CITY OF PFLUGERVILLE

RECLAIMED WATER MASTER PLAN

January 2015

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Project Number: 20101249

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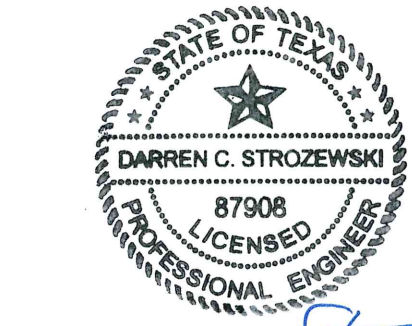

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Section 1
Introduction and Background

Public water supplies are treated to satisfy the requirements for potable use. However, potable use (drinking, cooking, bathing, laundry, and dishwashing) represents only a fraction of the total daily use of treated potable water. The remainder is primarily used for irrigation or other non-potable water uses and may not require water of potable quality.

Within the past few decades, planning for future potable water supplies has become an increasing concern for utilities nationwide. With the growth of communities and rapidly shrinking supplies of potable water, many utilities are looking to alternative sources of water to adequately plan for their future. Reclaimed water use has become a method many utilities are employing to manage treated wastewater and provide a new water supply to supplement and offset the demands on the potable water systems. For many municipalities, reclaimed water has become a key resource to provide sustainable water supplies to meet these future planning requirements. This Reclaimed Water Master Plan discusses opportunities for substituting reclaimed water for potable water supplies where potable water quality is not required.

1.1 TCEQ - USE OF RECLAIMED WATER

The use of reclaimed water in the State of Texas is governed by the Texas Commission on Environmental Quality's (TCEQ) Chapter 210 "Use of Reclaimed Water" regulations. The regulations establish general requirements, quality criteria, design and operational requirements for the beneficial use of reclaimed water which may be substituted for potable water and/or raw water. Under these regulations, the use of reclaimed water is permissible only if the use occurs after the wastewater has been treated in accordance with the facility's wastewater permit and the permit provides for an alternative means of disposal during times when there is no demand for use of reclaimed water.

Chapter 210 regulations outline the general requirements for the production, conveyance and use of reclaimed water which include storage, irrigation practices, and special design criteria for reclaimed water systems. Authorization for the use of reclaimed water applied to an area of land for irrigation requires determination and documentation of typical irrigation demands for the proposed use based on the type of vegetation and land area to be irrigated. These are most

commonly demonstrated with a project specific water balance to ensure that reclaimed water overflow, crop stress, and undesirable soil contamination by salts does not occur. In general, the regulations provide for two types of reclaimed water use with differing quality parameters as outlined in Table 1.1.

Table 1.1: Quality Standards for Using Reclaimed Water

Type I	
BOD_5 or $CBOD_5$	5 mg/L
Turbidity	3 NTU
Fecal Coliform (colony forming)	20 FC/100 ml (Geometric Mean)
Fecal Coliform (not to exceed)	75 FC/100 ml (Single Grab Sample)
Type II (Other than pond system)	
BOD_5	20 mg/L
or $CBOD_5$	15 mg/L
Turbidity	No standard for Type II
Fecal Coliform (colony forming)	200 FC/100 ml (Geometric Mean)
Fecal Coliform (not to exceed)	800 FC/100 ml (Single Grab sample)
Type II (Pond system)	
BOD_5	30 mg/L BOD
Turbidity	No standard for Type II
Fecal Coliform (colony forming)	200 FC/100 ml (Geometric Mean)
Fecal Coliform (not to exceed)	800 FC/100 ml (Single Grab sample)
* Values in Table are based on 30 day average unless otherwise noted.	

TCEQ 30 TAC §210.33 - Use of Reclaimed Water Regulations

Type I reclaimed water use is allowed for unrestricted areas where the public may come into contact with the reclaimed water and may also be used for any Type II use. The uses for Type I reclaimed water include, but are not limited to, the following:

- Irrigation of residences.
- Irrigation of public areas such as parks, school playgrounds, athletic fields, and golf courses with unrestricted access.
- Fire protection, either in internal sprinkler systems or external fire hydrants.
- Irrigation of food crops where the water may have direct contact with the edible part of the crop.
- Irrigation of pastures for milking animals.
- Toilet or urinal flushing.
- Maintenance of impoundments of natural water bodies where recreational activities such as wading and fishing are anticipated.
- Other similar activities where there is potential for unintentional human exposure.

Type II reclaimed water may only be used in restricted areas and where the public is unlikely to come into contact with the reclaimed water, or is applied in such a way to eliminate contact with the public (i.e. at night). The uses for Type II reclaimed water include, but are not limited to the following:

- Irrigation of sod farms and silviculture.
- Irrigation of limited access highway rights of way and roadway medians.
- Golf courses, cemeteries, and landscape areas surrounding commercial or industrial complexes as long as the area is not used by the public during irrigation operations, the irrigation site is bordered by walls or fences and access to the site is controlled.
- Irrigation of food crops where the water is not likely to have direct contact with the edible part of the crops.
- Irrigation of animal feed crops other than pastures for milking animals.
- Maintenance of impoundments or natural water bodies where direct human contact is not likely.
- Soil compaction or dust control in construction areas where application procedures minimize aerosol drift to public areas.
- Cooling tower makeup water.
- Irrigation or other non-potable uses where human access is restricted or unlikely to occur.

A summary comparison of the uses of reclaimed water and their quality requirements for various uses is presented in Table 1.2.

Table 1.2: Summary of Suitable Uses of Reclaimed Water

Reclaimed Water Use	Type I	Type II
Irrigation		
Unrestricted Public Access	✓	
Restricted Public Access	✓	✓
Impoundments		
Non-restricted Recreational	✓	
Restricted Recreational	✓	✓
Other Uses		
Toilet Flushing	✓	
Laundries	✓	
Air Conditioning and Industrial Cooling Towers	✓	
Industrial Processes w/Exposure to Workers	✓	
Industrial Cooling without Aerosols	✓	✓
Industrial Processes without Exposure to Workers	✓	✓
Fire Fighting	✓	
Construction Uses	✓	✓
Washing, Yards, Lots & Sidewalks	✓	
Supply for Decorative Fountains	✓	

Based on TCEQ Chapter 210 Use of Reclaimed Water Regulations

1.2 TCEQ - GENERAL REQUIREMENTS FOR RECLAIMED WATER

Type I and Type II reclaimed water systems have similar conveyance, storage, and special design criteria requirements. The general supplemental requirements are listed by category below. The conveyance requirements for reclaimed water include the following:

- Reclaimed water piping shall be separated from potable water piping by a horizontal distance of at least nine feet.
- Piping to be separated from parallel sewer lines a horizontal distance of three feet (outside to outside) with the reclaimed line at the level or above the sewer line.
- Pipe crossing a sewer line shall be centered over the sewer main such that the joints of the reclaimed waterline are equidistant and at least nine feet horizontally from the centerline of the sewer main.
- Piping shall be at least two feet above the sewer main or 18-inches above a pressure rated sewer main.
- Gravity flow reclaimed waterlines need to maintain fluid velocity to mitigate solids deposition.

The two dominant forms of reclaimed water storage include open surface ponds and storage tanks. Storage tanks are commonly used for cooling towers, industrial uses, fire protection, city irrigation, and other urban reclaimed water uses where land is limited. All ground level and elevated storage tanks are required to be designed, installed, and constructed in accordance to current American Water Works Association (AWWA) standards. Open surface pond storage is common in rural areas and is typically used for irrigation. The storage requirements for pond systems include the following:

- Storage ponds must prevent discharge into waters of the state, except for discharges due to rainfall events.
- Ponds shall not be located within the floodway.
- Ponds must be lined with at least 24-inches of soil or a 40 mils thick liner; both which must meet a permeability of less than 1×10^{-4} cm/sec.
- Certification of the ponds shall be furnished by a Texas Registered Professional Engineer.
- In addition, ponds may be enforced by further regulations if located in a vulnerable area as defined by "Ground-Water Pollution Potential – General, Municipal, and Industrial Sources" (DRASTIC) map defined in: 30 TAC §210.23(c). (The City of Pflugerville (City) and its extra territorial jurisdiction are not located within any of the vulnerable locations listed and therefore not restricted by further regulations).

General design requirements for reclaimed water include the following:

- All exposed piping and piping within buildings must be either purple pipe or painted purple; exposed piping should be stenciled in white with a warning reading "NON-POTABLE-WATER".
- All bibs and faucets are to be painted purple and designed to prevent connection to a standard water hose, additional vaults or locking tools to prevent unauthorized access are required.
- Eight inch by eight inch warning signs above taps stating "Reclaimed Water, Do Not Drink" in both English and Spanish are required.
- All reclaimed pipe shall be identified in specifications with approval by the American Society for Testing and Materials, American National Standard Institute, or AWWA.
- Design of distribution systems to convey reclaimed water to a user shall be submitted to the Executive Director and must receive approval.

The City of Austin (COA) has adopted Reclaimed Water planning and design criteria that can be found under Section 2 of the COA Utilities Criteria Manual (UCM). The section outlines construction plan information, submittal requirements and design specifics for reclaimed water services. It is recommended that the City consider formally adopting the COA UCM as standards for designing a system and producing construction drawings or plan to develop their own criteria. The manual particularly focuses on the distribution and system hydraulics. Also, it provides checklist items, design points, and other specifics for reclaimed water systems. Water quality should be dictated by wastewater treatment and water treatment specific design criteria. The overall design shall be verified to comply with TCEQ regulations.

Section 2
Reclaimed Water Supply

The City currently treats all of its wastewater at the Central Wastewater Treatment Facility (WWTF) located in the southeastern portion of the Upper Gilleland Creek drainage basin. The Central WWTF operates under a phased permit with phased average daily flow capacities of 4.40 mgd, 5.30 mgd, and 5.85 mgd. The facility currently operates at approximately 3.50 mgd and has the capacity to treat 5.85 mgd without any additional changes to the plant processes or equipment sizing.

2.1 AVAILABLE FLOWS ANALYSIS

As per the City Wastewater Master Plan, and Capital Improvements Plan the Central WWTF will be expanded to 9.0 mgd in the future to treat wastewater from portions of the Wilbarger drainage basin until approximately 2034. There are optional plans available for providing future wastewater treatment capacity to the east in the Wilbarger or Cottonwood drainage basins. Reclaimed water produced from these future wastewater treatment facilities should be evaluated independently at that time.

The City's Wastewater Master Plan indicates that the Central WWTF flows are predicted to increase over time as shown in Table 2.1. However, when a new WWTF is installed in the Wilbarger or Cottonwood drainage basin, a portion of the Central WWTF flows will be diverted to the new facility. At that time, it is estimated that the flow at the Central WWTF will be reduced to approximately 4.50 mgd. Figure 2.1 shows the projected treatment facility capacities as outlined in the City's Wastewater Master Plan.

In order to take advantage of any reclaimed water opportunities, the reclaimed water infrastructure should be planned prior to the development of potential users in the proposed service area. Based on the current and projected flows from the Central WWTF, there is a significant volume of water that could be reclaimed and used in applications such as: cooling towers, industrial processing, irrigation, and fire protection.

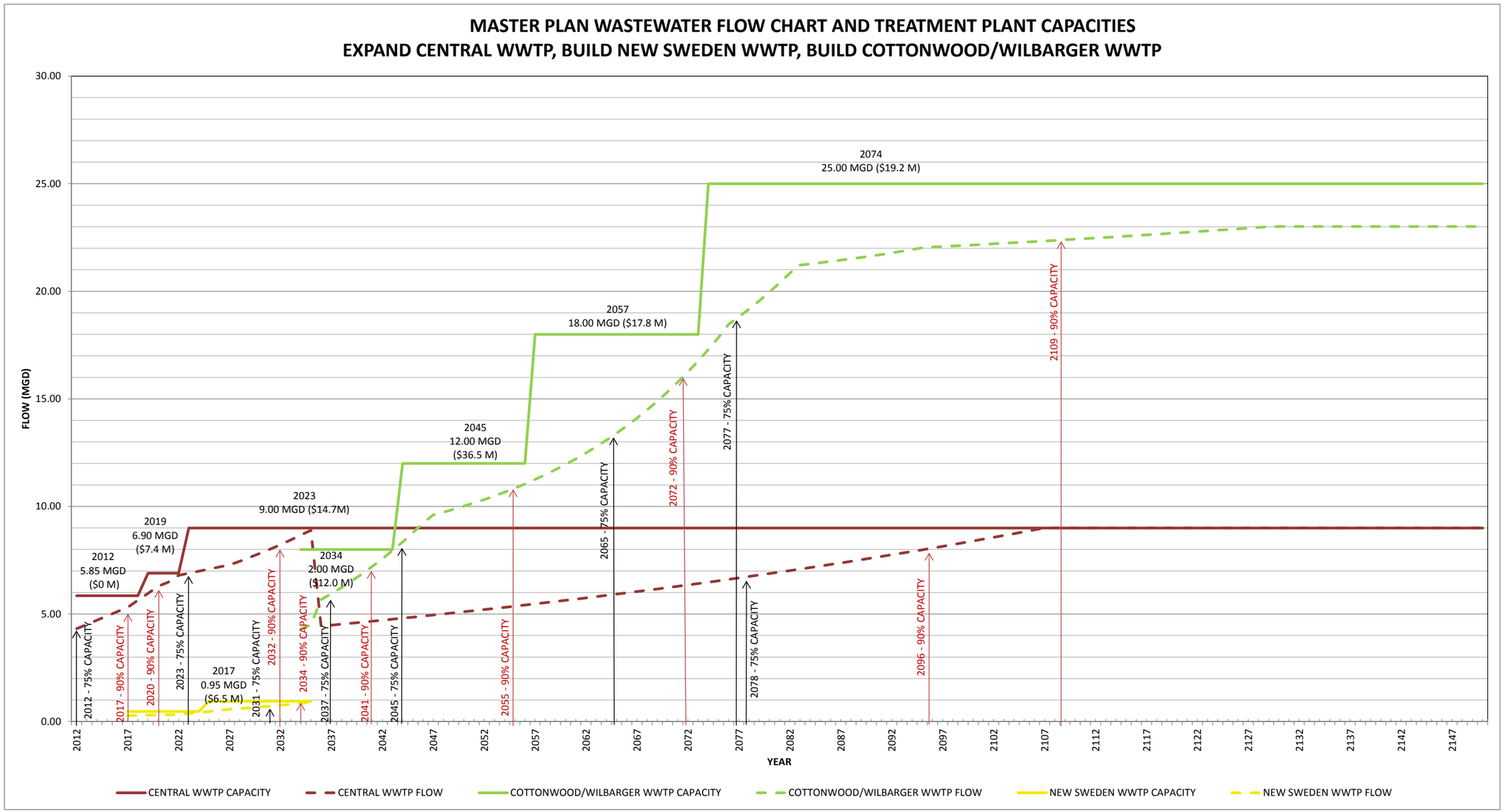


Exhibit 4.1 from the City of Pflugerville Wastewater Master Plan

Figure 2.1 – Projected WWTF Capacities

2.2 DIURNAL FLOWS

One of the obstacles in developing a reclaimed water system is balancing the demand for water with the limited and variable supply produced by a wastewater treatment facility. The flows demanded from the reclaimed water system are rarely constant and will vary significantly over a 24-hour period. Furthermore, the reclaimed water demands will fluctuate and vary greatly depending on the type of use and time of year. For example, typical irrigation demands are highest at night during the summer months when the air is cooler and the irrigation is most efficient. However, cooling tower makeup water usage is highest during the day when cooling demands are the greatest. When all demands are combined, the individual peaks are usually diminished, and collectively they create the overall demand diurnal curve.

Table 2.1 – Central WWTF Flow Projections

Planning Period	Central WWTF Wastewater Flow (mgd)
Existing	3.50
5-year	5.31
10-year	6.80
15-year	7.28
Ultimate	9.00

Since the reclaimed water supply is from a WWTF, the supply is also variable. The water that flows through a treatment facility will fluctuate throughout the day and the trend generally follows the non-irrigation domestic demand and use of potable water. Wastewater flows will often times have two peaks with a crest in the morning and lower flows through the day and then another peak in the evening before tailing off during the night time hours. The graph in Figure 2.2 shows the Central WWTF's diurnal curve that was used for modeling of the effluent flows from the City's WWTF. This curve was developed by evaluating the chart recordings from the Central WWTF on week days during dry weather conditions. It should be noted here that flow patterns on weekends are significantly different than week days.

In order to balance the supply and demand cycles, storage will be needed to store effluent during high effluent flows and then make that water available when flows through the WWTF are lower. The amount of storage capacity will be affected by the percentage of the total effluent that the City desires to utilize as reclaimed water and the actual reclaimed water user demands.

Potential demand uses and their associated diurnal curves will be discussed further in Sections 3 through 6, and the anticipated sizing and phasing of the proposed storage will be discussed further in Section 8.

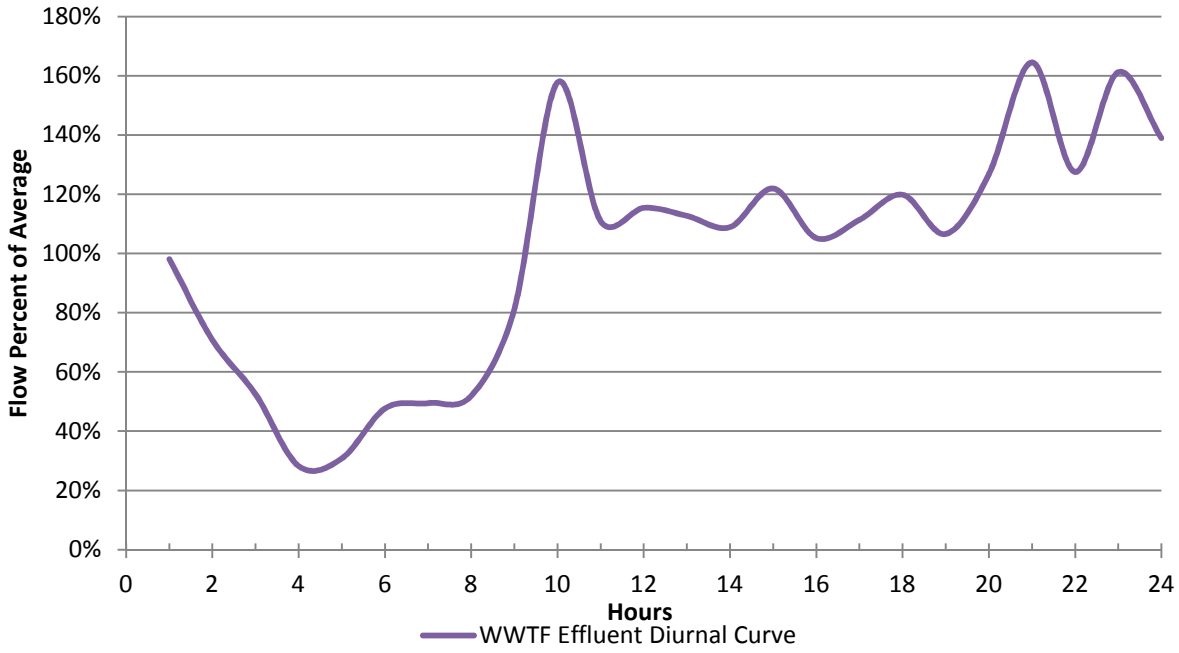


Figure 2.2 – Central WWTF Effluent Diurnal Curve

2.3 WATER QUALITY CONSTITUENTS

The reclaimed water use will generally dictate the type of treatment (Type I vs. Type II) that is needed from the WWTF. The only current user of reclaimed water from the City is the Travis County Northeast Metro Park (NEMP), who currently uses water from the Central WWTF to irrigate their athletic fields. Irrigation at a facility such as this typically requires the lower quality, Type II reclaimed water. The effluent from the Central WWTF currently meets the criteria for Type I water which will allow the City to evaluate other options for reclaimed water use. However, there are some constituents in the treated effluent that will need to be considered on a case by case basis.

