and the average daily flow is called the peaking factor. Larger systems will have lower peaking factors than smaller systems due to greater storage and residence time in the system.

Ideally, flow monitoring would be used to determine the relationship between the peak flows and the average daily flow for each area of a wastewater system. No flow monitoring data was available so a standard peaking factor relationship was utilized.

There are numerous approaches to determining a peaking factor for wastewater flows. Per the request of the City of Celina, the Dallas Water Utilities (DWU) method was used for the 2015 WWMP. This method applies a peaking factor based on pipe size that varies from 3.0 to 4.0. The peaking factor is applied to the average daily flows, therefore infiltration and inflow is considered in the peaking factor. Table 2-4 below is from the DWU Design Manual.

Table 2-4 DWU Wastewater Peaking Factors

Pipe Size	Peaking Factor	Depth of Flow
Less than 18"	4.0	Full
18" thru 30"	3.5	Full
Larger Than 30"	3.0	Full

2.7 Projected Flows

2.7.1 *Phase 1 – Flow Projections*

Phase 1 Development consists of the estimated 15-year growth projections associated with the known platted and pending plat developments in the City. These Phase 1 Developments along with existing City flows were used to determine the recommended near term capital improvements. Future developments include Light Farms, Ownsby Farm, Swisher Tract, Carter Ranch, Hillwood, the Lakes at Mustang Ranch, Sutton Fields, Wellspring Estates, Creeks of Legacy, and the Parks at Wilson Creek.

Phasing site plans for the developments were not available when analyzing the system, only projected connections, therefore, an assumed phasing was used. For instance, when analyzing the capacity exceedance of the DBL, the number of connections at proposed tie-in locations was forecasted for years 2015 through 2020, then 2025 and 2030. This was done by using the projected connections listed in Table 2-5.

Table 2-5 Total Projected Connections for Future Celina Developments

Year	Carter Ranch	Light Farms	Creeks of Legacy	Ownsby Farm	Swisher Tract	Hillwood	Parks at Wilson Creek	Well-spring Estates	Lakes at Mustang Ranch	Sutton Fields	Other
2015	700	370	20	0	0	0	0	131	25	0	0
2016	863	610	64	25	0	50	0	131	25	64	136
2017	863	850	192	50	10	200	0	262	150	192	368
2018	863	1,090	320	100	20	400	0	262	300	334	480
2019	863	1,330	448	200	80	650	25	262	550	492	572
2020	863	1,480	570	397	80	750	50	262	700	684	570
2025	863	2,980	965	397	80	1,010	1,216	262	700	1,536	1,375
2030	863	3,185	1,031	397	80	1,010	1,993	262	1,661	1,795	1,661

2.7.2 *Phase 2 – Ultimate Development*

A summary of the service area sizes, estimated ultimate development populations, and flows is provided in Table 2-6. The total population of the planning area that would be served by the Celina wastewater system is estimated to be 343,267 people. This is equivalent to 6.2 people per acre, which is consistent with the average density of McKinney, Plano, and Frisco.

Table 2-6 Ultimate Development Wastewater Projections by Service Area

Service Area	Area (ac)	Population	Connections	Average Daily Flow (MGD)	Peak Daily Flow (MGD)
Doe Branch	12,548	77,798	25,933	7.94	23.81
Wilson Creek	5,047	31,291	10,430	3.19	11.17
UTRWD Entry Point Subtotal	***17,595***	***109,089***	***36,363***	***11.13***	***34.98***
Clark Branch	2,686	16,653	5,551	1.70	5.95
Celina North	5,260	32,612	10,871	3.33	11.64
Celina City East	4,239	26,282	8,761	2.68	8.04
Celina City West	5,690	35,276	11,759	3.60	10.79
Little Elm Creek	12,108	75,070	25,023	7.66	22.97
Little Elm WWTP Subtotal	***29,983***	***185,893***	***61,964***	***18.96***	***59.40***
Honey Creek East	1,294	8,023	2,674	0.82	2.86
Honey Creek West	1,431	8,872	2,957	0.90	3.17
Honey Creek South	505	3,131	1,044	0.32	1.28
Haw Branch	2,419	14,998	4,999	1.53	5.35
Long Branch	2,139	13,262	4,421	1.35	4.73
Long Branch WWTP Subtotal	***7,788***	***48,286***	***16,095***	***4.93***	***17.40***
Total	**55,366**	**343,267**	**114,422**	**35.01**	**111.77**

2.8 Design Criteria

Most of the area within Celina's ultimate growth boundary is not currently served by a public collection and wastewater treatment system. A significant amount of new system and improvements to the existing system will need to be constructed. At this time, very little information is available from the existing system for analysis and design. To aid in preparing the conceptual wastewater system design in the 2015 WWMP, the following design criteria will be utilized to estimate gravity line sizes, force main sizes, and other system elements.

2.8.1 *Gravity Lines*

All calculations were based on the assumption that the pipes will be installed at the minimum slope that will provide a velocity of 2.0 ft/sec with the pipe flowing full. This is the minimum pipe velocity per TCEQ's sanitary sewer pipe design requirements (Texas Administrative Code

Chapter 30 §217.53). Additionally, a Manning's roughness value of 0.013 was assumed for all pipes. The minimum allowable pipe size is 8 inches, per City of Celina design guidelines.

Collection pipes are commonly phased in two ways. One option is to build the smaller pipe and later replace it with a larger pipe. This is generally most feasible when there are significant space constraints or when the capacity of the pipes will need to be upgraded near the end of the pipe's life span. A second option is to build smaller parallel pipes. This often requires more space, but provides more flexibility for adding capacity with each new line.

2.8.2 *Lift Stations and Force Mains*

It was assumed that all lift stations will use wet wells with dual pumps, with each pump having the capacity to pump the peak daily flow. Force main pipe sizes were determined so that the velocity is greater than the TCEQ 3.0 ft/sec minimum, but less than the 6.0 ft/sec. A minimum force main pipe size of 6 inches will be used as the design criteria standard for Celina.