In general, there are two constituents in the effluent from the Central WWTF that may affect the potential uses of the reclaimed water. The first constituent is the concentration of nutrients in the water. Treated effluent typically has a higher concentration of nitrogen and

phosphorus than potable water sources. This can be good for irrigation of crops, but can cause problems in certain industrial uses. The other constituent is the Total Dissolved Solids (TDS) which is a measure of the total concentration of dissolved minerals, salts, and metals that are present in the water. Water that is high in TDS can cause problems when it is used for irrigation if the minerals and salts are not regularly and adequately leached down through the soil.

Calcium and Magnesium are the two most common TDS constituents that when measured constitute the "hardness" of the water. Hard water is more common in ground water sources as compared to surface water sources such as lakes and rivers that are predominately fed by rainwater runoff. TDS measurements in the Pflugerville system can be seen in Figure 2.3. The figure shows the average TDS measurements for the Central WWTF (influent, effluent, and upstream and downstream of the discharge point in the Upper Gilleland Creek). As seen in the figure, the average effluent measurement at the plant was over 1,100 mg/L before the new water treatment plant was placed into service. Since then, the WWTF effluent has averaged approximately 800 mg/L over the past five years. Although, there has been a marked reduction in TDS, it is still relatively high for use as irrigation water in soils with high clay content.

The primary source of water for Pflugerville is now surface water from the Lower Colorado River Authority (LCRA) which has a TDS concentration of approximately 350 mg/L. This indicates that there is a 450 mg/L increase in TDS between the water treatment plant and the wastewater plant discharge. Significant sources of TDS addition include: blending of groundwater from Pflugerville and Manville water customers, chemicals added as part of the wastewater treatment, and water softening systems that use a salt brine to regenerate the softening systems.

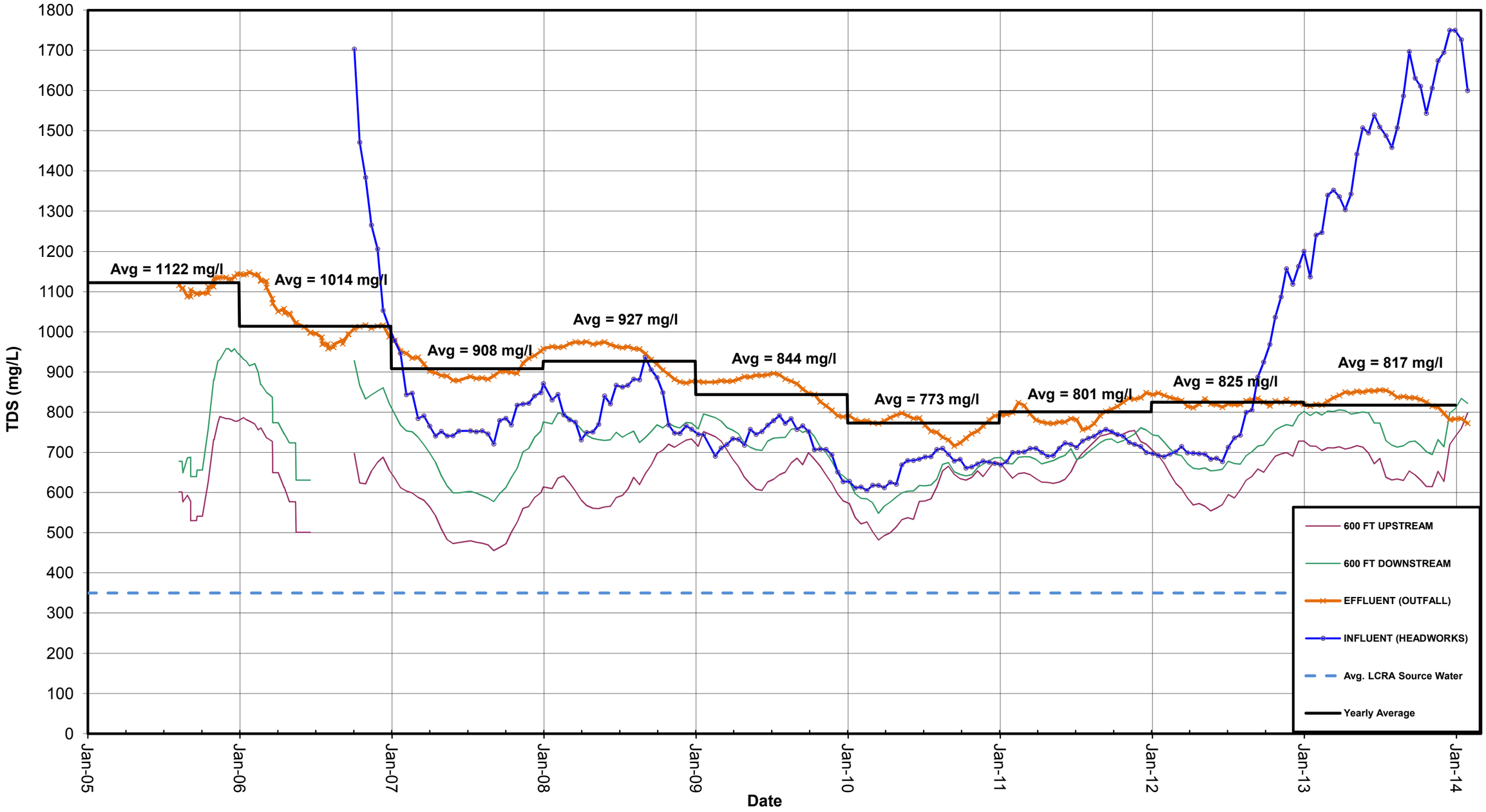


Figure 2.3 - Average TDS measurements at the Central WWTF

Section 3
Reclaimed Water Demand

3.1 EXISTING RECLAIMED WATER DEMAND

The City of Pflugerville obtained Chapter 210 authorization for use of reclaimed water from the Central WWTP on July 18, 2000 to irrigate NEMP with Type I and Type II reclaimed water. The authorization specifies that effluent from the Central WWTP could be used for irrigating NEMP in two phases. The first phase supplied Type II water to the park for grass establishment and growth during construction of the park. The second phase was and is currently supplying Type I water to the same area for irrigating athletic fields and landscaped areas. The water is used to irrigate Bermuda grass, trees and landscaping. A copy of the Chapter 210 authorization is included in Appendix A.

NEMP currently irrigates approximately 36 acres of athletic fields and miscellaneous green space with an average application rate of 1.0-inch per week. Overall, the park is largely undeveloped as only about 10 to 15 percent of the park's 398 acres is improved. As the park continues to develop, the need for more reclaimed water will increase. Historical water use by the NEMP is shown in Figures 3.1 and 3.2, and has averaged approximately 0.167 mgd since 2004. As shown in the Figures, usage increases during the summer months, with monthly averages reaching 0.37 mgd and maximum daily usage over 1.0 mgd.

Since obtaining authorization to use reclaimed water, the City has been able to consistently deliver Type I water to the NEMP using the plant's tertiary treatment and disinfection systems.

The NEMP reclaimed water system is automated so that reclaimed water is supplied on demand to the NEMP without communication with City staff. The existing system is comprised of two groups of facilities with one group located on the WWTF site and the other located at the park. The facilities at the plant are comprised of one reuse basin, three vertical turbine pumps with at total capacity of 1,200 gpm, a pump control panel, one 20,000 gallon hydropneumatic tank, an air compressor with control panel, a magmeter to record flow, a 10-inch reclaimed water pipeline rated at 200 psi dedicated to the park, and water sample ports. The facilities at the park are comprised of the continuation of the 10-inch pipeline, three water storage ponds at the soccer

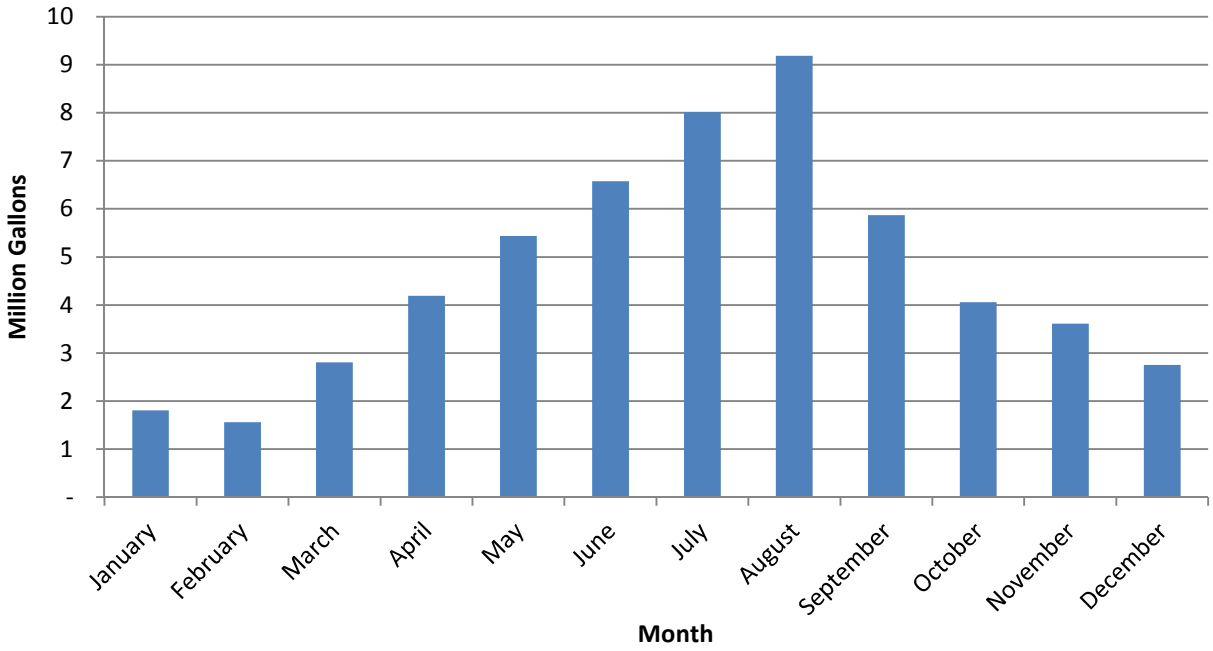


Figure 3.1: NEMP Reclaimed Water Use — Average Water Used per Month

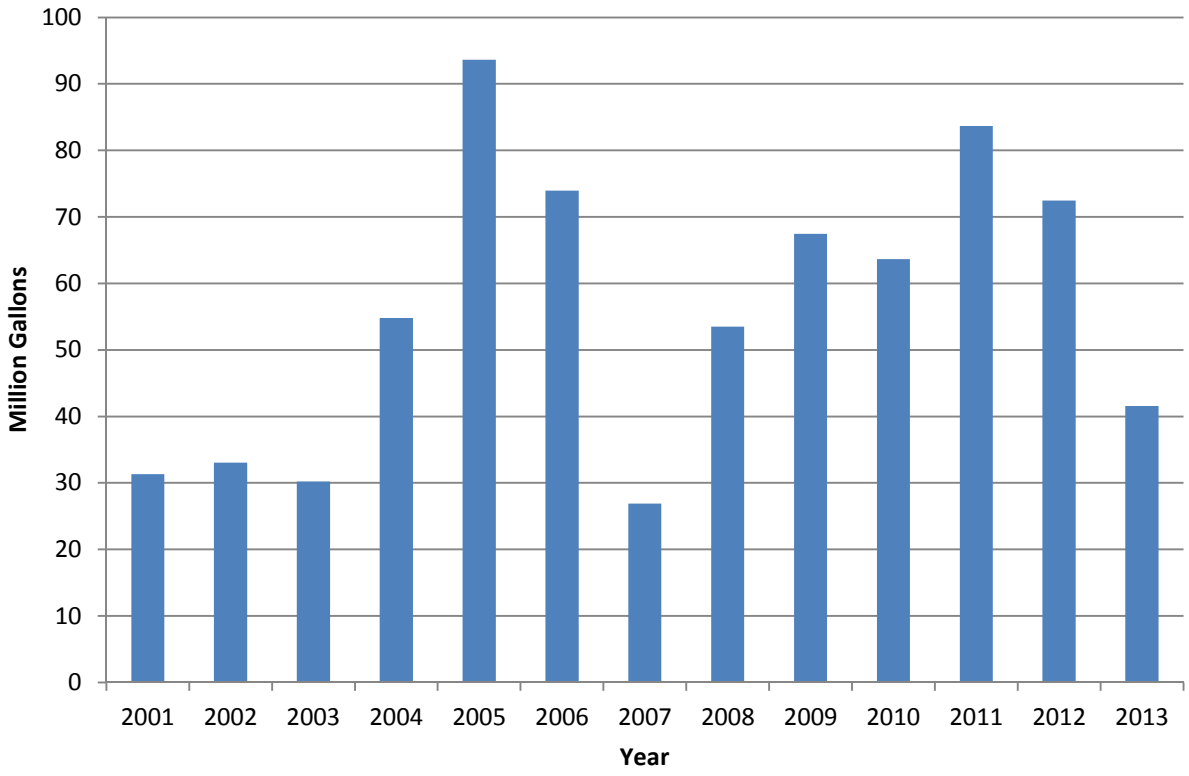


Figure 3.2: NEMP Reclaimed Water Use —Total Water Used Per Year

fields with an automated control valve, one water storage pond at the baseball fields with an automated control valve, pond level switches, and two irrigation pumping stations. The irrigation pumping stations are operated and maintained by the park.

The water is pumped out of the reuse basin at the plant, which does not provide any storage capacity. Instead the pump control panel is programmed such that water can be pumped up to a maximum of 1,200 gpm (1.7 mgd) from the plant as long as the flow through the plant equals or exceeds the quantity at the requested time of pumping. With this programming, the maximum amount of water can automatically be pumped out of the plant at any given time without adversely impacting plant operations. The pumps are turned on when a pressure drop is sensed in the pipeline due to one or both automated valves opening at the storage ponds in the park. Upon filling the ponds, the valves are programmed to close until the pond requests more water based on a predetermined level setting. A chlorine residual of 1.0 mg/L is required in the water when it leaves the plant site, but can be as high as 4.0 mg/L. However, by the time the water reaches the fields, after being discharged into the holding ponds and then broadcast sprayed onto the athletic fields, chlorine residual levels are very likely well below 1.0 mg/L.

In April 2000, the City and County entered into an Interlocal Cooperation Agreement (ICA) for supplying reclaimed water to the NEMP (Appendix B). As part of this agreement, the County agreed to pay for the construction of the upgraded reclaimed water system and, upon construction completion, would turn them over to the City to operate and maintain for perpetuity. The cost to cover operation and maintenance was set at $0.05 per 1,000 gallons of reclaimed water in the original agreement. However, it was found that the City's actual operation and maintenance costs were $0.24 per 1,000 gallons of reclaimed water. In January 2006, the City and County signed the First Amendment to the ICA which raised the cost per 1,000 gallons to be $0.24 and also included a provision for this cost to be recalculated on a yearly basis to reflect changing costs as experienced by the City. This Amendment is also included in Appendix B.

3.2 SERVICE AREA

The efficient implementation of a reclaimed water distribution system should include the identification of potential users with characterization of the type and quantity of water required. A reclaimed water system planning workshop was conducted with the City's Public Works staff

to develop short and long term goals and expectations for the Reclaimed Water System. Ultimately, the City would like to be able to reuse up to one half to two thirds of the effluent produced from the Central WWTF (i.e. 4.5 mgd to 6.0 mgd).

Due to the added cost of building infrastructure in previously developed areas, the City has indicated that they would prefer to target potential large reclaimed water users in currently undeveloped areas as close as possible to the Central WWTF. Other than NEMP, there are no potential large volume customers currently developed near the treatment facility. However, there are a number of open tracts of land that could be developed with high demands of reclaimed water. Figure 3.3 shows the area along SH 130 and East Pecan Street that have been identified as the proposed initial service area.

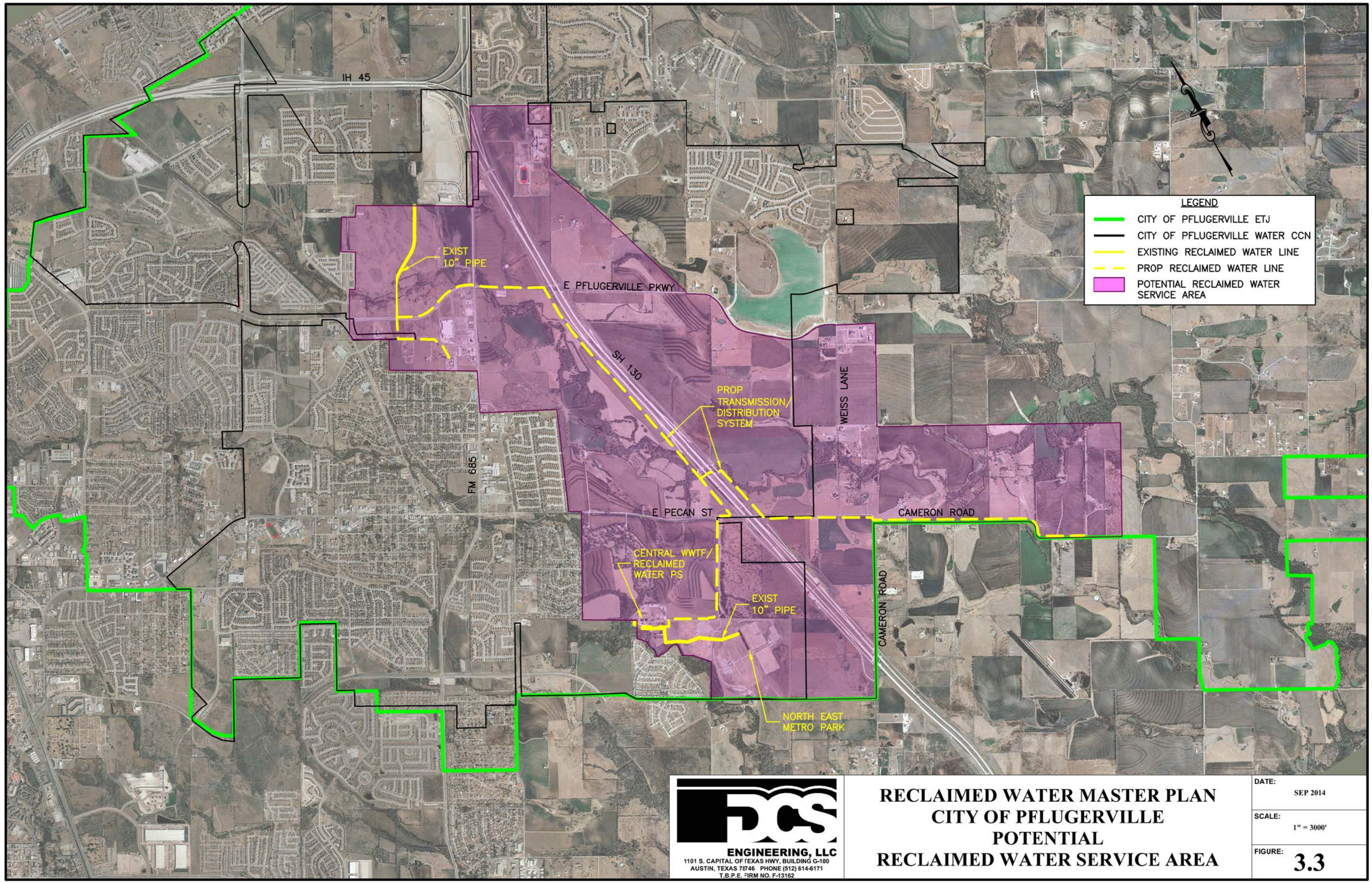
The City has also invested in a short segment of reclaimed water pipeline along Pfluger Farm Lane in anticipation of an extension of the reclaimed water system to the Pflugerville Parkway west of SH 130. It is understood that the properties along Pfluger Farm Lane will likely be developed as light industrial and commercial with one tract potentially being developed as a data center. It is anticipated that the properties adjacent to SH 130 will most likely be developed as commercial, and the properties to the East of SH 130 along Pecan Street and Cameron Road have the potential of being developed as light industrial. Each of these developable areas have the potential for reclaimed water use.

3.3 POTENTIAL HIGH DEMAND RECLAIMED WATER USES

With the anticipated development and growth of the City along the SH 130 corridor, there are three types of reclaimed water markets that will be targeted with the development of the system: irrigation, cooling tower makeup water, and industrial usage. Each of these have the potential to for significant reclaimed water demands, and incorporating a balanced mix of uses in the ultimate system will allow for a more efficient use of the reclaimed water. Each of these uses will be discussed in more detail in subsequent sections of the plan.

3.4 POTABLE REUSE

Advancements in wastewater treatment technology has led to treated effluent that is of a higher quality than many raw water sources for potable water systems. With the severe drought in the past few years, a limited number of communities in Texas have started using reclaimed



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RECLAIMED WATER MASTER PLAN
CITY OF PFLUGERVILLE
POTENTIAL
RECLAIMED WATER SERVICE AREA

DATE: SEP 2014

SCALE: 1" = 3000'

FIGURE: 3.3

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water as a potable water source (i.e. direct or indirect reuse). Some of these systems recycle their water indirectly by discharging the treated effluent back to a natural water body upstream of their water intake. This creates a buffer between the discharge point and the intake for the potable water system (i.e. indirect reuse). Some municipalities have eliminated the natural barrier and are treating the effluent through reverse osmosis (RO) filters before mixing it directly with other raw source waters (i.e. direct reuse).

Indirect reuse is not recommended at this time for Pflugerville, however it may be considered as a potential use in the future if other sources of water are not available. Indirect reuse at this time could only be used on a limited basis due to the high concentration of TDS in the water. If too much is recycled back to the potable system, the overall TDS level in Lake Pflugerville could rise above EPA drinking water standards. Discharging the treated effluent upstream of the lake would also require special permitting and water rights negotiations with TCEQ and/or LCRA.

Direct reuse is also not recommended at this time. The direct reuse systems that have been approved by TCEQ have been in communities that have been hit the hardest with drought and have little or no other alternatives for a potable water source. It should be noted here that for Pflugerville, one of the benefits of a TCEQ required RO treatment system is that it would remove the TDS from the treated effluent. However, the City would then need to find a means to dispose of the highly concentrated waste stream from the RO system (i.e. a brine solution). Currently, common methods of disposal include evaporation, for small systems in arid regions, and deep well injection into underground aquifers to prevent contamination of other aquifers containing potable water.

Due to the high costs that would be associated with direct and indirect potable reuse, it is recommended that the City look for opportunities to offset their potable water demand by developing a reclaimed water system that serves high volume water users that do not require potable water quality before considering a potable reuse alternative.

Section 4
Reclaimed Water for Irrigation

The first and often times most common, use for reclaimed water is irrigation. As discussed previously, NEMP already utilizes reclaimed water to irrigate the athletic fields in their facility adjacent to the Central WWTF. As development continues along SH 130, there will be opportunities to increase the amount of water used for irrigation.

Irrigation usage is seasonal with peak usage in the summer and little to no usage during the winter months depending on the type of crop/turf that is being irrigated. Since irrigation water is typically applied during the cooler hours at night, the peak demand is in the early hours of the morning when the supply (treated wastewater effluent) is the lowest. Figure 4.1 shows the typical demand curve for irrigation vs. the typical supply curve over a 24 hour period assuming average demands are one half of the available supply. In order to efficiently utilize reclaimed water for irrigation, a large volume of storage is required to offset the supply/demand balance. For example, if the average flow through the treatment plant was 9.0 mgd and the average demand for irrigation water was 4.5 mgd (50% treated effluent utilization), a usable storage volume of approximately 1.2 million gallons would be required to balance the supply and demand.

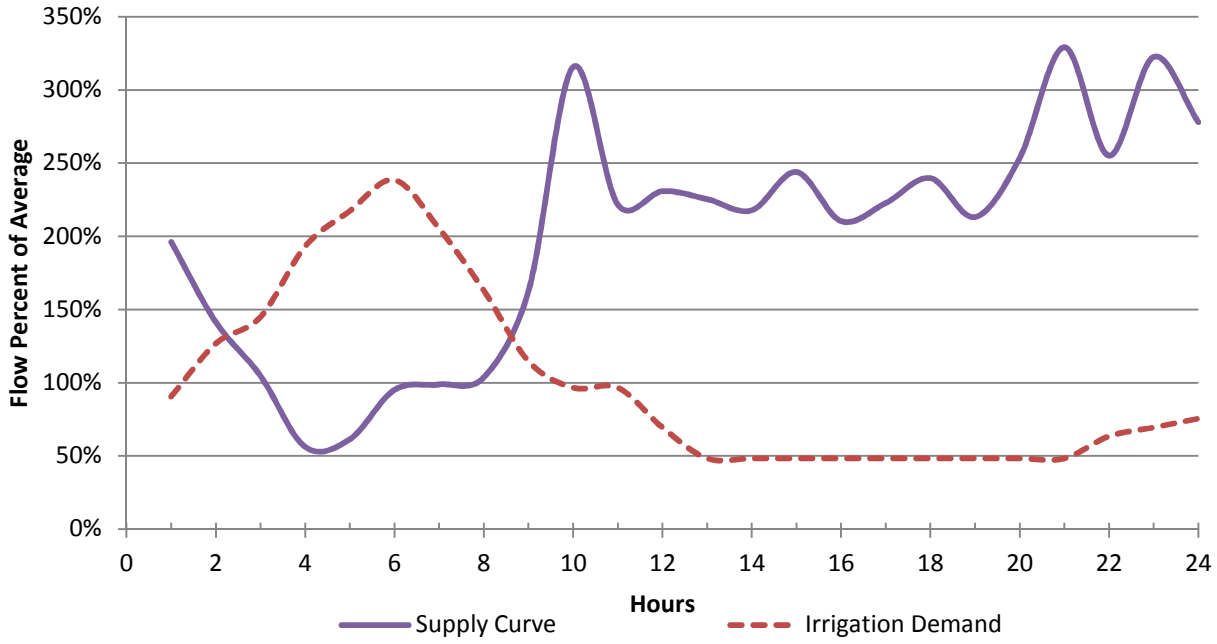

Figure 4.1 – Irrigation Demand vs Supply Curve

There are several advantages for utilizing reclaimed water for irrigation. The first is that it is usually an economical alternative to highly treated potable water. The nutrients in the water are beneficial to the plants being irrigated, and the use of reclaimed water would not necessarily be restricted during drought conditions allowing for a reliable source of water. Additionally, there are no return flows back to the City's treatment facility associated with irrigation usage. This allows for the permanent removal of any dissolved solids from the reclaimed water system.

4.1 EXISTING EPA GUIDELINES FOR IRRIGATION WATER REUSE

A major limiting factor for use of reclaimed water for irrigation is the TDS content of the water, often referred to as the salt content. TDS is a measurement of all dissolved constituents (i.e. chloride, sulfate, nitrate, sodium, boron, bicarbonate, and trace metals) in the water. Excessive dissolved solids may damage some crops by limiting the ability of the vegetation to uptake water. Exposing the plant to extreme levels of certain ions (i.e. chlorides and boron) can also be toxic to plants. According to Environmental Protection Agency (EPA) Guidelines, when TDS concentrations are below 500 mg/L no detrimental effects are usually noticed. Between 500 and 1,000 mg/L, TDS in irrigation water can affect some sensitive plants. At 1,000 to 2,000 mg/L, TDS levels can affect many crops and careful management practices should be highly followed. Above 2,000 mg/L, water can be used regularly only for salt tolerant plants in permeable soils. Table 4.1 shows the recommended TDS limits for irrigation on different types of soil.

For irrigation, crops must be chosen carefully to ensure that they can tolerate the salinity of the water. For example, Bermuda grass is a relatively salt tolerant grass that can respond well to soil salinity of approximately 520 mg/L TDS. Ryegrass, however, is a cool season grass and may be severely injured by soil salinity over 260 mg/L TDS. In cases of high salinity, careful management practices would include making sure the soil is properly drained and adequately leached to prevent salt build-up in the soil. Leaching is the deliberate over application of irrigation water in excess of the vegetation needs to establish a downward movement of water to carry the salt away from the root zone of the plants.

Table 4.1: Water Quality Criteria for Irrigation.

Salinity	Acceptable	Marginal	Unacceptable
Total Dissolved Solids (TDS), mg/L	<450	450-2000	>2000
Permeability			
Sodium Absorption Ratio, adjusted (SARa)	<6.0	6.0-9.0	>9.0
Ion Toxicity			
Chloride, mg/L	<140	140-350	>350
Boron, mg/L	<0.7	0.7-3.0	>3.0
Miscellaneous			
Nitrogen (NO_3-N), mg/L	<5	5-30	>30
Bicarbonate (HCO_3), meq/L	<1.5	1.5-8.5	>8.5
Residual Chlorine, mg/L	<1.0	1.0-5.0	>5.0

Based on University of California, Davis Acceptability Guidelines

If the TDS concentrations in the City's reclaimed water remain elevated, there will likely be increased management required by the end user to prevent the buildup of the salts in the soil.

Section 5
Cooling Tower Makeup Water

The second use for reclaimed water with a potentially large user base is for evaporative cooling towers. Many commercial and industrial facilities use cooling towers as part of their heating, ventilating and air conditioning (HVAC) systems. These systems utilize the cooling effect of evaporation to dissipate the heat generated by the condensers via a heat pump. As the water evaporates, the water must be replenished to maintain a constant water volume in the system. As the water evaporates, minerals are left behind and become concentrated in the water. Therefore, the water must be replaced from time to time with makeup water.

5.1 COOLING TOWER WATER DEMAND

Reclaimed water is a good candidate for cooling towers as it can be a cost effective alternative to utilizing higher quality potable water. However, there are a few design considerations that should be taken into account when using reclaimed water as a source for cooling tower makeup. Demands for cooling tower water usage are variable based on the type of facility being cooled. Typically commercial usage would have higher demands in warmer weather and would peak during the day when it is the hottest. Depending on the usage, industrial customers and data centers are anticipated to have a less variable demand for makeup water with potentially smaller peaks during warm weather. This is due to their more constant heat loss demands from their equipment.

Figure 5.1 shows the typical supply and summer demand curves for commercial HVAC cooling tower usage over a 24-hour period assuming demand is equal to one half of the available supply. Because the demand is higher through the day and lower at night, the demand curve generally follows the supply curve generated by the treated effluent from the WWTF. In order to efficiently utilize reclaimed water for commercial cooling, a relatively small volume of storage will be required to offset the supply/demand balance. For example, if the average flow through the treatment plant was 9.0 mgd and the average demand for commercial cooling tower makeup water was 4.5 mgd (50% treated effluent utilization), no storage would be required to balance the supply and demand.

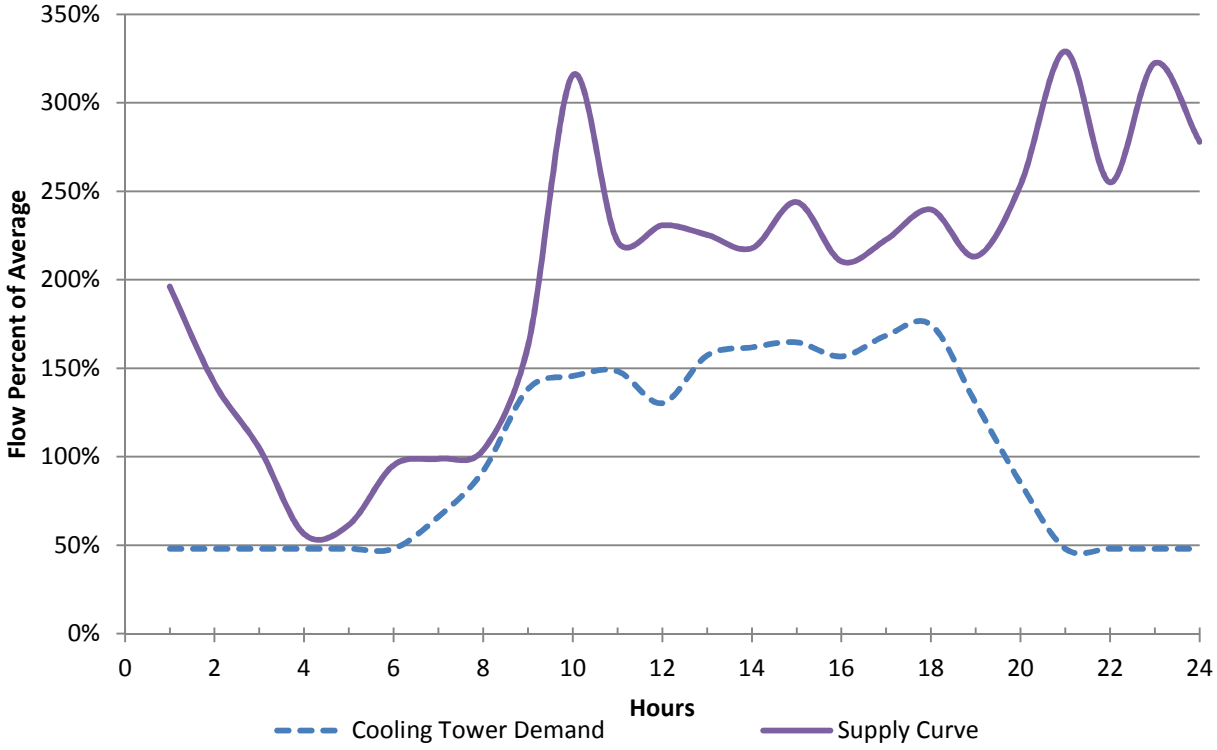

Figure 5.1 – Commercial Cooling Tower Demand vs. Supply Curve

5.2 COOLING TOWER WATER QUALITY

There are three primary factors that have to be addressed with the operation of cooling towers: scale formation, biological fouling, and corrosion. The source water can lead to increased control measures for each of the items.

Reclaimed water typically has a higher nutrient content (nitrogen, phosphorus, etc.) than potable water. These nutrients can lead to biological growth within the cooling tower and will reduce the efficiency of the system. Many facilities treat their water (potable or non potable) with algaecides and other chemicals to disinfect the water to prevent biological growth in the system. The use of reclaimed water may require higher doses of chemicals to prevent biological growth than potable water.

The cyclical process of heating, evaporating and cooling of the water has a concentrating effect on the minerals and other constituents in the water. As the water is heated, a significant amount of the water evaporates causing the dissolved minerals to build up over time and

eventually start precipitating out causing scale. The primary minerals that form scale include calcium phosphate (most common), silica (fairly common), and calcium sulfate (fairly common). Other minerals that are less commonly found include calcium carbonate, calcium fluoride, and magnesium silicate. Constituents with the potential to form scale must be evaluated and controlled by chemical treatment and/or by adjusting the cycles of concentration. These constituents are not significantly higher in reclaimed water compared to potable water sources. The EPA has generated general guidelines for target levels of some constituents in reclaimed water used for cooling towers. This information is tabulated in Table 5.1.

Table 5.1: Water Quality Criteria for Cooling Tower

Parameters	Reclaimed Water Quality
Total Soluble Solids (TSS), mg/L	≤ 30
Biochemical Oxygen Demand (BOD), mg/L	≤ 30
Residual Chlorine, mg/L	≥ 1.0
Fecal Coliform/100ml	≤ 200
PH	6.0 – 9.0
Recommended Treatment should include secondary treatment and Disinfection by Chemical Coagulation and Filtration. Additional treatment by user to prevent scaling, corrosion, biological growths, fouling and foaming.	

Based on Suggested guidelines for Water Reuse, EPA 2012

Standard operating procedures for cooling towers include, continually replacing a percentage of the water to prevent the buildup of certain minerals, this is known as "blow-down". Systems that utilize potable drinking water typically have to blow-down after about six to eight cycles. Many reclaimed water cooling systems require blow-down after three to five cycles due to the higher concentrations of minerals and other particulate matter in the water. Therefore, these systems require more water and often times the cost of the additional water offsets some of the savings over potable water sources.

5.3 COOLING TOWER PRE-TREATMENT: HIGH EFFICIENCY SOFTENING

In order to make reclaimed water more cost effective, the makeup water can be pre-treated through a high efficiency softening process. There are several advantages to using softened water for cooling tower usage that are not dependant on the water source. The first

advantage is that most of the minerals that precipitate out due to evaporation are removed by the softening process. Therefore the water can be recycled more and the number of cycles between blow-downs can increase to 50 to 100 cycles. This greatly reduces the amount of water required for cooling usage and makes reclaimed water a more cost effective source.

A result of the high number of cycles between blow-downs is that the TDS (salinity) of the water is greatly increased. The process also raises the pH of the water. When the pH is raised above nine, silicates in the water will polymerize and form a passivating layer on exposed metals in the system inhibiting corrosion in the system. The increased salinity and pH also significantly inhibits microbial growth and reduces the need for algaecides and other disinfection chemicals.

Regardless of water source and whether or not high efficiency softening is utilized, cooling tower usage will generate a concentrated waste stream that is going to be high in dissolved solids that will typically be returned to the WWTF. If a significant portion of the reclaimed water is used for cooling tower makeup water and is returned to the Central WWTF, the City will need to develop an overall plan to address the increased TDS loading as discussed earlier.