Typically, the wet well of a lift station should be built for the ultimate conditions volume, while the pump capacity can be increased through the addition of new pumps or by increasing the capacity of the pumps. As with the collection pipes, the capacity of the force mains can be phased by running parallel pipes, or by increasing the size of the force main.

2.8.3 *Wastewater Treatment*

WWTPs are typically constructed in phases to allow for increased demand. Several options are available, most of which involve adding parallel systems. This may involve parallel plants, or utilizing parallel systems within one larger plant. Upgrading an entire plant may be feasible if the time the service area takes to develop is about the same as the life span of the plant. Leasing package plants is also an option which can assist the City in leveraging their financial planning for capital projects.

The timing of constructing the WWTP should also be coordinated with the regional plans of the UTRWD. If they can provide an entry point when needed at a lower cost than a City owned WWTP, then consideration should be given to utilizing the UTRWD entry point.

Section 3
Recommended Capital Improvements

3.1 General

Celina's existing wastewater system covers a small area of the ultimate growth boundary. Due to its age and size, much of the existing system will need to be upgraded as development progresses. This represents both a challenge and an opportunity for Celina. The challenge is to construct a large and new wastewater system with a patchwork of early developments and their aging and inadequate infrastructure to handle future flows. The opportunity exists because the City is not hindered by an extensive, antiquated existing system that must be upgraded with limited options.

3.1.1 *Collection Lines*

The collection pipe sizes shown in Exhibit 1 are the ultimate build-out sizes and assume that a single pipe is run. Smaller parallel pipes may also be used (not shown), depending on the timing of development within each basin. If development proceeds at the densities expected, then most of the existing collection lines and systems will have to be increased in size to handle the increased flows. Consideration should always be given to increasing capacity as the system ages and must be rehabilitated or replaced.

3.1.2 *Lift Stations*

Due to the maintenance costs associated with lift stations, the number of permanent lift stations should be minimized. The timing, sequence of development, and construction of the gravity collection system may require that additional lift stations will be needed to accommodate areas that cannot be readily served by the gravity system. In some cases these lift stations can be abandoned as the gravity collection system is constructed, but some will become permanent. This is consistent with the ultimate build-out characteristics of the neighboring Plano and Frisco wastewater systems.

3.1.3 *Wastewater Treatment Plants*

Current philosophy regarding City-owned WWTPs is mixed and is based upon numerous factors. Short term treatment demands (2-20 years) and long term plans (21-50 years) may conflict. The ultimate location, design flows and costs will determine the final selected systems. It will be important for the City to remain flexible and adjust to the development demands and treatment plant options as they occur in the future.

Two new treatment plants are proposed. As mentioned above, all treatment plants will likely be done in phases, with incremental increases in capacity as demand increases. Wastewater demands and land requirements will have to be analyzed to ensure that each plant can achieve its ultimate capacity.

If Celina is going to construct and maintain the collection and treatment system for their land in Denton County, there will have to be some negotiation and agreement with the current Certificate of Convenience and Necessity (CCN) holder, Mustang Special Utility District. Mustang will have to release their CCN in Celina's boundaries, or be the provider of wastewater service.

For the 2015 WWMP, flows generated in the Mustang CCN sewershed areas that would flow along gravity lines to the Little Elm WWTP were included in the overall flow calculations. Additionally, the pending development Sutton Fields was also included.

3.2 Phase 1 – 2015 to 2030

3.2.1 *Wilson Creek Sewershed*

The Wilson Creek basin will require wastewater collection and treatment starting in 2016 based on the projected connections for the planned developments. There currently is no WWTP or access to regional gravity sewer; therefore, the City plans to transfer wastewater flows to the Doe Branch basin for Phase 1 development. Eventually Wilson Creek should transition to a NTMWD entry point for ultimate development. The Phase 2 recommendations are discussed further in Section 3.3.1.

3.2.1.1 Transfer to Doe Branch

The sewerline from the Parks at Wilson Creek to the Lakes at Mustang Ranch has been sized to accommodate ultimate development using the DWU peaking factor for design flows and TCEQ required minimum slopes. The eventual designed sewerline could be smaller depending on actual slopes for the pipe segments.

The sewer main that is under design for the Lakes of Mustang Ranch (Pacheco-Koch plans dated November 2014) is currently proposed to be a 20-inch gravity main, generally in Pebble Creek Dr., that flows to a lift station to convey the wastewater to the Doe Branch Basin. It is recommended that this portion of the pipeline be a 27-inch pipe at a minimum to accommodate ultimate flows.

The lift station and force main system design should include provisions to accommodate expansion to the 10 year flow projection of approximately 5 MGD firm capacity. The force main proposed to be approximately 1,300 feet should be a minimum 12-inch diameter pipe.

Transferring Wilson Creek wastewater flows to the Doe Branch basin should be considered a temporary option only because the Doe Branch sewer main is not sized to accommodate Wilson Creek flows and there is limited capacity in the Doe Branch Water Reclamation Plant (Further discussed in Section 3.2.2)

3.2.2 ***Doe Branch Sewershed***

3.2.2.1 Existing Sewer Main

The existing sewer main in the Doe Branch basin will become undersized as the projected connections tie into this line over the next 15 years. Eventually the entire line will need to be upgraded to accommodate ultimate development capacity. However, the location and timing of the Phase 1 developments will determine which segments need to be upgraded. The known developments and assumed tie-in locations are shown in Exhibit 2.

Using estimated wastewater flows from both the Doe Branch basin and the Wilson Creek basin transfer calculated with the DWU peaking factor, the Doe Branch sewer main is estimated to be out of capacity between 2024 and 2025, and will reach 75% capacity between 2021 and 2022. Planning and design of capacity expansion projects should begin when the segments reach 75% of capacity.