5.4 PFLUGER FARM LANE DATA CENTER

The land adjacent to Pfluger Farm Lane north of Pflugerville Parkway is currently zoned "Urban Level 4". The utilities along this street were constructed with a 10-inch reclaimed water line in anticipation of future data center development in the area. Data centers use a significant amount of electricity that is ultimately converted to heat from its equipment. This in turn requires large cooling systems for the equipment. It is anticipated that a large data center on Pfluger Farm Lane could utilize up to 1.0 million gallons per day of reclaimed water for its cooling towers.

Section 6
Light Industrial/Process Water Use

The third significant potential use for reclaimed water is process water for light industrial facilities. The suitability of reclaimed water for use in industrial processes depends on the particular use. For example, the electronics industry requires water of almost distilled quality for washing circuit boards and other electronic components. On the other hand, the tanning industry can use relatively low-quality water. Requirements for textiles, pulp, paper, and metal fabricating are intermediate. Thus, in considering the feasibility of industrial reuse with reclaimed water, potential users must be evaluated on a case by case basis to determine the specific requirements for their process water.

6.1 INDUSTRIAL RECLAIMED WATER DEMANDS

The water demands required for industrial use will vary. However, it is anticipated that the demand rates will be fairly constant throughout the day. Figure 6.1 shows the typical supply and demand curves for industrial use over a 24-hour period assuming the demand volume is equal to one half of the available supply volume over the same time period. In order to efficiently utilize reclaimed water for industrial use, a moderate volume of storage is required to offset the supply/demand balance. For example, if the average flow through the treatment plant was 9.0 mgd and the average demand for industrial process water was 4.5 mgd (50% treated effluent utilization), a usable storage volume of approximately 0.500 million gallons would be required to balance the supply and demand.

Since there are a number of possible uses for reclaimed water that would fall into the light industrial category, the City will need to consider each one with regard to its demand rates and any return flows that may be sent back to the wastewater treatment facility. This is especially true if the industry provides additional treatment through reverse osmosis and will be returning the reject water from the purification process to the Central WWTF. These waste streams could potentially generate a significant amount of dissolved solids and could adversely affect other reclaimed water users.

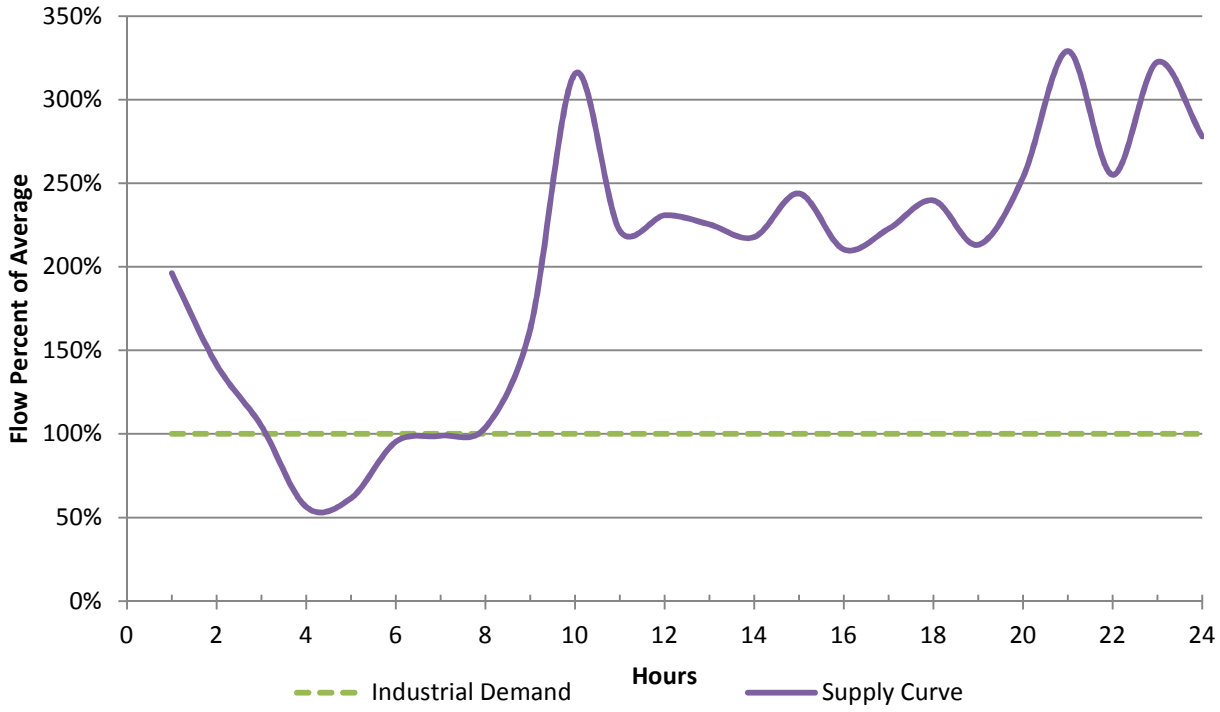

Figure 6.1 – Light Industrial Demand vs. Supply Curve

6.2 LIGHT INDUSTRIAL ON EAST CAMERON ROAD

The land adjacent to Pecan Street and Cameron Road east of SH 130 is not currently zoned. However, discussions with the City have indicated that there is potential for this area to develop as light industrial. Due to the undeveloped nature of this area and its proximity and access to SH 130, industrial demands of 2.0 mgd and 1.0 mgd have been tentatively allocated to the proposed extension east of SH 130 and have been included in the hydraulic model detailed in Section 8.

Section 7
Fire Protection

Fire protection is another potential use of reclaimed water. This type of use is often not considered for reclaimed water systems because it does not have a consistent demand but requires additional storage, pump, and power requirements. However, it may be advantageous for the City to consider incorporating fire protection in the design and planning of the future reclaimed water system.

It is recommended that the City maintain fire protection utilizing potable water for its customers within the City's potable water Certificate of Convenience and Necessity (CCN) area. However, there are areas within the City's ETJ that are outside the City's CCN that currently have no fire protection available and are in close proximity to the Central WWTF's future reclaimed water pumping system. The City may wish to consider providing fire protection service to users that develop in this area.

7.1 FIRE DEMANDS

The City has adopted the International Fire Code, 2012 Edition. In accordance with the 2012 International Fire Code, the required fire flow demand is based on the size and type of structure that is constructed. For planning and modeling purposes, it was assumed that future structures could be in excess of 140,000 sq. ft and would be constructed to the minimum standards to be classified as Type IIB by the 2012 International Building Code. It was also assumed that the building(s) would be constructed with an approved automatic sprinkler system. The base fire flow requirements for a building of this size and type would be 8,000 gpm for four hours. However, Section B105.2 of the Fire Code allows a reduction in the required fire-flow of up to 75%. Therefore, the required minimum fire flow was calculated to be 2,000 gpm for four hours.

7.2 DESIGN REQUIREMENTS

In order to provide adequate fire protection with the reclaimed water system, the storage, piping, and pumping facilities must all be sized to deliver the required fire flow in both volume and rate. In order to do this, the system will need to be constructed with a minimum of 0.500

million gallons of water storage that is always available for use in a fire (2,000 gpm x 240 min = 480,000 gallons). This capacity could be provided by ground storage with increased pumping capacity, elevated storage, or a combination of both. Additionally, the reclaimed water distribution system would need to be sized to deliver the required fire flow. This flow should be included in addition to any other demands in the system. An analysis has been performed on the proposed distribution system and has been included in the system modeling presented in Section 8.

Section 8
Ultimate Reclaimed Water System

In order to minimize redundant expenses when developing a new distribution system, it is important to know what the ultimate goals are for the system and to develop an overall plan of what the ultimate system will achieve. Once the goals have been identified, the plan can be mapped out and modeled to optimize the City's capital investments by constructing the right infrastructure at the right time while also minimizing upfront costs and duplicity in construction efforts.

Based on discussions with City staff, it is understood that the City desires to develop a reclaimed water system that would provide service along the SH 130 corridor where commercial and industrial developments are anticipated. DCS has developed a plan for a phased expansion of the reclaimed water system and sized the infrastructure to serve the ultimate flows from the Central WWTF.

8.1 RECLAIMED WATER SYSTEM MODEL

A reclaimed water system model was developed using the Water CAD (unlimited pipes) modeling program. The water modeling system consisted of a supply node, a proposed ground storage tank, a proposed pumping station, an elevated storage facility at or near the existing north standpipe location, and the proposed large diameter transmission lines. The proposed reclaimed water system configuration including these elements is shown in Figure 8.1.

The proposed pipe network for the reclaimed water system consisted of pipes 1 to 9 as shown in Figure 8.1. Approximate lengths of the pipes were 925 ft (Pipe 1), 8400 ft (Pipe 2), 11,000 ft (Pipe 3), 3,100 ft (Pipe 4), 4,700 ft (Pipe 5), 3,800 ft (Pipe 6), 6,300 ft (Pipe 7), 2,900 ft (Pipe 8), and 4,100 ft (Pipe 9). Pipe sizes were based on velocities in the pipes not exceeding 10 ft/sec to avoid excessive head loss. Water CAD utilizes the Hazen-Williams formula to compute friction head loss in pipe networks. A C-factor of 130 was used for all the pipes in the model.

The model's nodal elevations were based on the Capital Area Council of Governments elevation contours and then imported into the model using Geographic Information Systems (GIS). The highest elevation of the system is where the existing North Standpipe is located, with a ground elevation of approximately 758 ft. The second highest elevation in the system is at

node D1 near the north end of Pfluger Farm Lane. The lowest elevation in the system is at node D2F at the east end of Cameron Road.

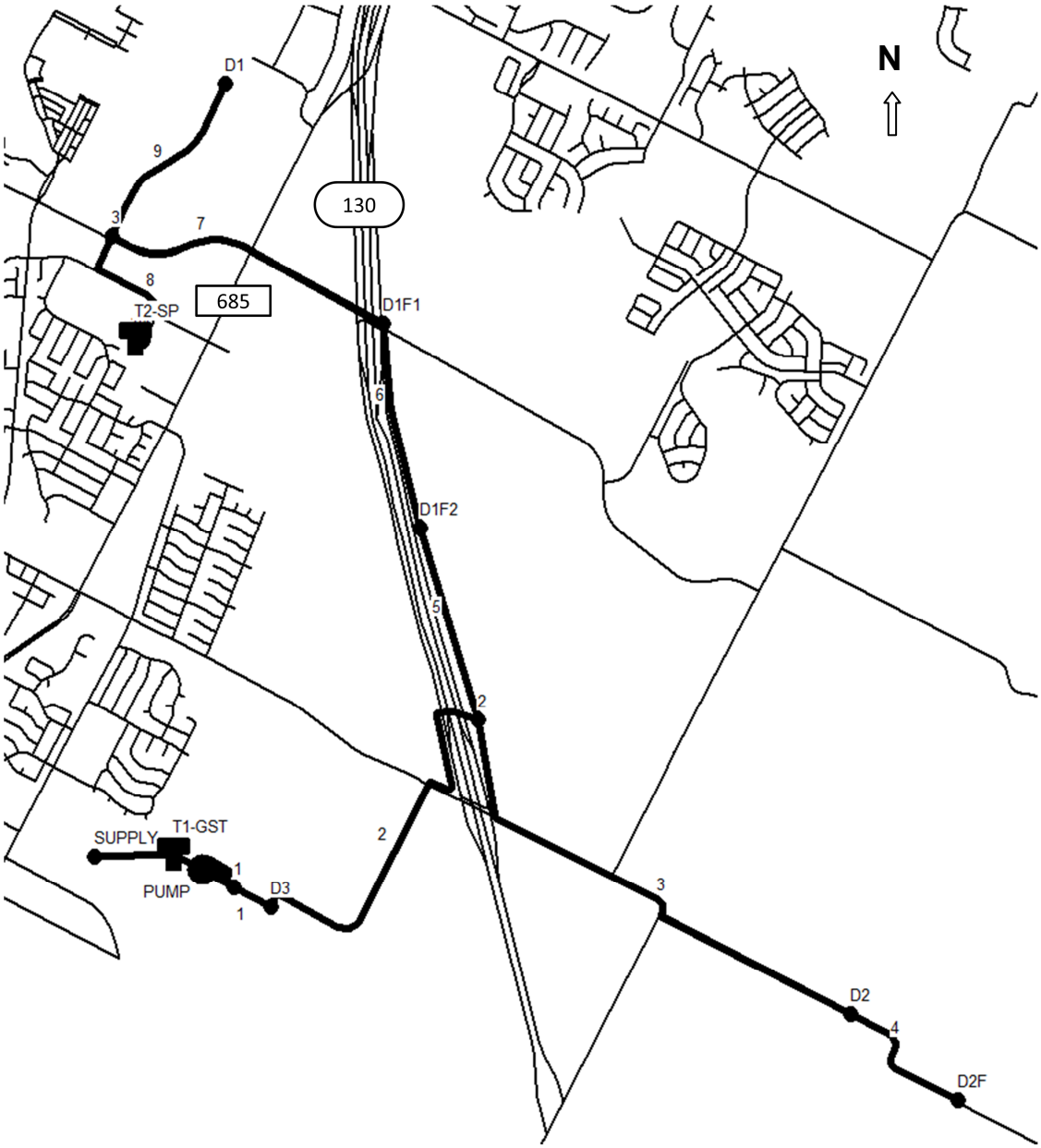

Figure 8.1: Ultimate Reclaimed Water System Model

Reclaimed water demands (maximum day demands) were assigned to nodes throughout the system with their associated diurnal demand patterns for different user categories. Table 8.1

shows the node demands that were used in the model with the associated demand patterns. Demand patterns for each type of use were discussed and shown in Sections 4 through 7.

The system was modeled with a system maximum day demand of 5.76 mgd as shown in Table 8.1. It should be noted here that this flow was used to size the ultimate distribution system and to allow for variability in the location and volume of the future demands. Since the flows at the WWTF are projected to be reduced from approximately 9.00 mgd to 4.50 mgd when the Wilbarger or Cottonwood WWTF is constructed, we recommend the City limit contracted flows to no more than 4.50 mgd until the new WWTF is constructed and the flows at the Central WWTF can support the increased flows. Alternatively, funds could be allocated to construct a second pumping station and storage tank at the new WWTF and connect them together with pipelines from the Central WWTF. This would allow the City to commit to reclaimed water flows of up to 9.0 mgd prior to the new WWTF being constructed. However, this decision would need to be made prior to constructing pipelines so that pipelines built before the new WWTF is constructed are appropriately sized.

Table 8.1: Node Demands and Patterns

Node Location	Node	Demand (MGD)	Pattern Category	Area Use
Pfluger Farm Lane	D1	1.0	Cooling Tower	Data Center
SH 130 and Pflugerville Parkway	D1F1	0.5	Cooling Tower	Commercial/ Office Park
SH 130	D1F2	0.5	Irrigation	Commercial/ Office Park
Cameron Rd. East	D2	2.0	Industrial	Light Industry
Cameron Rd. East	D2F	1.0	Cooling Tower	Light Industry
Northeast Metro Park	D3	0.76	Irrigation	NEMP Irrigation
Total		**5.76**		

Once the framework of the system was laid out, four basic scenarios were developed to analyze the system using extended period simulations under different operating conditions. This analysis included variations in the system including storage capacities, pump sizes and fire flows. Each scenario was analyzed to determine the optimal pipe sizes for the distribution system. A summary matrix of the various scenarios that were analyzed can be found in Table 8.2.

Table 8.2: Scenario Summary

Scenario	Elevated Storage Provided	Fire Flow Included
S1	No	No
S2	Yes	No
S3	No	Yes
S4	Yes	Yes

In Scenarios S2 and S4, the model included the use of an elevated storage tank. For the purposes of the model, a 1.0 million gallon standpipe was utilized with an overflow elevation of 888 ft (i.e. the existing North Standpipe). This was based on the understanding that there is a possibility that the City may be able to convert and utilize the existing North Standpipe for reclaimed water once a new elevated storage tank is constructed to serve the north side of the City. If the existing standpipe does not become available and elevated storage is required for the reclaimed water system, a separate elevated tank or standpipe could be constructed to meet the needs of the system.

Additionally, fire flows were included in the analysis for the service area outside the City's current potable water CCN. For modeling purposes, a constant fire flow demand of 2,000 gpm was applied with a duration of four hours based on the guidelines of the International Fire Code 2012 edition as discussed in Section 7. Fire flows were analyzed at the east end of the line extending to Cameron Road (D2F).

8.2 DISTRIBUTION SYSTEM MODEL RESULTS

As mentioned previously, extended period simulations were performed to develop the needs for the City's ultimate reclaimed water system. As indicated in Table 8.3, using an ultimate peak day demand of 5.76 (65% of the ultimate flow expected at the WWTF), the required pipe sizes in the distribution system ranging from 10 to 20-inches in diameter and the pumping capacity requirements ranging from 4,600 gpm at 126 psi to 6,300 gpm at 135 psi. The pump and pipe sizes were optimized in each scenario to maintain a minimum operating pressure of 30 psi in the distribution system.

As expected, the pumping requirements are higher when elevated storage facilities are not provided. For the scenarios without fire flow, the pumping requirements went from

approximately 4,600 gpm at 126 psi to 4,700 gpm at 141 psi. For the scenarios with fire flow, the pumping requirements went from approximately 5,150 gpm at 110 psi to 6,300 gpm at 135 psi. In order to maintain adequate pressures during fire flow conditions, pipe 4 was increased in size from 10-inches in diameter to 12-inches in diameter; and pipes 5 and 6 were increased from 12-inches in diameter to 16-inches in diameter. These are both nominal pipe diameter increases to serve the additional flow. A detailed summary of the modeling analysis has been included in Appendix C.

Table 8.3: Distribution System Model Results

Scenario	Max Day Demand (MGD)	Proposed Pump		Fire Flow Node	Existing 1 MG Standpipe (Overflow Elev. = 888')	System Pressure	
		Max. Flow (GPM)	Head at Max. Flow (psi)		Level Change %	Min. (psi)	Max. (psi)
S1	D1 = 1 (Cooling) D1F1 = 0.5 (Cooling) D1F2 = 0.5 (Irrigation) D2 = 2 (Indudtrial) D2F = 1 (Cooling) D3 = 0.76 (Irrigation) Total = 5.76	4,667	141	N/A	N/A	45 psi at D1	173 psi at D2F
S2	D1 = 1 (Cooling) D1F1 = 0.5 (Cooling) D1F2 = 0.5 (Irrigation) D2 = 2 (Indudtrial) D2F = 1 (Cooling) D3 = 0.76 (Irrigation) Total = 5.77	4,611	126	N/A	Water Level changes between 888 ft and 867 ft (0.16 MG) with 100% recovery.	48 psi at SP point	150 psi at D2F
S3	D1 = 1 (Cooling) D1F1 = 0.5 (Cooling) D1F2 = 0.5 (Irrigation) D2 = 2 (Indudtrial) D2F = 1 (Cooling) D3 = 0.76 (Irrigation) Total = 5.78	6,326	135	D2F	N/A	40 psi at D1	165 psi at D2F
S4	D1 = 1 (Cooling) D1F1 = 0.5 (Cooling) D1F2 = 0.5 (Irrigation) D2 = 2 (Indudtrial) D2F = 1 (Cooling) D3 = 0.76 (Irrigation) Total = 5.79	5,146	110	D2F	Water Level changes between 888 ft and 839 ft (0.38 MG) with 60% recovery to 873 ft.	36 psi at SP point.	130 psi at D2F

8.3 STORAGE VOLUME ANALYSIS

As discussed previously in Section 2, the source of water for the reclaimed water system is from the treated effluent from the Central WWTF. Analysis of the effluent flow data from the facility indicates that the plant currently discharges a total of approximately 3.5 mgd in a 24-hour period. The instantaneous flow rate ranges from approximately 0.5 mgd to 5.0 mgd in that 24-hour period.