Additionally, begin a flow monitoring program by the end of 2015 for the Doe Branch sewer main and the Wilson Creek lift station once it is constructed. This will enable the City to better monitor capacity levels in the Doe Branch sewer main, as well as expansions to the Wilson Creek lift station.

Begin a program to increase the capacity of the Doe Branch sewer main system. As illustrated in Table A-1 in the appendix, certain sections will require expansion before others. An expansion program should prioritize the projects based on actual measured flows. Although those areas appear apparent in Table A-1, any new developments not included in this study will also have an impact. When the Wilson Creek wastewater flow is able to be removed from the Doe Branch sewer main, the expansion program can be amended or reduced. Although the program could not be eliminated completely, as the existing line is currently undersized for the ultimate development of the Doe Branch sewershed.

It is also recommended that the City require the Wilson Creek wastewater flows to outfall into the Doe Branch sewer main no further upstream than the reach of 27 inch pipeline as indicated by point 3B in the Exhibit 2.

3.2.2.2 Sutton Fields Development

The planned development Sutton Fields is located on the far southwest corner of the City's service area. About 60% of the development is located in the Doe Branch basin with the remaining portion in the Little Elm basin. Since there is no wastewater treatment service in the Little Elm basin, it is recommended that this development use a lift station to send all flow to Doe Branch and the UTRWD entry point on Parvin Rd.

The line sizes recommended by the developer will also accommodate the remaining area in the Little Elm subbasin that the development resides within. However, it is recommended that a lift station be constructed off FM-1385 to pump the flows from the northwest section of Sutton Fields to the Doe Branch basin. There is a 35ft difference in elevation between the proposed

Sutton Field lift station and the 12-inch gravity main, therefore using gravity lines to transfer this flow is not recommended.

3.2.3 ***Downtown Celina***

3.2.3.1 Downtown Wastewater Treatment Plant

The DWWTP will need to be expanded to handle future development within the basin, as well as development from the eastern basins that will be pumped to the DWWTP. Currently the average daily flow capacity of the plant is 0.5 MGD, with a peak capacity of 2.5 MGD. It is currently permitted at 0.95 MGD.

Ultimately, the existing plant will need to be expanded to accommodate an average daily flow of 5 MGD with a peak capacity of 12.5 MGD. This will likely be done in phases, with incremental increases in capacity as flow increases. This will also require a larger site of approximately 5 to 6 total acres.

If land for expansion is unavailable, or increasing the capacity of existing DWWTP is undesirable, then there is the option to send some or all of the basin's wastewater to the proposed City owned Little Elm WWTP.

3.3 Phase 2 – Ultimate Development

3.3.1 ***Wilson Creek Sewershed***

It is recommended that a permanent solution for Wilson Creek sewershed wastewater be determined as soon as possible. Although the NTMWD cannot serve the Wilson Creek basin until after 2021, a timeline for extending the District's gravity main to the City should be developed. Discussions should also be conducted with the UTRWD regarding the possibility of increased flows in the DBL. If neither the UTRWD not the NTMWD will contract to treat Wilson Creek flows, another alternative would be to construct a new WWTP in the basin.

To accommodate ultimate flows for Wilson Creek basin, negotiate with NTMWD to treat Wilson Creek's 3.2 MGD of wastewater. This alternative will also require constructing a gravity main from the corner of Pebble Creek Dr. and FM-1461. The line would most likely be micro tunneled east along FM-1461 to Custer Rd, then south along Custer Rd to connect with an NTMWD interceptor. This line should be sized to handle 11.2 MGD at peak flow.

At the time when Wilson Creek flows can be sent to NTMWD, the lift station on FM-1461 can be abandoned, as well as the sewer lines conveying flows to Doe Branch.

3.3.2 ***Doe Branch Sewershed***

In addition to the Phase 1 monitoring program to determine required improvements on the DBL discussed in Section 3.2.2, an additional 100,000 feet of gravity lines are recommended to service ultimate development in the basin. All of these lines will discharge to the UTRWD entry point.

3.3.3 *Downtown*

As development expands around Downtown Celina, the main sewer line running along Pecan, Texas and then Maple streets before reaching the DWWTP will need to be replaced. This line will be undersized when development north of Sunset Blvd begins.

3.3.4 *Little Elm Wastewater Treatment Plant*

The ArcHyrdo analysis in ArcGIS shows flows from Clark Branch, Celina North and Celina City West will all discharge into the Little Elm basin. Therefore for ultimate development, it is recommended that a WWTP be constructed on FM-1385 to treat 19.4 MGD of average daily flow generated in these basins. The 19.4 MGD also includes flows from the Celina City East basin should the Downtown WWTP be decommissioned.

The site proposed location for the Little Elm WWTP is within Denton County and will need to be negotiated due to the Mustang SUD's CCN currently covering that area. The proposed site is ideal as it will capture all of the wastewater flows generated on the northwest side of the City's service area. This will eliminate the need for additional entry points to UTRWD for treatment.

3.3.5 *Long Branch Wastewater Treatment Plant*

The Honey Creek East, Honey Creek West, Honey Creek South, Haw Branch and Long Branch all discharge along the western boundary of the City service area. For the ultimate development plan, it is recommended that the flows be pumped to a common WWTP located at the outlet of Long Branch.

Currently the only wastewater service in these five basins is Honey Creek South. The existing High Point Lift Station pumps the flows to Celina City East where is it continues by gravity lines to the DWWTP. When this lift station and force main reach 75% capacity, design for the Proposed Long Branch WWTP should begin.