If the reclaimed water demand pattern was the same as the flow pattern through the treatment facility, the reclaimed water system could utilize up to 100% of the flow without storage. However, if the flow patterns do not perfectly match, the maximum amount of reclaimed water that the City could provide reliably would be approximately 0.5 mgd, the base flow through the plant. Thus, storage is required to serve instantaneous flows greater than 0.5 mgd.

Alternatively, if adequate storage is provided, the system will be able to accumulate water during periods of high supply (i.e. low demand) and then provide water during periods of low supply (i.e. high demand). The amount of storage that will be required is highly dependent on the type of demand patterns that are anticipated. As discussed in Sections 4, 5, and 6, there are three types of demand patterns that have been included in this planning analysis. Each of them will have significantly different storage requirements and there are an infinite number of combinations of those demand patterns that could make up the ultimate system.

Based on this, an analysis was performed analyzing the extreme conditions (100% of each demand pattern), a equally balanced condition (33.33% allocated to each demand pattern), and a projected demand condition (52% cooling tower usage, 13% Irrigation, and 35% industrial usage). These conditions were each analyzed under varying flow conditions for the wastewater treatment plant: 3.5 mgd (current flow), 5.3 mgd (current permit limit), 5.85 mgd (future permit limit), and 9.0 mgd (ultimate flow). The detailed results of this analysis have been included in Appendix D.

With an ultimate WWTF design capacity of 9.0 mgd and assuming the reclaimed water demand is maintained at 50% of the WWTF flow or less, the storage requirements ranged from zero gallons (100% cooling tower) to 1.2 million gallons (100% irrigation). However, the storage requirements were reduced to approximately 360,000 gallons for the equally balanced

condition and 105,000 gallons for the projected condition. These volumes are total operating volumes in the system and could be provided by either ground storage, elevated storage, or a combination of both.

It should be noted here that the above volume analysis does not include storage for fire protection. If fire flows are to be provided, the City should maintain a minimum of 500,000 gallons of additional storage (2,000 gpm for four hours). Thus, a total storage volume of 1,000,000 gallons has been proposed to allow for variability in the anticipated demands and to provide storage for fire protection.

8.4 PHASED SYSTEM EXPANSION

Developing a reclaimed water system will require a significant capital investment by the City. Therefore, it is recommended that the system be constructed in a way that will minimize any redundant costs as it is developed. This approach will include installing pipe that will meet the ultimate demands in the distribution system first and phasing the installation of the pumping and storage facilities as described below.

8.4.1 Distribution System

It is recommended that the distribution system piping be constructed on an as-needed basis to provide service to the first major user (0.5 million gallons or more) and then extend the system as more users are identified. The anticipated pipe routes and sizes are shown in Figure 8.2 and Figure 8.3. These will provide the basic structure of the ultimate system. Ultimately, the exact routes and locations may vary depending on the location of the first user(s), the availability of land, or the requirements for easements. Figure 8.2 shows the proposed pipe sizes required for fire flow protection for the areas to be served outside the City's potable water CCN. Figure 8.3 shows the proposed pipe sizes required if fire flow protection is not required. A general schedule for the proposed pipe sizes is shown in Table 8.4 and includes sizes required for the system both with and without fire protection to certain areas outside the City's CCN.

IH 45

CITY OF PFLUGERVILLE WATER CCN

1.0 MGD (AVG) DATA CENTER NG=±722'

PFLUGER FARM LANE

EXIST 10"

0.5 MGD (AVG) COOLING NG=±686'

E PFLUGERVILLE PKWY

SEGMENT 4–12"

SEGMENT 5–12"

NG=±714'

NORTH STAND PIPE (1.0 MG) (0.5 MG USABLE) NG=±758'

SH 130

SEGMENT 3–16"

0.5 MGD (AVG) IRRIGATION NG=±650'

WEISS LANE

FM 685

E PECAN ST

SEGMENT 1–20"

SEGMENT 2–16"

SEGMENT 2–12"

CAMERON ROAD

2.0 MGD (AVG) LIGHT INDUSTRIAL NG=±610'

1.0 MGD (AVG) LIGHT INDUSTRIAL NG=±610'

CAMERON ROAD

GROUND STORAGE TANK (1.0 MG) NG=±630'

CENTRAL WWTF / RECLAIMED WATER PS (8.0 MGD)

EXIST 10"

NEMP IRRIGATION 0.167 MGD (AVG) NG=±647'

CITY OF PFLUGERVILLE ETJ

LEGEND

- SERVICE AREA NO. 1
- SERVICE AREA NO. 2
- SERVICE AREA NO. 3
- SERVICE AREA NO. 4
- FIRE FLOW PROTECTION AREA
- SERVICE AREA NO. 1 PIPE
- SERVICE AREA NO. 2 PIPE
- SERVICE AREA NO. 3 PIPE
- SERVICE AREA NO. 4 PIPE
- CITY OF PFLUGERVILLE ETJ
- CITY OF PFLUGERVILLE WATER CCN

ENGINEERING, LLC
1101 S. CAPITAL OF TEXAS HWY, BUILDING G-100
AUSTIN, TEXAS 78746 PHONE (512) 614-6171
T.B.P.E. FIRM NO. F-13162

RECLAIMED WATER MASTER PLAN
CITY OF PFLUGERVILLE
PROPOSED DISTRIBUTION SYSTEM WITH FIRE FLOW PROTECTION

DATE: SEP 2014

SCALE: 1" = 3000'

FIGURE: 8.2

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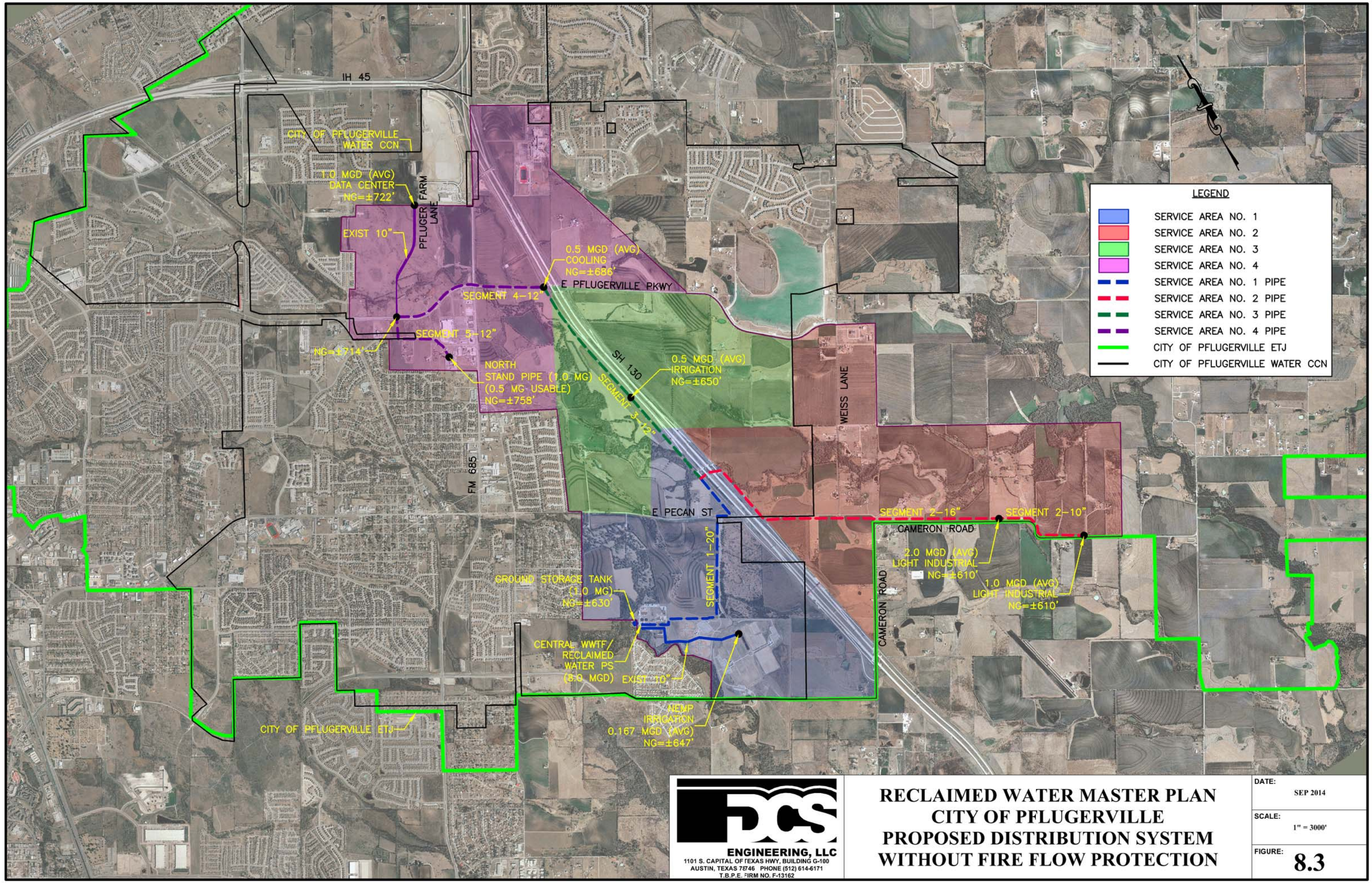

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RECLAIMED WATER MASTER PLAN
CITY OF PFLUGERVILLE
PROPOSED DISTRIBUTION SYSTEM
WITHOUT FIRE FLOW PROTECTION

DATE: SEP 2014

SCALE: 1" = 3000'

FIGURE: 8.3

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Table 8.4: Distribution System Pipe Schedule

Pipe Segment	General Location	Pipe Size	
		With Fire Service	Without Fire Service
1	WWTP to Pecan St.	20"	20"
2	Pecan St. to East Cameron Rd.	16"	16"
3	SH 130	16"	12"
4	Pflugerville Pkwy.	12"	12"
5	Connection to North Stand Pipe	12"	12"

8.4.2 Pumping and Storage Facilities

In order to efficiently capture and deliver reclaimed water, the City will need to provide pumping and storage facilities to provide pressurized reclaimed water service. Depending on the needs of the initial and ultimate system, it is recommended that a phased approach be implemented. This will allow the City to provide service at the minimum initial capital cost and start generating revenue to fund future system improvements. It should be noted that the phased plan outlined below could be truncated by omitting Phase 1 and/or Phase 2 if the water demand dictates.

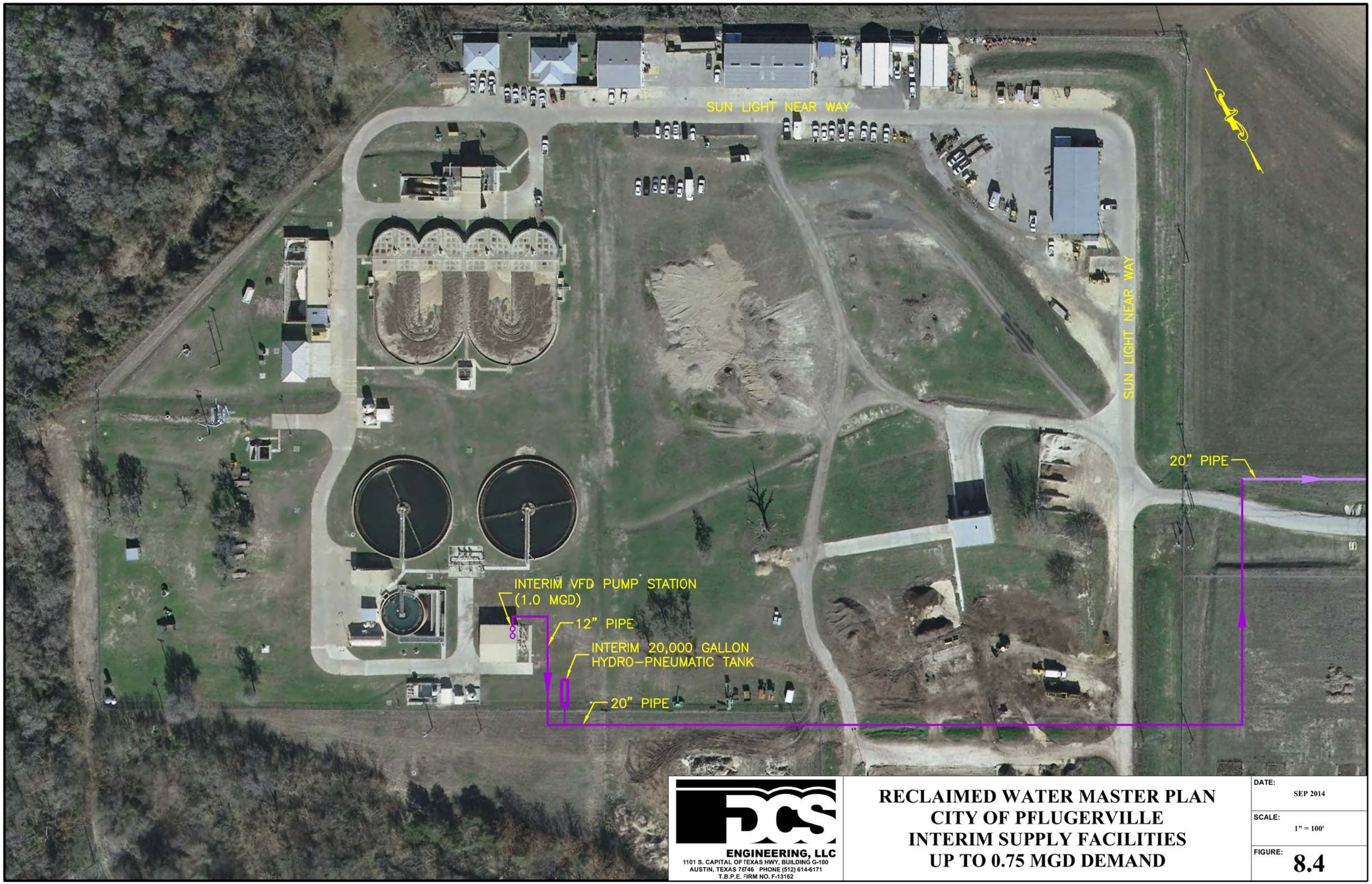
8.4.2.1 – Demands less than 0.75 mgd

The first phase is intended to provide service up to approximately 0.75 mgd. This represents the base flow through the WWTF. The system would include the installation of three (two firm) vertical turbine pumps in the effluent basin of the tertiary filter, which would pump directly to the distribution system. The pumps would be sized for approximately 350 gpm each, at 125 ft of total dynamic head (TDH). These pumps would be equipped with variable frequency drives (VFDs) so that they can vary the flow based on demand.

A 20,000 gallon hydro-pneumatic tank would be included with these pumps. A hydro-pneumatic tank will attenuate minor spikes in demand and reduce the cycling of the pumps during low flow conditions. Figure 8.4 shows the proposed facilities for Phase 1.

8.4.2.2 – Demands from 0.75 mgd to 3.0 mgd

The second phase of improvements will provide service between 0.75 mgd and 3.0 mgd. Depending on the actual users and their associated demands, this phase includes the conversion



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RECLAIMED WATER MASTER PLAN
CITY OF PFLUGERVILLE
INTERIM SUPPLY FACILITIES
UP TO 0.75 MGD DEMAND

DATE:	SEP 2014
SCALE:	1" = 100'
FIGURE:	8.4

of the existing unused sludge holding basin on the west side of the Central WWTF into a reclaimed water ground storage tank. Conversion of the tank will require cleaning of the existing structure and constructing a cover over the tanks to prevent contamination from animals or blowing debris.

Pumping improvements will include the installation of four (three firm) pumps to transfer water from the tertiary filter effluent channel to the converted ground storage tank. The two existing pumps would be removed from this location. These pumps will be sized to capture the peak flows through the WWTF and are estimated to be approximately 1,500 gpm each at 40 ft of TDH (6.48 mgd firm pumping capacity).

A second pumping station will be constructed in this phase to pump water from the converted sludge holding basin into the reclaimed water distribution system. We recommend that the design and construction of this facility include considerations for the ultimate system. Thus, the second pumping station and pumps would be sized to accommodate a firm capacity of approximately 5.4 mgd to accommodate the peak flows. This could be accomplished by constructing a pumping facility that would ultimately include six pumps, but only install four (three firm) of the pumps in Phase 2. These pumps should be designed to pump approximately 1,250 gpm each at 125-ft TDH. Figure 8.5 shows the proposed facilities required for flows between 0.75 mgd and 3.0 mgd.