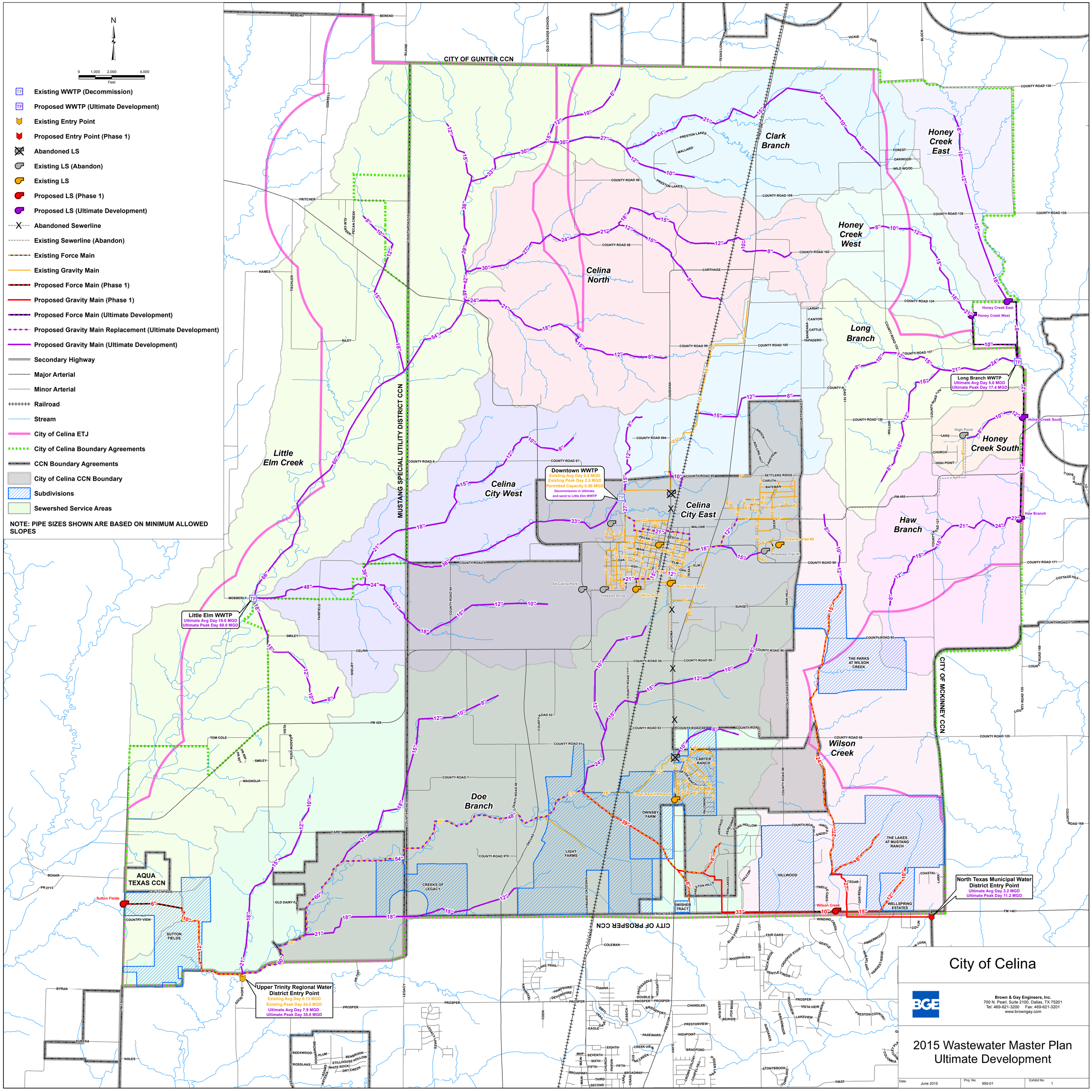
3.4 Land Acquisition and Easements

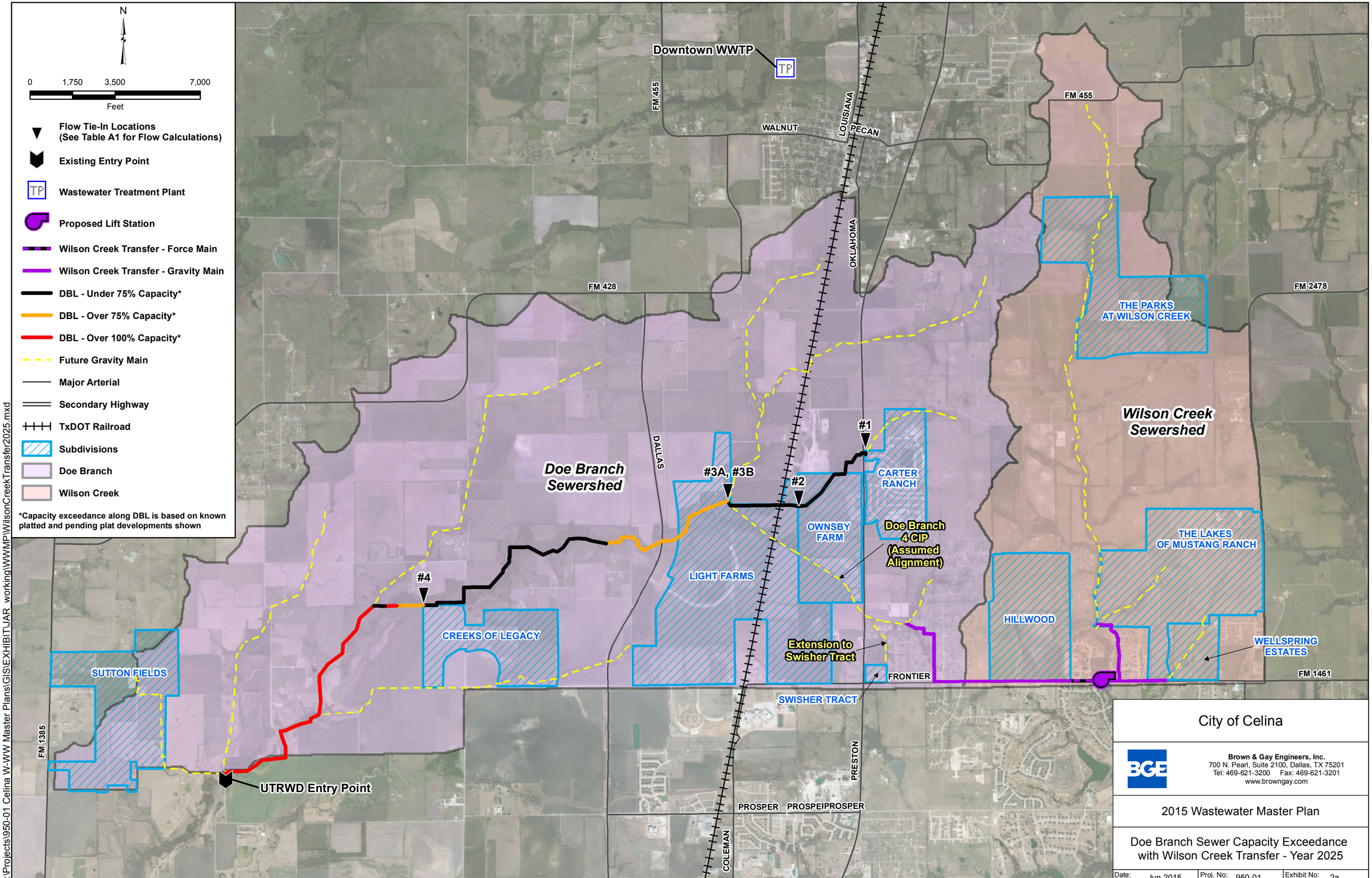
Utility easements need to be acquired as development occurs. Land needs to be located and planned for larger facilities, such as wastewater treatment plants and lift stations while it is still available and before development at these critical locations occur. Land owners and developers should be notified on the proposed locations of easements and land requirements as soon as they are identified. Easement and land acquisition must be a part of the development process, even if the development will not immediately be served by the wastewater system.