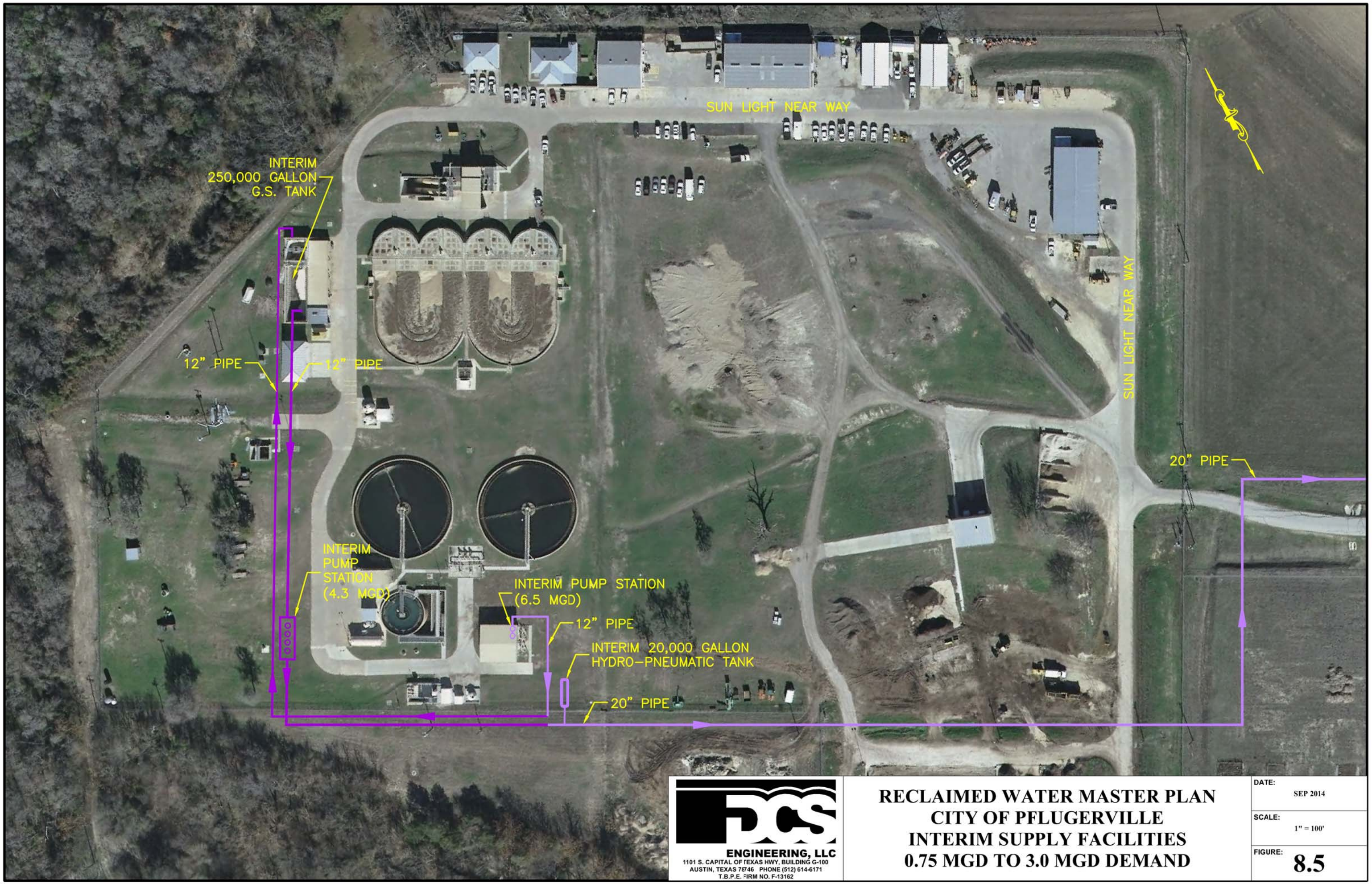
8.4.2.3 – Demands from 3.0 mgd to 4.5 mgd

Phase 3 of the improvements will provide service for flows up to 4.5 mgd. These facilities will include the construction of a new 1.0 million gallon ground storage tank and adding two additional 1,250 gpm pumps to the pump station constructed in Phase 2. This will provide a firm pumping capacity of approximately 9.0 mgd. It is proposed that the new ground storage tank be constructed partially below ground so that it automatically takes water from the WWTF by gravity. This will eliminate the need for the converted sludge holding basins, the intermediate transfer pumps, and any associated operation and maintenance of those facilities constructed in earlier phases. Figure 8.6 shows the proposed facilities to be constructed for demands between 3.0 mgd and 4.5 mgd.

8.4.3 Disinfection

Disinfection of the reclaimed water will be provided through the normal wastewater treatment process. However, a chlorine residual will be required in the reclaimed water system. The current chlorination of the treated effluent should be adequate for the facilities through Phase 1. However, with the addition of the converted ground storage tank in Phase 2 and the ultimate ground storage tank in Phase 3, additional chlorination may be required to boost the residual chlorine in the reclaimed water system.

If the City elects to change the disinfection method to ultraviolet disinfection, a new chlorination system will not be required since the existing system could be scaled down and repurposed for the reclaimed water system. Depending on the flows at that time, the City should consider disinfection using smaller 150 lb chlorine cylinders or other methods of chlorination to eliminate the need for one ton cylinders from the treatment facility.



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RECLAIMED WATER MASTER PLAN
CITY OF PFLUGERVILLE
INTERIM SUPPLY FACILITIES
0.75 MGD TO 3.0 MGD DEMAND

DATE:	SEP 2014
SCALE:	1" = 100'
FIGURE:	8.5

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RECLAIMED WATER MASTER PLAN
CITY OF PFLUGERVILLE
ULTIMATE SUPPLY FACILITIES
3.0 TO 4.5 MGD DEMAND

DATE:	SEP 2014
SCALE:	1" = 100'
FIGURE:	8.6

Section 9
Summary and Recommendations

9.1 RECOMMENDATIONS

We recommend that the City of Pflugerville develop a reclaimed water system to provide a reliable source of drought resistant water for customers with substantial non potable water needs. The Central WWTF currently discharges an average of 3.5 mgd of treated effluent to Upper Gilleland Creek. Flows are expected to increase to approximately 9.0 mgd and then be reduced to approximately 4.5 mgd with the construction of the Wilbarger or Cottownwood WWTF in 2033. Utilizing up to 4.5 mgd of reclaimed water will substantially reduce the anticipated needs for potable water in the future and could provide an additional revenue stream from a currently unutilized resource.

9.2 TOTAL DISSOLVED SOLIDS

The City of Pflugerville has historically had relatively high concentrations of TDS in the Central WWTF effluent. Efforts in the past few years have reduced the TDS concentrations to approximately 800 mg/L. This level is considerably higher than the source water from LCRA and is considered marginal for reclaimed water when it is used for irrigation. Significant sources of TDS addition include: blending of groundwater from Pflugerville and Manville, chemicals added as part of the water and wastewater treatment, and water softening systems that use a salt brine to regenerate the softening systems. If significant commercial or industrial reclaimed water users have return flows to the wastewater treatment facility, it is likely that the TDS concentrations will be higher than what was supplied, raising the overall concentration at the treatment facility. It is recommended that the City continue efforts and consider additional means to reduce the overall TDS addition in the system.

9.3 FIRE PROTECTION

One of the first decisions the City should consider when planning for the future reclaimed water system, is whether or not to include fire protection service, utilizing reclaimed water to customers outside the City's potable water CCN. Offering fire protection service may provide an incentive to certain developments and could prove advantageous to the City. As discussed in

Section 7, providing fire protection service will require an additional 0.5 million gallons of ground storage, larger booster pumps, utilization of the existing North Standpipe, and larger pipe sizes in portions of the transmission/distribution system. Additionally, emergency power via a generator should be provided to any mechanical equipment in the system to maintain reliable service.

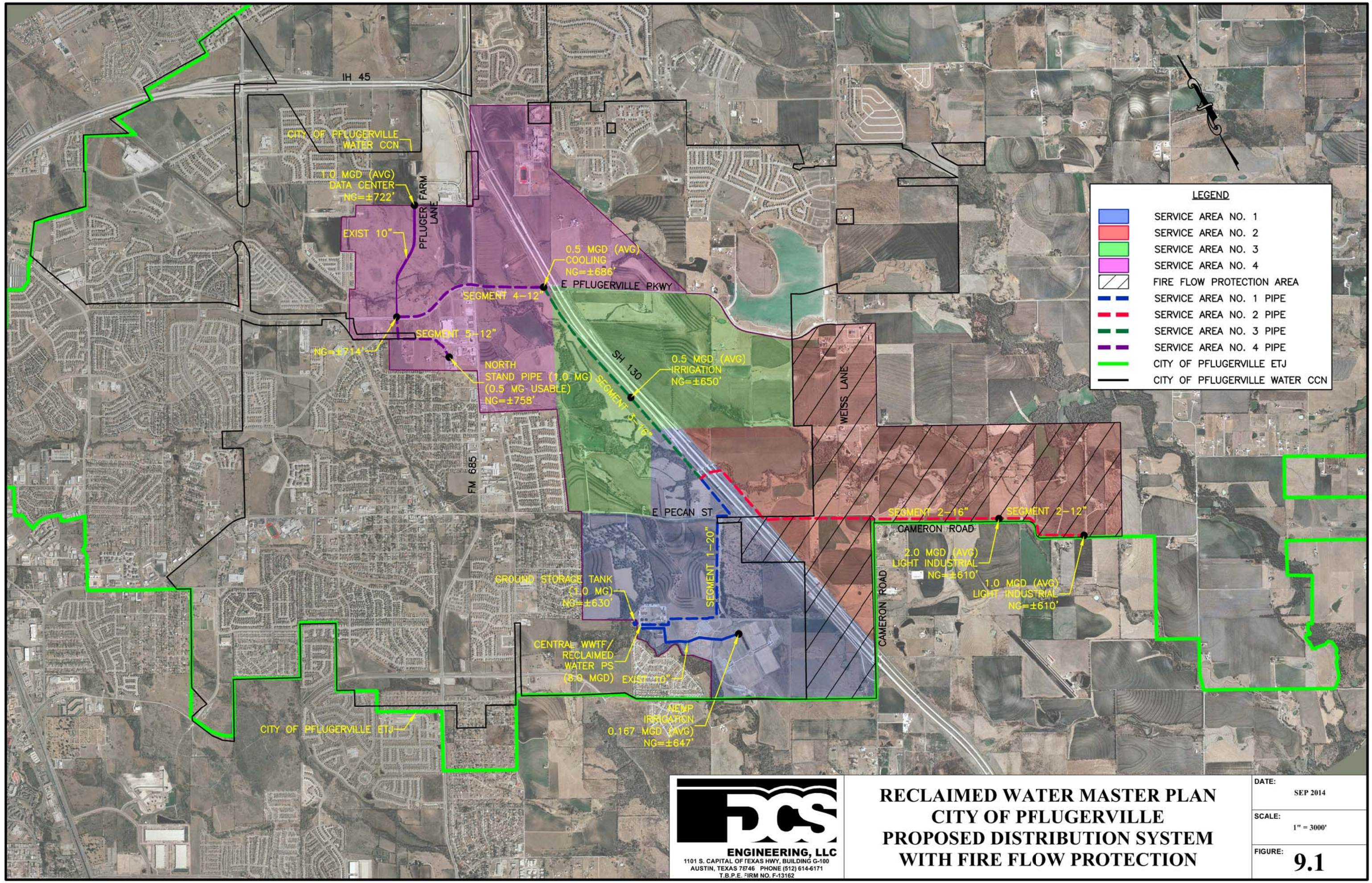
9.4 TRANSMISSION AND DISTRIBUTION SYSTEM

We recommend that the ultimate reclaimed water pipe infrastructure be built in phases with the first phase being installed to the first significant reclaimed water user (0.5 mgd or greater). By installing the ultimate pipe first, the City will not incur the expense of constructing multiple pipelines through the same areas. The recommended pipe sizes as discussed in Section 8 are summarized again in Table 9.1 with the estimated cost associated with each. (Note: all cost estimates are presented in 2014 dollars and do not include inflation, capital recovery, or operation and maintenance costs.) Figure 9.1 shows the proposed system with the pipes sized for fire protection for the proposed areas outside the City's CCN.

Table 9.1: Distribution System Pipe Schedule and Cost Summary

Pipe Segment	General Location	With Fire Service		Without Fire Service	
		Pipe Size	Cost Estimate	Pipe Size	Cost Estimate
1	WWTP to Pecan St.	20"	$2,258,000	20"	$2,258,000
2	Pecan St. to East Cameron Rd.	16" and 12"	$2,421,000	16" and 10"	$2,245,000
3	SH 130	16"	$1,527,000	12"	$1,240,000
4	Pflugerville Pkwy.	12"	$845,000	12"	$845,000
5	Connection to North Stand Pipe	12"	$461,000	12"	$461,000
	Total		**$7,512,000**		**$7,049,000**

It is understood that there are current pressure problems in the vicinity of the North Standpipe and that the City is considering removing it from the potable water system once a new elevated storage tank is constructed and a higher pressure plane is created. Once this happens, it is recommended that the City repurpose the North Standpipe to provide elevated storage and pressure maintenance for the reclaimed water system. The standpipe's location is well situated geographically, and it is near the highest elevation in the proposed service area. This will provide operational flexibility for the system and will reduce the ultimate pump size requirements for the reclaimed water supply system.



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RECLAIMED WATER MASTER PLAN
CITY OF PFLUGERVILLE
PROPOSED DISTRIBUTION SYSTEM WITH FIRE FLOW PROTECTION

DATE: SEP 2014

SCALE: 1" = 3000'

FIGURE: 9.1

FILENAME: Z:\Projects\20101249 - COP Reclaimed Water Master Plan 2012\200 - Planning_Study\2.1 - Drawings\DWG\Figure 8.2- 8.3 and 9.1.dwg, LAST SAVED ON: Nov 19 2014 3:55pm, PLOTTED BY: MKHALIGH, ON: Nov 19 2014 4:22pm, CFG:

9.5 STORAGE AND PUMPING FACILITIES

In order to supply water to the proposed reclaimed water system, facilities will need to be constructed to capture and convey the treated effluent from the Central WWTF. It is recommended that the supply facilities be constructed in phases as the system demands increase. As discussed in Sections 3 through 6, there is significant variability in the potential demands which will have a significant impact on the required pumping and storage facilities. Developing the supply system in phases will allow time to see how the ultimate demand flows will be structured and the ultimate facilities can be optimized accordingly.

Phase 1:

As discussed in Section 8, the first proposed phase would include a hydropneumatic tank and temporary pumping facilities that pump water from the effluent basin of the tertiary filters directly into the transmission/distribution system (Figure 8.4). This system would provide up to 0.75 mgd of reclaimed water. This rate is established by the base flow through the WWTF but could vary depending on how the demand patterns correlate to the supply pattern.

Phase 2:

The second phase would provide capacity up to 3.0 mgd. Improvements associated with this phase would include converting the existing sludge holding basin and thickener at the Central WWTF into a reclaimed water ground storage tank (Figure 8.5). These tanks will provide approximately 250,000 gallons of storage for the system. Due to the hydraulics of the system, the treated effluent will have to be transferred to the converted basins and then pumped into the transmission/distribution system. In order to utilize the existing basins, they will need to be cleaned, disinfected, and covered.

It is recommended that the temporary booster pumps used in phase one be modified into temporary transfer pumps to route the flow to the converted basins. The booster pumps would be designed and sized so that they can be incorporated into the ultimate system, eliminating the need for replacement in the future. The booster station design should allow for the installation of two additional pumps that will be required in Phase 3.

Additionally, chlorine residuals are required in Type I reclaimed water. The existing treatment process will provide some, if not all, the required residual. However, a chlorination system may be required once a storage tank is utilized and will be required if the Central WWTF treatment process is changed to include UV disinfection. A chlorination system has been included in the cost estimates for this phase.

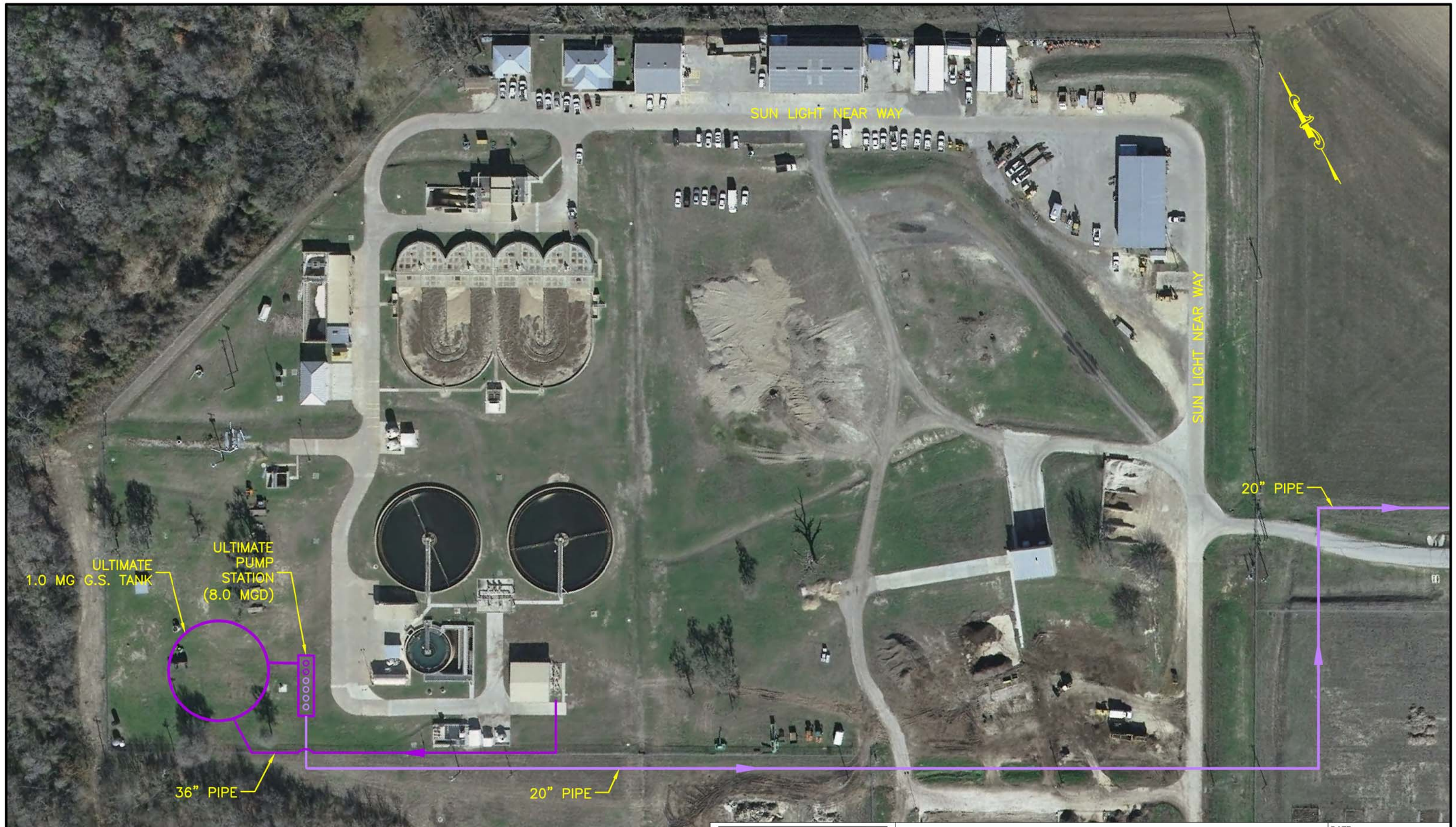
Phase 3:

The third and final phase would provide capacity up to an estimated 4.5 mgd. Improvements in this phase would include the construction of a 1.0 million gallon ground storage tank. We recommend that the ground storage tank be located in the southwest corner of the Central WWTF site and be constructed so that treated effluent will flow by gravity to the tank when it has available capacity. This will simplify the system and reduce operation and maintenance by eliminating the need for intermediate transfer pumps. In order to accommodate the increased demand during this phase, we recommend that up to two pumps be added to the booster pump station constructed in Phase 2. Figure 9.2 shows the ultimate supply facilities proposed in this phase.

The phased approach outlined above includes the construction of temporary facilities that may not be used in the ultimate system. The City could elect to forego the construction of Phase 1 and/or Phase 2 and reduce the overall cost of the ultimate system by approximately $1,268,000. A summary of the cost estimates for the phased storage and pumping facilities is presented in Table 9.2.