Easements should also include the space needed for the number of pipes to facilitate phasing ultimate flows or the ultimate pipe size, spacing between pipes, and construction and maintenance access. Cities prefer all facilities in exclusive easements dedicated only to the city. In certain cases, consideration should also be given to other utilities that may need to share the easement.

3.5 UTRWD Agreements

The approved plan will be transmitted to the UTRWD so that coordination can begin for the development of future facilities. A copy of this report should be delivered to the UTRWD after final approval by the City.


N
0 1,000 2,000 4,000
Feet
Existing WWTP (Decommission)
Proposed WWTP (Ultimate Development)
Existing Entry Point
Proposed Entry Point (Phase 1)
Abandoned LS
Existing LS (Abandon)
Existing LS
Proposed LS (Phase 1)
Proposed LS (Ultimate Development)
Abandoned Sewerline
Existing Sewerline (Abandon)
Existing Force Main
Existing Gravity Main
Proposed Force Main (Phase 1)
Proposed Gravity Main (Phase 1)
Proposed Force Main (Ultimate Development)
Proposed Gravity Main Replacement (Ultimate Development)
Proposed Gravity Main (Ultimate Development)
Secondary Highway
Major Arterial
Minor Arterial
Railroad
Stream
City of Celina ETJ
City of Celina Boundary Agreements
CCN Boundary Agreements
City of Celina CCN Boundary
Subdivisions
Sewershed Service Areas
NOTE: PIPE SIZES SHOWN ARE BASED ON MINIMUM ALLOWED SLOPES
CITY OF GUNTER CCN
MUSTANG SPECIAL UTILITY DISTRICT CCN
CITY OF MCKINNEY CCN
CITY OF PROSPER CCN
AQUA TEXAS CCN
Clark Branch
Honey Creek East
Honey Creek West
Celina North
Long Branch
Little Elm Creek
Celina City West
Celina City East
Honey Creek South
Haw Branch
Doe Branch
Wilson Creek
Downtown WWTP
Existing Avg Day 0.5 MGD
Existing Peak Day 2.5 MGD
Permitted Capacity 0.95 MGD
Decommission in Ultimate and send to Little Elm WWTP
Little Elm WWTP
Ultimate Avg Day 19.0 MGD
Ultimate Peak Day 60.0 MGD
Long Branch WWTP
Ultimate Avg Day 5.0 MGD
Ultimate Peak Day 17.4 MGD
Upper Trinity Regional Water District Entry Point
Existing Avg Day 0.13 MGD
Existing Peak Day 24.0 MGD
Ultimate Avg Day 7.9 MGD
Ultimate Peak Day 35.0 MGD
North Texas Municipal Water District Entry Point
Ultimate Avg Day 3.2 MGD
Ultimate Peak Day 11.2 MGD
Sutton Fields
Wilson Creek
Honey Creek East
Honey Creek West
Honey Creek South
Haw Branch
Shawnee Trail #2
Shawnee Trail #1
Business 298 #1
Winn Road
Tolleson Drive
Old Celina Park
Carter Ranch Phase II
THE PARKS AT WILSON CREEK
THE LAKES AT MUSTANG RANCH
CARTER RANCH
OWNSBY FARM
LIGHT FARMS
CREEKS OF LEGACY
SUTTON FIELDS
HILLWOOD
WELLSPRING ESTATES
SWISHER TRACT
City of Celina
Brown & Gay Engineers, Inc.
700 N. Pearl, Suite 2100, Dallas, TX 75201
Tel: 469-621-3200 Fax: 469-621-3201
www.browngay.com
2015 Wastewater Master Plan
Ultimate Development
Date: June 2015
Proj. No: 950-01
Exhibit No: 1