Table 9.2: Storage and Pumping Facility Costs

Phase	Average Demand Capacity	Cost Estimate
Phase 1	Up to 0.75 mgd	$1,213,000
Phase 2	0.75 mgd to 3.0 mgd	$1,598,000
Phase 3	3.0 mgd to 4.5 mgd	$3,927,000
	Total	**$6,738,000**



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RECLAIMED WATER MASTER PLAN
CITY OF PFLUGERVILLE
ULTIMATE SUPPLY FACILITIES
3.0 TO 4.5 MGD DEMAND

DATE:	SEP 2014
SCALE:	1" = 100'
FIGURE:	9.2

9.6 CAPITAL INVESTMENT SUMMARY

By constructing the reclaimed water distribution system in increments as users are identified and phasing the construction of the pumping and storage facilities, the City will be able to postpone some of the capital investment for the system. However, the phased approach presented for the storage and pumping facilities will require the construction of temporary facilities that will not be included in the ultimate system costing the City additional capital. By constructing the ultimate facilities first without the interim phases, it is estimated that the City could save approximately $1,268,000. Table 9.3 shows a summary of the total costs for proposed reclaimed water system assuming fire service is provided.

Table 9.3: Total Capital Investment Summary

	Estimated Cost
Transmission/Distribution Piping[1]	$7,512,000
Storage and Pumping (Phased)[2]	$6,738,000
Storage and Pumping (Non Phased)[3]	$5,470,000
Total Construction Cost (Phased)	**$14,250,000**
Total Construction Cost (Non Phased)	**$12,982,000**
Estimated Savings for Non Phased Approach	$1,268,000

1 – Piping sized for fire protection service
2 – Assumes Phases 1, 2, and 3 will be constructed.
3 – Assumes Phases 1 and 2 will not be constructed.

9.7 IMPLEMENTATION PLAN

Developing a reclaimed water master plan is the first step in implementing a reclaimed water system. The phased approach outlined in this plan will allow the City to negotiate with potential developments that will have significant reclaimed water needs. Once the first significant reclaimed water user has been identified, the City can move forward with the design and construction of the pipeline to that user including the design and construction of the storage and pumping facilities at the Central WWTF. For planning purposes, it is estimated that design, bidding and construction of the storage and pumping facilities will take 12 to 18 months, depending on which phase is required for the initial user(s). The design, easement acquisition, bidding and construction of the transmission piping is estimated to take 18 to 24 months. We

recommend that the City consider budgeting for the design of these facilities in order to shorten the implementation timeline once a significant user is identified.

APPENDIX A

TCEQ – RECLAIMED WATER AUTHORIZATION NO. R11845-002

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

July 18, 2000

Mr. John A. Bartle, P.E.
Neptune-Wilkinson Associates, Inc.
4010 Manchaca Road
Austin, Texas 78704

Re: Reclaimed Water Project
Texas Natural Resource Conservation Commission (TNRCC) Permit Nos. 11845-002
Authorization No. R 11845-002
Travis County, Texas

Dear Mr. Bartle:

We have completed our review of information submitted on the above referenced project. The project under review consists of using reclaimed water from the City of the Pflugerville's Upper Gilleland Central Wastewater Treatment Plant (TNRCC Permit No. 11845-002) in Travis County. The treated effluent will be used to irrigate the Northeast Metropolitan Park with Type I and Type II Reclaimed Water defined in 30 TAC §210.32 (Specific Uses of Reclaimed Water).

Our review showed that the material generally meets the applicable minimum standards as set forth in the Texas Natural Resource Conservation Commission's rules titled Use of Reclaimed Water. The project is approved. The attachment to this letter indicates the approved site and conditions that apply to this approval.

If you have any questions please contact me at (512) 239-4552.

Sincerely,

Louis C. Herrin, III, P.E. (MC 148)
Wastewater Permitting Section

cc: Mr. Steve Jones, City of Pflugerville, w/attachments
Mr. John Carlton, Armbrust Brown & Davis, LLP.
TNRCC, Region 11, Office, w/attachments
TNRCC, Wastewater Data Management Team, (Attn: Ms. Jan Sills), w/attachments
TNRCC, Application Team, (Att.: Ms. Mary Taylor), w/attachments

Authorization No. R11845-002

AUTHORIZATION FOR RECLAIMED WATER

Producer: City of Pflugerville
P.O. Box 589
Pflugerville, Texas 78660-0589

Providers: City of Pflugerville
Upper Gilleland Central Wastewater Treatment Plant
P.O. Box 589
Pflugerville, Texas 78660-0589

Users: Travis County
P.O. Box 1748
Austin, TX 78767

Location: The wastewater treatment plant site is located approximately 1.7 miles southeast of the City of Pflugerville and approximately 1.0 mile southwest of the intersection of Dessau Road and Farm-to-Market Road 1825 on the east bank of Gilleland Creek in Travis County.

Authorization: The effluent is to be used for irrigating the Northeast Municipal Park in two phases: the first phase will supply Type II reclaimed water to the park to establish grass growth during construction of the park facilities and second phase will supply Type I reclaimed water on the same area to maintain the playing fields and landscaped area.

This authorization contains the conditions that apply to the uses of the reclaimed water. The approval of a reclaimed water use project under Chapter 210 does not affect any existing water rights. If applicable, a reclaimed water use authorization in no way affects the need of a producer, provider and/or user to obtain a separate water right authorization from the commission.

Issued Date: July 18, 2000

Louis C. Herrin, III, P.E.
Wastewater Permitting Section
Water Permits and
Resource Management Division

I. General Requirements.

(a) No wastewater treatment plant operator (producer) shall transfer to a user reclaimed water without first notifying the commission.

(b) Irrigation with untreated wastewater is prohibited.

(c) Food crops that may be consumed raw by humans shall not be spray irrigated. Food crops including orchard crops that will be substantially processed prior to human consumption may be spray irrigated. Other types of irrigation that avoid contact of reclaimed water with edible portions of food crops are acceptable.

(d) There shall be no nuisance conditions resulting from the distribution, the use, and/or storage of reclaimed water.

(e) Reclaimed water shall not be utilized in a way that degrades ground water quality to a degree adversely affecting its actual or potential uses.

(f) Reclaimed water managed in ponds for storage must be prevented from discharge into waters in the state, except for discharges directly resulting from rainfall events or in accordance with a permit issued by the commission. All other discharges are unauthorized. If any unauthorized overflow of a holding pond occurs causing discharge into or adjacent to waters in the state, the user or provider, as appropriate, shall report any noncompliance. A written submission of such information shall also be provided to the commission regional office and to the Austin Office, Water Enforcement Section (MC-149), within five (5) working days of becoming aware of the overflow. The written submission shall contain a description of the noncompliance and its cause; the potential danger to human health or safety, or the environment; the period of noncompliance, including exact dates and times; if the noncompliance has not been corrected, the anticipated time it is expected to continue; and, steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance, and to mitigate its adverse effects.

(g) Unless otherwise provided in this authorization, there shall be no off-site discharge, either airborne or surface runoff, of reclaimed water from the user's property except to a wastewater treatment system or wastewater treatment collection system unless the reclaimed water user applies for and obtains a permit from the commission which authorizes discharge of the water.

(h) Signs in both English and Spanish shall be posted at storage areas, hose bibs and faucets reading "Reclaimed Water, Do Not Drink" or similar warnings. Alternately, the area may be secured to prevent access by the public.

(I) Reclaimed water piping shall be separated from potable water piping when trenched by a distance of at least nine feet. Exposed piping, hose bibs and faucets shall be painted purple and designed to prevent connection to a standard water hose. All piping shall be stenciled with a warning reading "NON-POTABLE WATER".

(j) The design of distribution systems which will convey reclaimed water to a user shall be approved by the executive director. Materials shall be submitted for approval by the executive director in accordance with the Texas Engineering Practice Act (Article 3271a, Vernon's Annotated Texas Statutes). The plans and specifications for the distribution systems authorized by this authorization must be approved pursuant to state law, and failure to secure approval before commencing construction of such works or making a transfer of reclaim water therefrom is a violation of this authorization, and each day of a transfer is an additional violation until approval has been secured.

(k) Nothing in this authorization modifies any requirements of the Texas Department of Health found in Title 25 Texas Administrative Code (TAC), Chapter 337.

(l) Major changes from a prior notification for use of reclaimed water must be approved by the executive director. A major change includes:
- (1) a change in the boundary of the approved service area not including the conversion of individual lots within a subdivision to reclaimed water use;
- (2) the addition of a new producer;
- (3) major changes in the intended use, such as conversion from irrigation of a golf course to residential irrigation; or
- (4) changes from either Type I or Type II uses to the other except as authorized herein.

(m) The reclaimed water producer and user shall maintain on the sites a current operation and maintenance plan. The operation and maintenance plan which shall contain, as a minimum the following:
- (1) a labeling and separation plan for the prevention of cross connections between reclaimed water distribution lines and potable water lines;
- (2) the measures that will be implemented to prevent unauthorized access to reclaimed water facilities (e.g., secured valves);
- (3) procedures for monitoring reclaimed water;
- (4) a plan for how reclaimed water use will be scheduled to minimize the risk of inadvertent human exposure;
- (5) schedules for routine maintenance;
- (6) a plan for worker training and safety; and
- (7) contingency plan for system failure or upsets.

II. Storage Requirements for Reclaimed Water.

(a) All initial holding ponds designed to contain Type I or Type II effluent shall conform to the following requirements:
- (1) The ponds, whether constructed of earthen or other impervious materials, shall be designed and constructed so as to prevent groundwater contamination;
- (2) Soils used for pond lining shall be free from foreign material such as paper, brush, trees, and large rocks;
- (3) All soil liners must be of compacted material having a permeability less than or equal to 1×10^{-4} cm/sec, at least 24 inches thick, compacted in lifts no greater than 6 inches each;
- (4) Synthetic membrane linings shall have a minimum thickness of 40 mils. In situ liners at least 24 inches thick meeting a permeability less than or equal to 1×10^{-4} cm/sec are acceptable alternatives;
- (5) Certification shall be furnished by a Texas Registered Professional Engineer that the pond lining meets the appropriate criteria prior to utilization of the facilities; and
- (6) Soil embankment walls shall have a top width of at least five feet. The interior and exterior slopes of soil embankment walls shall be no steeper than one foot vertical to three feet horizontal unless alternate methods of slope stabilization are utilized. All soil embankment walls shall be protected by a vegetative cover or other stabilizing material to prevent erosion. Erosion stops and water seals shall be installed on all piping penetrating the embankments.
- (7) An alternative method of pond lining which provides equivalent or better water quality protection than provided under this section may be utilized with the prior approval of the executive director.

(8) A specific exemption may be obtained from the executive director if, after the review of data submitted by the reclaimed water provider or user, as appropriate, the executive director determines containment of the reclaimed water is not necessary, considering:

(A) soil and geologic data, and ground water data, including its quality, uses, quantity and yield; and

(B) adequate demonstration that impairment of ground water for its actual or potential use will be prevented.

(b) Reclaimed water may be stored in leak-proof, fabricated tanks.

III. Specific Uses and Quality Standards for Reclaimed Water

Numerical parameter limits pertaining to specific reclaimed water use categories are contained in this section. These limits apply to reclaimed water before discharge to initial holding ponds or a reclaimed water distribution system. It shall be the responsibility of the reclaimed water producer to establish that the reclaimed water meets the quality limits at the sample point for the intended use in accordance with the monitoring requirements identified in Section IV relating to Sampling and Analysis.

Phase I Limitations: During the period starting from the date of issuance and lasting through the completion of the construction of the pump station, the authorization is subjected to the following requirements:

(a) Type II Reclaimed Water Use. The type of use is that where the public would not come in contact with the reclaimed water. The use allowed by this authorization is the irrigation of Northeast Metropolitan Park for the establishment of grass and landscaping during the construction of the park facilities.

(b) The following conditions apply to this type of use of reclaimed water. At a minimum, the reclaimed water producer shall only transfer reclaimed water of the following quality as described for Type II reclaimed water use, reclaimed water on a 30-day average shall have a quality of:

$CBOD_5$	15 mg/l
Fecal Coliform	200 CFU/100 ml*
Fecal Coliform (not to exceed)	800 CFU/100 ml**

Phase II Limitations: During the period starting from the completion of the construction of the pump station and lasting through the date of expiration of this authorization, the authorization is subjected to the following requirements:

(c) Type I Reclaimed Water Use. The type of use is that where the public would come in contact with the reclaimed water. The use allowed by this authorization is the irrigation of Northeast Metropolitan Park to maintain the playing fields and landscaped areas.

(d) The following conditions apply to this type of use of reclaimed water. At a minimum, the reclaimed water producer shall only transfer reclaimed water of the following quality as described for each type of specific use, reclaimed water on a 30-day average shall have a quality of:

$CBOD_5$	5 mg/L
Turbidity	3 NTU
Fecal Coliform	20 CFU/100 ml*
Fecal Coliform (not to exceed)	75 CFU/100 ml**

* geometric mean

** single grab sample

IV. Sampling and Analysis.

The reclaimed water producer shall sample the reclaimed water prior to distribution to user to assure that the water quality is in accord with the intended contracted use. Analytical methods shall be in accord with those specified in Chapter 319 (relating to Monitoring and Reporting). The minimum sampling and analysis frequency for Type II reclaimed water is once per week and for Type I reclaimed water is twice per week.

The monitoring shall be done after the final treatment unit prior to pumping the reclaimed water to Northeast Metropolitan Park. These records shall be maintained on a monthly basis and be available at the plant site for inspection by authorized representatives of the Commission for at least five years.

V. Record Keeping and Reporting.

(a) The reclaimed water provider and user shall maintain records on site for a period of five years.

(1) Records to be maintained by the provider include:

(A) copies of notifications made to the commission concerning reclaimed water projects.

(B) as applicable, copies of contracts made with each reclaimed water user (this requirement does not include reclaimed water users at residences that have separate distribution lines for potable water).

(C) records of volume of water delivered to each reclaimed water user per delivery (this requirement does not apply to reclaimed water users at residences that have separate distribution lines for potable water).

(D) reclaimed water quality analyses.

(2) The reclaimed water producer shall report to the commission on a monthly basis the following information on forms furnished by the executive director. Such reports are due to the commission by the 20th day of the month following the reporting period.

(A) volume of reclaimed water delivered to provider.

(B) quality of reclaimed water delivered to a user or provider reported as a monthly average for each quality criteria except those listed as "not to exceed" which shall be reported as individual analyses.

VI. Transfer of Reclaimed Water.

Reclaimed water transferred from a provider to a user shall be done on a demand only basis. This means that the reclaimed water user may refuse delivery of such water at any time. All reclaimed water transferred to a user must be of at least the treatment quality specified in Section IV. Transfer shall be accomplished via pipes or tank trucks.

VII. General Prohibitions.

Except for on-channel ponds, storage facilities for retaining reclaimed water prior to use shall not be located within the flood way and shall be protected from the 100-year flood.

VIII. Restrictions.

This authorization does not convey any property right and does not grant any exclusive privilege.

IX. Responsibilities and Contracts.

(a) The producer of reclaimed water will not be liable for misapplication of reclaimed water by users, except as provided in this section. Both the reclaimed water provider and user have, but are not limited to, the following responsibilities:

(1) The reclaimed water producer shall:

(A) transfer reclaimed water of at least the minimum quality required by this chapter at the point of delivery to the user for the specified use;

(B) sample and analyze the reclaimed water and report such analyses in accordance with Sections IV and V relating to Sampling and Analysis and Record keeping and Reporting, respectively; and

(C) notify the executive director in writing within five (5) days of obtaining knowledge of reclaimed water use not authorized by the executive director's reclaimed water use approval.

(2) The reclaimed water provider shall:

(A) assure construction of reclaimed water distribution lines/systems in accordance with 30 TAC Chapter 317 and in accordance with approved plans and specifications;

(B) transfer reclaimed water of at least the minimum quality required by this chapter at the point of delivery to the user for the specified use;.

(C) notify the executive director in writing within five (5) days of obtaining knowledge of reclaimed water use not authorized by the executive director's reclaimed water use approval; and

(D) not be found in violation of this chapter for the misuse of the reclaimed water by the user if transfer of such water is shut off promptly upon knowledge of misuse regardless of contract provisions.

(3) The reclaimed water user shall:

(A) use the reclaimed water in accordance with this authorization; and

(B) maintain and provide records as required by Section V relating to Record Keeping and Reporting.

X. Enforcement.

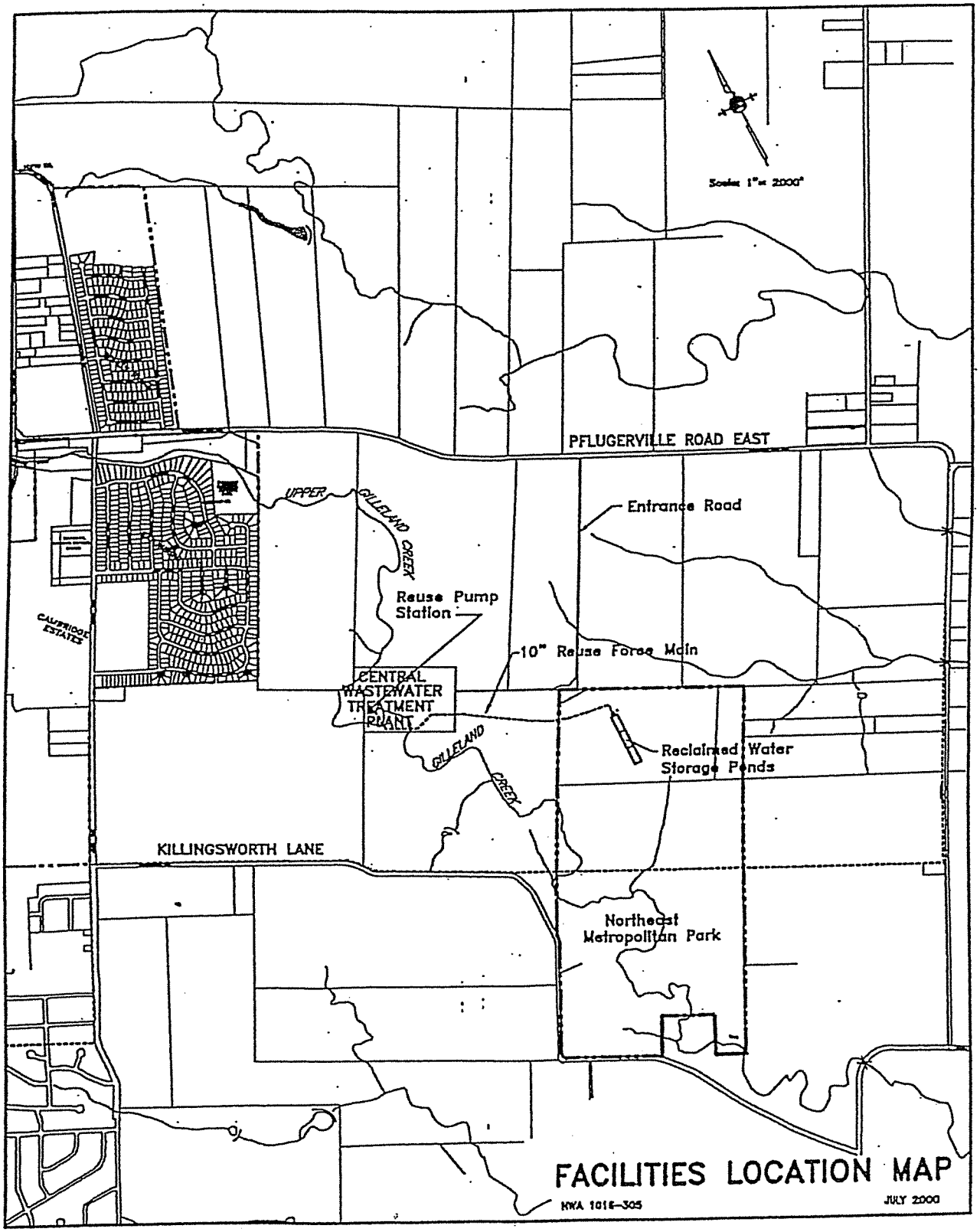
If the producer, provider and/or user fails to comply with the terms of this authorization, the executive director may take enforcement action provided by the Texas Water Code, §§26.019 and 26.136.