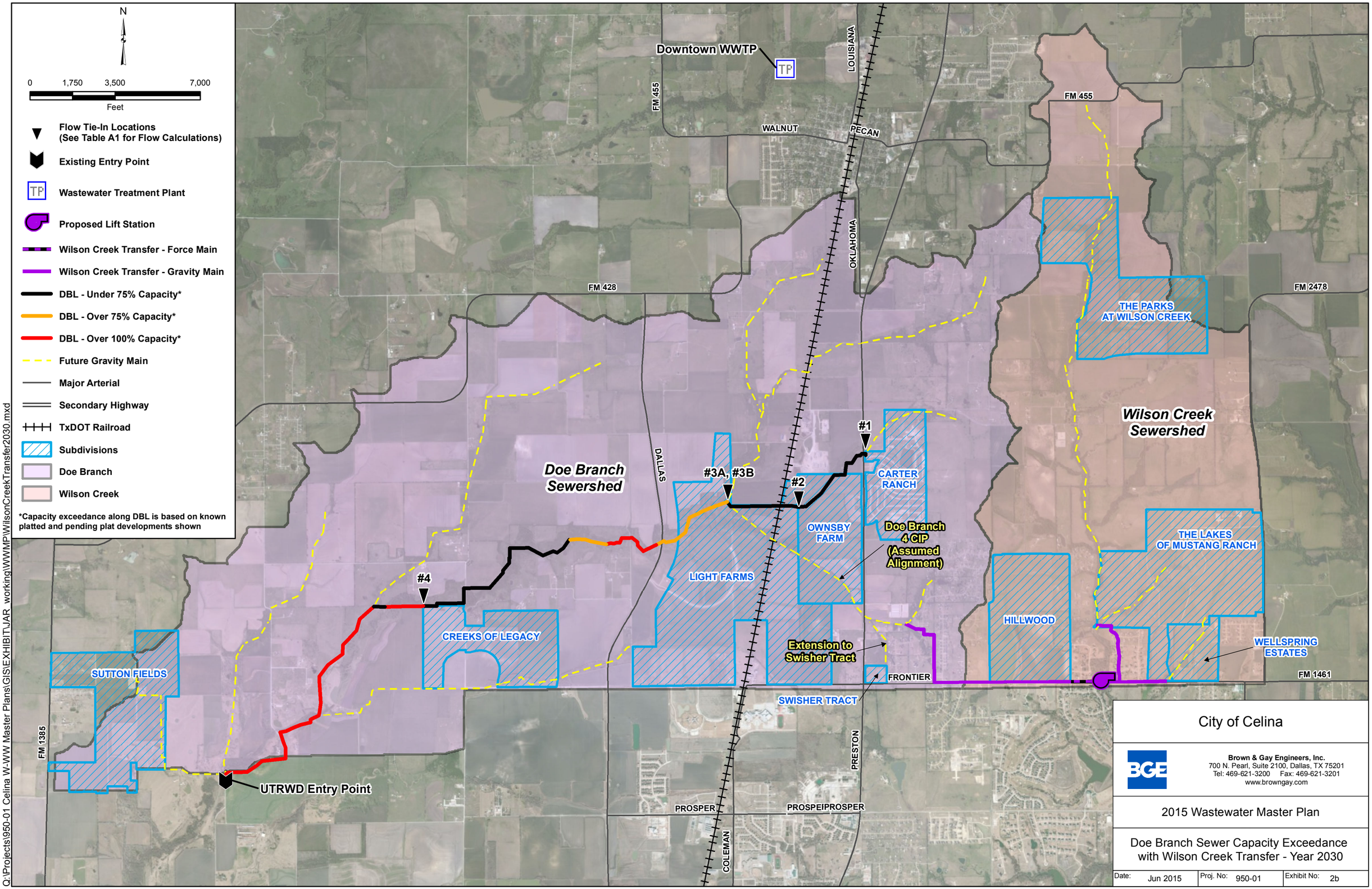
City of Celina

Brown & Gay Engineers, Inc.
700 N. Pearl, Suite 2100, Dallas, TX 75201
Tel: 469-621-3200 Fax: 469-621-3201
www.browngay.com

2015 Wastewater Master Plan

Doe Branch Sewer Capacity Exceedance with Wilson Creek Transfer - Year 2025

Date:	Jun 2015	Proj. No:	950-01	Exhibit No:	2a



Q:\Projects\950-01 Celina W-WW Master Plans\GIS\EXHIBIT\JAR_working\WWMP\WilsonCreekTransfer2030.mxd

City of Celina

Brown & Gay Engineers, Inc.
700 N. Pearl, Suite 2100, Dallas, TX 75201
Tel: 469-621-3200 Fax: 469-621-3201
www.browngay.com

2015 Wastewater Master Plan

Doe Branch Sewer Capacity Exceedance with Wilson Creek Transfer - Year 2030

Date:	Jun 2015	Proj. No:	950-01	Exhibit No:	2b

Table A-1a Doe Branch Existing Sewer Capacity versus Projected Connections for Doe Branch Developments Only
DWU Method for Estimating Flows

				2015					2016					2017					2018				
Tie In	Pipe Size	Slope	Full Flow Capacity (MGD)	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity
1	**15**	**0.25**	**2.20**	**700**	**4.0**	**0.86**	**0.86**	**39%**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**
	15	0.77	3.90				0.86	22%				1.06	27%				1.06	27%				1.06	27%
	15	0.80	4.00				0.86	21%				1.06	26%				1.06	26%				1.06	26%
2	**18**	**0.70**	**6.10**	**0**	**3.5**	**0.00**	**0.86**	**14%**	**25**	**3.5**	**0.03**	**1.08**	**18%**	**60**	**3.5**	**0.06**	**1.12**	**18%**	**120**	**3.5**	**0.13**	**1.18**	**19%**
	18	0.50	5.10				0.86	17%				1.08	21%				1.12	22%				1.18	23%
	18	0.75	6.30				0.86	14%				1.08	17%				1.12	18%				1.18	19%
	18	1.00	7.20				0.86	12%				1.08	15%				1.12	16%				1.18	16%
3	**27**	**0.30**	**11.70**	**370**	**3.5**	**0.40**	**1.25**	**11%**	**610**	**3.5**	**0.65**	**1.74**	**15%**	**850**	**3.5**	**0.91**	**2.03**	**17%**	**1090**	**3.5**	**1.17**	**2.35**	**20%**
	27	0.20	9.50				1.25	13%				1.74	18%				2.03	21%				2.35	25%
	30	0.20	12.60				1.25	10%				1.74	14%				2.03	16%				2.35	19%
	30	0.25	14.10				1.25	9%				1.74	12%				2.03	14%				2.35	17%
4	**30**	**0.20**	**12.60**	**20**	**3.5**	**0.02**	**1.27**	**10%**	**200**	**3.5**	**0.21**	**1.95**	**15%**	**560**	**3.5**	**0.60**	**2.63**	**21%**	**800**	**3.5**	**0.86**	**3.21**	**25%**
	30	0.18	12.00				1.27	11%				1.95	16%				2.63	22%				3.21	27%
	30	0.17	11.60				1.27	11%				1.95	17%				2.63	23%				3.21	28%
	30	0.61	22.10				1.27	6%				1.95	9%				2.63	12%				3.21	15%
	30	0.16	11.25				1.27	11%				1.95	17%				2.63	23%				3.21	29%
	36	0.06	11.25				1.27	11%				1.95	17%				2.63	23%				3.21	29%
Totals				**1,090**	**14.50**	**1.27**	**1.27**		**1,698**	**14.50**	**1.95**	**1.95**		**2,333**	**14.50**	**2.63**	**2.63**		**2,873**	**14.50**	**3.21**	**3.21**	

				2019					2020					2025					2030				
Tie In	Pipe Size	Slope	Full Flow Capacity (MGD)	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity
1	**15**	**0.25**	**2.20**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**
	15	0.77	3.90				1.06	27%				1.06	27%				1.06	27%				1.06	27%
	15	0.80	4.00				1.06	26%				1.06	26%				1.06	26%				1.06	26%
2	**18**	**0.70**	**6.10**	**280**	**3.5**	**0.30**	**1.36**	**22%**	**477**	**3.5**	**0.51**	**1.57**	**26%**	**580**	**3.5**	**0.62**	**1.68**	**27%**	**580**	**3.5**	**0.62**	**1.68**	**27%**
	18	0.50	5.10				1.36	27%				1.57	31%				1.68	33%				1.68	33%
	18	0.75	6.30				1.36	22%				1.57	25%				1.68	27%				1.68	27%
	18	1.00	7.20				1.36	19%				1.57	22%				1.68	23%				1.68	23%
3	**27**	**0.30**	**11.70**	**1330**	**3.5**	**1.42**	**2.78**	**24%**	**1480**	**3.5**	**1.59**	**3.15**	**27%**	**2980**	**3.5**	**3.19**	**4.87**	**42%**	**3185**	**3.5**	**3.41**	**5.09**	**43%**
	27	0.20	9.50				2.78	29%				3.15	33%				4.87	51%				5.09	54%
	30	0.20	12.60				2.78	22%				3.15	25%				4.87	39%				5.09	40%
	30	0.25	14.10				2.78	20%				3.15	22%				4.87	35%				5.09	36%
4	**30**	**0.20**	**12.60**	**1020**	**3.5**	**1.09**	**3.87**	**31%**	**1140**	**3.5**	**1.22**	**4.37**	**35%**	**2340**	**3.5**	**2.51**	**7.38**	**59%**	**2692**	**3.5**	**2.88**	**7.97**	**63%**
	30	0.18	12.00				3.87	32%				4.37	36%				7.38	61%				7.97	66%
	30	0.17	11.60				3.87	33%				4.37	38%				7.38	64%				7.97	69%
	30	0.61	22.10				3.87	18%				4.37	20%				7.38	33%				7.97	36%
	30	0.16	11.25				3.87	34%				4.37	39%				7.38	66%				7.97	71%
	36	0.06	11.25				3.87	34%				4.37	39%				7.38	66%				7.97	71%
Totals				**3,493**	**14.50**	**3.87**	**3.87**		**3,960**	**14.50**	**4.37**	**4.37**		**6,763**	**14.50**	**7.38**	**7.38**		**7,320**	**14.50**	**7.97**	**7.97**	

NOTES

1) Developments at each tie in are listed below

1 - Carter Ranch

2 - Ownsby Farms and Swisher Tract

3 - Light Farms

4 -Creeks at Legacy

2) Average Daily flows is based on Celina Master Plan of 3.0 people/household per at 102 gal/person/day

3) Estimated Peak Flow is based on the DWU Design Manual peaking factor

Table A-1b Doe Branch Existing Sewer Capacity versus Projected Connections for Doe Branch Developments and Wilson Creek Basin Transfer
DWU Method for Estimating Flows

				2015					2016					2017					2018				
Tie In	Pipe Size	Slope	Full Flow Capacity (MGD)	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity
1	**15**	**0.25**	**2.20**	**700**	**4.0**	**0.86**	**0.86**	**39%**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**
	15	0.77	3.90				0.86	22%				1.06	27%				1.06	27%				1.06	27%
	15	0.80	4.00				0.86	21%				1.06	26%				1.06	26%				1.06	26%
2	**18**	**0.70**	**6.10**	**0**	**3.5**	**0.00**	**0.86**	**14%**	**25**	**3.5**	**0.03**	**1.08**	**18%**	**60**	**3.5**	**0.06**	**1.12**	**18%**	**120**	**3.5**	**0.13**	**1.18**	**19%**
	18	0.50	5.10				0.86	17%				1.08	21%				1.12	22%				1.18	23%
	18	0.75	6.30				0.86	14%				1.08	17%				1.12	18%				1.18	19%
	18	1.00	7.20				0.86	12%				1.08	15%				1.12	16%				1.18	16%
3A	**27**	**0.30**	**11.70**	**370**	**3.5**	**0.40**	**1.25**	**11%**	**610**	**3.5**	**0.65**	**1.74**	**15%**	**850**	**3.5**	**0.91**	**2.03**	**17%**	**1090**	**3.5**	**1.17**	**2.35**	**20%**
3B				**0**	**3.5**	**0.00**	**1.25**	**11%**	**206**	**3.5**	**0.22**	**1.96**	**17%**	**612**	**3.5**	**0.66**	**2.69**	**23%**	**962**	**3.5**	**1.03**	**3.38**	**29%**
	27	0.20	9.50				1.25	13%				1.96	21%				2.69	28%				3.38	36%
	30	0.20	12.60				1.25	10%				1.96	16%				2.69	21%				3.38	27%
	30	0.25	14.10				1.25	9%				1.96	14%				2.69	19%				3.38	24%
4	**30**	**0.20**	**12.60**	**20**	**3.5**	**0.02**	**1.27**	**10%**	**200**	**3.5**	**0.21**	**2.17**	**17%**	**560**	**3.5**	**0.60**	**3.29**	**26%**	**800**	**3.5**	**0.86**	**4.24**	**34%**
	30	0.18	12.00				1.27	11%				2.17	18%				3.29	27%				4.24	35%
	30	0.17	11.60				1.27	11%				2.17	19%				3.29	28%				4.24	37%
	30	0.61	22.10				1.27	6%				2.17	10%				3.29	15%				4.24	19%
	30	0.16	11.25				1.27	11%				2.17	19%				3.29	29%				4.24	38%
	36	0.06	11.25				1.27	11%				2.17	19%				3.29	29%				4.24	38%
Totals				**1,090**	**18.00**	**1.27**	**1.27**		**1,904**	**18.00**	**2.17**	**2.17**		**2,945**	**18.00**	**3.29**	**3.29**		**3,835**	**18.00**	**4.24**	**4.24**	

				2019					2020					2025					2030				
Tie In	Pipe Size	Slope	Full Flow Capacity (MGD)	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity	Projected Connections	DWU Peaking Factor	Added Peak Flow (MGD)	Cumulative Peak Flow (MGD)	Percent Capacity
1	**15**	**0.25**	**2.20**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**	**863**	**4.0**	**1.06**	**1.06**	**48%**
	15	0.77	3.90				1.06	27%				1.06	27%				1.06	27%				1.06	27%
	15	0.80	4.00				1.06	26%				1.06	26%				1.06	26%				1.06	26%
2	**18**	**0.70**	**6.10**	**280**	**3.5**	**0.30**	**1.36**	**22%**	**477**	**3.5**	**0.51**	**1.57**	**26%**	**580**	**3.5**	**0.62**	**1.68**	**27%**	**580**	**3.5**	**0.62**	**1.68**	**27%**
	18	0.50	5.10				1.36	27%				1.57	31%				1.68	33%				1.68	33%
	18	0.75	6.30				1.36	22%				1.57	25%				1.68	27%				1.68	27%
	18	1.00	7.20				1.36	19%				1.57	22%				1.68	23%				1.68	23%
3A	**27**	**0.30**	**11.70**	**1330**	**3.5**	**1.42**	**2.78**	**24%**	**1480**	**3.5**	**1.59**	**3.15**	**27%**	**2980**	**3.5**	**3.19**	**4.87**	**42%**	**3185**	**3.5**	**3.41**	**5.09**	**43%**
3B				**1487**	**3.5**	**1.59**	**4.37**	**37%**	**1762**	**3.5**	**1.89**	**5.04**	**43%**	**4148**	**3.5**	**4.44**	**9.31**	**80%**	**4925**	**3.5**	**5.27**	**10.36**	**89%**
	27	0.20	9.50				4.37	46%				5.04	53%				9.31	98%				10.36	109%
	30	0.20	12.60				4.37	35%				5.04	40%				9.31	74%				10.36	82%
	30	0.25	14.10				4.37	31%				5.04	36%				9.31	66%				10.36	73%
4	**30**	**0.20**	**12.60**	**1020**	**3.5**	**1.09**	**5.47**	**43%**	**1140**	**3.5**	**1.22**	**6.26**	**50%**	**2340**	**3.5**	**2.51**	**11.82**	**94%**	**2692**	**3.5**	**2.88**	**13.25**	**105%**
	30	0.18	12.00				5.47	46%				6.26	52%				11.82	98%				13.25	110%
	30	0.17	11.60				5.47	47%				6.26	54%				11.82	102%				13.25	114%
	30	0.61	22.10				5.47	25%				6.26	28%				11.82	53%				13.25	60%
	30	0.16	11.25				5.47	49%				6.26	56%				11.82	105%				13.25	118%
	36	0.06	11.25				5.47	49%				6.26	56%				11.82	105%				13.25	118%
Totals				**4,980**	**18.00**	**5.47**	**5.47**		**5,722**	**18.00**	**6.26**	**6.26**		**10,911**	**18.00**	**11.82**	**11.82**		**12,245**	**18.00**	**13.25**	**13.25**	

NOTES

1) Developments at each tie in are listed below

1 - Carter Ranch

2 - Ownsby Farms and Swisher Tract

3A - Light Farms

3B - Wilson Creek Basin Transfer: Parks and Wilson Creek, Lakes at Mustang Ranch, Wellspring Estates, and Hillwood Estates

4 -Creeks at Legacy

2) Average Daily flows is based on Celina Master Plan of 3.0 people/household per at 102 gal/person/day

3) Estimated Peak Flow is based on the DWU Design Manual peaking factor