XI. STANDARD PROVISIONS:

(a) This authorization is granted in accordance with the Texas Water Code and the rules and other Orders of the Commission and the laws of the State of Texas.

(b) Acceptance of this authorization constitutes an acknowledgment and agreement that the provider and user will comply with all the terms, provisions, conditions, limitations and restrictions embodied in this authorization and with the rules and other Orders of the Commission and the laws of the State of Texas. Agreement is a condition precedent to the granting of this authorization.

Attachment "A"



NORTHEAST METRO PARK UTILITIES INTERLOCAL COOPERATION AGREEMENT CITY OF PFLUGERVILLE AND TRAVIS COUNTY, TEXAS

This agreement is made and entered into by and between Travis County, Texas, (the "County") and the City of Pflugerville (the "City"), hereinafter collectively referred to as the "Parties", for the purposes and consideration herein described.

RECITALS:

Whereas, to serve various improvements at the Northeast Metro Park (the "Park"), including athletic fields, a concession building, and public restrooms, the County has constructed the following utility facilities:

1. an 8" to 6" water main ("Water Main") beginning at the end of the City's existing 12" water main and then running east along the north side of Killingsworth Road and then northeast along the dry tributary to Gilleland Creek and then across Gilleland Creek and into the Park;

2. a wastewater force main ("Force Main"), including lift stations, grinder pumps, and electrical service with metering, for the collection of wastewater within the Park and delivery of the wastewater to the City's wastewater treatment plant; and

3. a treated wastewater effluent distribution system ("Reuse System"), including lines, pumps, control system, and electric service with metering, from near the City's wastewater treatment facility to a point that discharges into the County's retention ponds in the Park; and

Whereas, the City is capable of providing potable water, wastewater service, and treated wastewater effluent for irrigation; and

Whereas, supplying the Park improvements with potable water, wastewater service, and treated wastewater effluent for irrigation will mutually benefit the residents of both the City and the County; and

Whereas, the City and the County intend to conform this Agreement with the Interlocal Cooperation Act, Texas Government Code Section 791.001, et seq.;

AGREEMENTS:

NOW, THEREFORE, the parties hereto agree as follows:

I. OWNERSHIP AND OPERATION OF THE FACILITIES

a. WATER MAIN

i. The County shall complete the Water Main by connecting it to the City's existing main, including the installation of an 8" gate valve, and installing a 2" water meter at a point approximately 300 to 400 feet within the Park ("Point of Connection"). Upon receipt of the necessary impact fees under the City's Ordinances and Regulations, the City shall provide water service.

ii. After the City has determined that the completed Water Main meets all City standards, the County will dedicate and the City will accept the Water Main and associated easements for operation and maintenance from the 8" gate valve to the Point of Connection. Once accepted, the City will operate and maintain the Water Main at its sole cost and expense. The County shall own, operate, and maintain the Water Main until accepted by the City.

iii. The County must comply with all the City's Ordinances and Regulations regarding water utility service, including regulations regarding water conservation and payment of utility bills. The City may terminate the retail water service provided under this Agreement if the County fails to comply with the City's Ordinances and Regulations regarding water utility service.

iv. All areas to be served by the Water Main in the immediate future are outside the certificated water service area of any utility. However, future phases of the Park are inside the certificated water service area of Manville Water Supply Corporation ("Manville"). The County, on behalf of and with the cooperation and assistance of the City, will obtain Manville's written consent and agreement to allow the City to provide retail water service to the Park as contemplated under this Agreement. Upon Manville granting such consent to the City and completion of the necessary facilities by the County, the City shall begin providing service.

b. FORCE MAIN

i. The County shall complete the Force Main by connecting it to the City's wastewater treatment facility. Upon receipt of the necessary impact fees under the City's Ordinances and Regulations, the City will provide wastewater service for the Park.

ii. After the City has determined that the completed Force Main meets all City standards, the County will dedicate and the City will accept the Force Main and associated easements for operation and maintenance. Once accepted, the City will operate and maintain the Force Main at its sole cost and expense, including cost of electricity. The County shall own, operate, and maintain the Force Main until accepted by the City.

iii. The County must comply with all the City's Ordinances and Regulations regarding wastewater utility service, including regulations regarding water conservation and payment of utility bills. The City may terminate the wastewater service provided under this Agreement if the County fails to comply with the City's Ordinances and Regulations regarding wastewater utility service.

c. REUSE SYSTEM

i. The County shall complete the Reuse System, including a pump station within the City's wastewater treatment facility, electrical service, and an electrical meter. The Reuse System must be designed and constructed in accordance with all applicable federal, state and local regulations, including approval by the City, regarding such reuse facilities. Upon receipt of any necessary approvals from the Texas Natural Resource Conservation Commission ("Commission"), or any other regulatory entities with jurisdiction over the reuse of treated wastewater, the City will deliver an amount of treated wastewater effluent to the County through the Reuse System. Upon approval by the Commission, the City will provide treated wastewater effluent "on demand" by and in the quantities determined by the County to be necessary for its irrigation needs in the Park.

ii. After the City has determined that the Reuse System meets all City and other standards, the County will dedicate and the City will accept the Reuse System and associated easements for operation and maintenance. Once accepted, the City will operate and maintain the Reuse System at its sole cost and expense, including cost of electricity. The County shall remain responsible for operation and maintenance of the Reuse System until accepted by the City.

d. CONSTRUCTION UPON CITY PROPERTY

The County will coordinate with a designated City employee and the General Contractor for any construction work upon or near City property. No construction may occur upon City property without the prior written approval of the City Manager.

e. PERMITS

The City will expeditiously apply for and obtain all permits, permit amendments, or other authorizations from governmental entities having jurisdiction that are necessary to provide the services contemplated by this Agreement. The City will not unduly delay any aspect of the permitting process that is within its control. The County may review and concur with such applications before their filing.

II. FEES.

a. In accordance with the City's Impact Fee Ordinance for connection to the City's water and wastewater systems, the County will pay an impact fee for water service in the amount of $6,368.00 and for wastewater service in the amount of $3,696.00, both based on use of the 2" water meter to be installed by the County. If the County replaces the 2" meter with a meter of a different size, the impact fee shall be adjusted accordingly. The County shall either pay the difference if it installs a larger meter or be entitled to a credit if it installs a smaller meter. The City waives all service deposits, permit fees, and other similar charges for approvals required by the City for utility service to the Park.

b. The County will pay the City for water delivered to the Point of Connection at the City's then current adopted rates, charges, and fees for water supplied by the City.

c. The County will pay the City for wastewater collected at the City's then current adopted rates, charges, and fees for non-residential City treated wastewater.

d. For treated wastewater effluent, the County shall pay $0.05 per 1000 gallons for the first 25,000,000 gallons per month and $.10 per 1000 gallons thereafter. After the first year, the County agrees to pay a per gallon rate calculated to reflect the City's actual operation and maintenance costs for the Reuse System from the prior year. Effluent volumes used shall be calculated by multiplying the period of time the City is operating the pump to send effluent to the County's ponds in the Park by the capacity of the pump. The capacity of the pump shall be recalibrated annually.

III. GENERAL PROVISIONS

a. The City Manager and the County's Executive Manager of Transportation and Natural Resources (the "Manager") will act on behalf of the City and the County, respectively, in the implementation of this contract. The City Manager and the Manager will have complete authority to interpret and define the City's and County's policies and decisions with respect to the administration of this Agreement. The City Manager and the Manager may designate other representatives to transmit instructions and receive information.

b. To the extent provided by Texas law, the City and the County agree that each separate entity is responsible for its own negligent acts and omissions in the activities undertaken pursuant to this Agreement.

c. The party or parties paying for the performance of governmental functions or services shall make payments therefore from current revenues available to the paying party.

d. Any notice given hereunder by either party to the other shall be in writing and may be effected by personal delivery in writing or by registered or certified mail, return receipt requested when mailed to the proper party, at the following addresses:

CITY: City of Pflugerville
Attention: Steve Jones, City Manager (or successor)
100 E. Main St.
Pflugerville, Texas 78660

COPY TO: John Carlton, City Attorney (or successor)
Armbrust Brown & Davis, L.L.P.
100 Congress Avenue, Suite 1300
Austin, Texas 78701

COUNTY: Joe Gieselman (or successor)
Executive Manager

Transportation and Natural Resources
P.O. Box 1748
Austin, Texas 78767

COPY TO: Ken Oden (or successor)
Travis County Attorney
Attention: File No. 163.750
P.O. Box 1748
Austin, Texas 78767

e. As used in this Agreement, whenever the context so indicates, the masculine, feminine, or neuter gender and the singular of plural number shall each be deemed to include the others.

f. This Agreement contains the complete and entire Agreement between the parties respecting the matters addressed herein, and supersedes all prior negotiations, agreements, representations, and understandings, if any. This Agreement may not be modified, discharged, or changed in any respect whatsoever except by a further agreement in writing duly executed by the parties hereto. However, any consent, waiver, approval or authorization shall be effective, if signed by the party granting or making such consent, waiver, approval, or authorization. No official, representative, agent, or employee of Travis County, Texas has any authority to modify this Agreement, except pursuant to such express authority as may be granted by the Commissioners Court of Travis County, Texas. No official, representative, agent, or employee of the City of Pflugerville, Texas, has any authority to modify this Agreement, except pursuant to such express authority as may be granted by the City Council of the City of Pflugerville, Texas.

g. The parties agree that to execute other and further instruments and documents as are or may become necessary or convenient to carry out the purposes of this Agreement.

h. Any clause, sentence, provision, paragraph, or article of this agreement held by a court of competent jurisdiction to be invalid, illegal, or ineffective shall not impair, invalidate, or nullify the remainder of this Agreement, but the effect thereof shall be confined to the clause, sentence, provision, paragraph, or article so held to be invalid, illegal, or ineffective.

i. This Agreement shall be construed under the laws of the State of Texas and all obligations of the parties hereunder are performable in Travis County, Texas. Any suits pursued relating to this Agreement will be filed in a district court of Travis County, Texas.

j. Except as otherwise expressly provided herein, nothing in this Agreement, express or implied, is intended to confer upon any person, other than the parties hereto, any benefits, rights, or remedies under or by reason of this Agreement.

k. This Agreement may be executed simultaneously in one or more counterparts, each of which shall be deemed an original and all of which together constitute one and the same instrument. In like manner, from and after the time it executes a consent or other document authorized or required by the terms of the Agreement, such consent or other document shall be binding upon such party.

Effective as of the later day written below.

TRAVIS COUNTY, TEXAS

By: Samuel T. Biscoe
Samuel T. Biscoe, County Judge

Date: 4-20-00

CITY OF PFLUGERVILLE

By: S. Jones
Steve Jones, City Manager

Date: 4/17/00

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 16, 2009

Mr. David Buesing, City Manager
City of Pflugerville
P.O. Box 589
Pflugerville, Texas 78660-0589

Re: Upper Gilleland Central Wastewater Treatment Facility
Reclaimed Water Authorization No.11845002
CN600412985, RN101611440
Travis County

Dear Mr. Buesing:

The Texas Commission on Environmental Quality has completed its review of the application for an amendment to the above referenced authorization submitted on April 27, 2009. The authorization allows the use of Type I and Type II reclaimed water from the Upper Gilleland Creek facility. The amendment included in this authorization is the addition of irrigation of five acres owned by the City and used as a community garden.

Thank you for your cooperation during this review process. If you have any questions, please contact Sherry Smith of my staff at (512) 239-0571.

Sincerely,

Chris Linendoll, Manager
Wastewater Permitting Section
Water Quality Division

CL/SS/ms

cc: Mr. Darren Strozewski, P.E., GE Walker & Associates, 6034 W. Courtyard Dr., Ste. 135, Austin, Texas 78730
Mr. James Wills, Utility Director, City of Pflugerville, P.O. Box 589, Pflugerville, Texas 78691

Authorization No. R11845002
This authorization supersedes and
replaces No. R 11845002
approved July 18, 2000.

AUTHORIZATION FOR RECLAIMED WATER

Producer: City of Pflugerville
P.O. Box 589
Pflugerville, TX 78660-0589

Providers: City of Pflugerville
Upper Gilleland Creek Central Wastewater Treatment Plant
P.O. Box 589
Pflugerville, TX 78660-0589

Users:

Travis County	City of Pflugerville
P.O. Box 1748	P.O. Box 589
Austin, TX 78767	Pflugerville, TX 78660-0589

Location: The wastewater treatment plant site is located approximately 1.7 miles southeast of the City of Pflugerville and approximately 1.0 mile southwest of the intersection of Dessau Road and Farm-to-Market Road 1825 on the east bank of Gilleland Creek in Travis County.

Authorization: Type I and Type II reclaimed water from the City's Upper Gilleland Creek Wastewater Treatment Facility (TPDES Permit No. WQ0011845002) to be used for irrigation of athletic fields, green spaces, and a community garden. The service area is within the city limits as shown in Attachment A.

This authorization contains the conditions that apply for the uses of the reclaimed water. The approval of a reclaimed water use project under Chapter 210 does not affect any existing water rights. If applicable, a reclaimed water use authorization in no way affects the need of a producer, provider and/or user to obtain a separate water right authorization from the commission. This authorization does not allow irrigation of any area authorized for irrigation under a Texas Land Application Permit.

This action is taken under authority delegated by the Executive Director of the Texas Commission on Environmental Quality.

Issued Date: June 16, 2009

Mark Vickery, Executive Director

The authorization is subject to the following requirements:

I. General Requirements

(a) No producer or provider may begin transferring reclaimed water to a user without first notifying the commission.

(b) Reuse of untreated wastewater is prohibited.

(c) Food crops that may be consumed raw by humans must not be spray irrigated. Food crops including orchard crops that will be substantially processed prior to human consumption may be spray irrigated. Other types of irrigation that avoid contact of reclaimed water with edible portions of food crops are acceptable.

(d) There must be no nuisance conditions resulting from the distribution, the use, and/or storage of reclaimed water.

(e) Reclaimed water must not be used in a way that degrades groundwater quality to a degree adversely affecting its actual or potential uses.

(f) Reclaimed water stored in ponds must be prevented from discharging into waters in the state, except for discharges directly resulting from rainfall events, in accordance with a permit issued by the commission, or as authorized under the City's Upper Gilleland Creek wastewater treatment facility (TPDES No. WQ0011845002). All other discharges are unauthorized. If any unauthorized overflow of a holding pond occurs causing discharge into or adjacent to waters in the state, the user or provider, as appropriate, shall report any noncompliance. A written submission of such information must be provided to the TCEQ Region 11 office in Austin and to the TCEQ Enforcement Division (MC-149) in Austin, within five (5) working days after becoming aware of the overflow. The written submission must contain a description of the noncompliance and its cause; the potential danger to human health, safety, or the environment; the period of noncompliance, including exact dates and times; if the noncompliance has not been corrected, the anticipated time it is expected to continue; and, steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance, and to mitigate its adverse effects.

(g) Unless otherwise provided in this authorization, there must be no off-site discharge, either airborne or surface runoff, of reclaimed water from the user's property except to a wastewater treatment system or wastewater treatment collection system unless the reclaimed water user applies for and obtains a permit from the commission that authorizes discharge of the water.

(h) All reclaimed water piping must be separated from potable water piping when trenched by a distance of at least nine feet. All buried pipe must be manufactured in purple, painted purple, taped with purple metallic tape or bagged in purple. All exposed piping, hose bibs and faucets must be painted purple, designed to prevent connection to a standard water hose, and stenciled with a warning reading "**NON-POTABLE WATER.**"

(i) The design of any new distribution system that will convey reclaimed water to a user must require the approval of the executive director. Materials must be submitted to the executive director in accordance with the Texas Engineering Practice Act (Article 3271a, Vernon's Annotated Texas Statutes). The plans and specifications for any new distribution system constructed pursuant to this authorization must be approved pursuant to state law, and failure to secure approval before commencing construction of such works or making a transfer of reclaimed water is a violation of this authorization. Each day of a transfer is an additional violation until approval has been secured.

(j) Nothing in this authorization modifies any requirements of the found in 30 TAC Chapter 290, *Public Drinking Water.*

(k) A major change from a prior notification for use of reclaimed water must be approved by the executive director before it can be implemented. A major change includes:

(1) a change in the boundary of the approved service area not including the conversion of individual lots within a subdivision to reclaimed water use;

(2) the addition of a new producer;

(3) a major change in the intended use, such as conversion from irrigation of a golf course to residential irrigation; or

(4) a change from either Type I or Type II use to the other.

(l) The reclaimed water producer, provider, and user shall maintain a current operation and maintenance plan on the sites over which they have operational control. The operation and maintenance plan must contain the following, as a minimum:

(1) a copy of the signed contract between the user and provider and/or a copy of the signed contract between the provider and the producer;

(2) a labeling and separation plan for the prevention of cross connections between reclaimed water distribution lines and potable water lines;

(3) the measures that will be implemented to prevent unauthorized access to reclaimed water facilities (e.g., secured valves);

(4) procedures for monitoring reclaimed water;

(5) a plan for how reclaimed water use will be scheduled to minimize the risk of inadvertent human exposure;

(6) schedules for routine maintenance;

(7) a plan for worker training and safety; and

(8) contingency plan for system failure or upsets.

(m) One of the following requirements must be met by the user or provider, for any area where reclaimed water is stored or where there are hose bibs or faucets:

(1) Signs having a minimum size of eight inches by eight inches must be posted at all storage areas and on all hose bibs and faucets reading, in both English and Spanish, **"Reclaimed Water, Do Not Drink"** or similar warning.

(2) The area must be secured to prevent access by the public.

(n) Where a reclaimed water line parallels a sewer line, the reclaimed water line must be constructed in accordance with subsection (p) or (q) of this section. The horizontal separation distance must be three feet (outside to outside) with the reclaimed water line at the level of or above the sewer line. Reclaimed water lines that parallel sewer lines may be placed in the same benched trench. Where a reclaimed water line crosses a sewer line, the requirement of 30 TAC §290.44(e)(5)(B), *Location of Water Lines*, must be followed with the reclaimed water line substituted for the water line.

(o) Reclaimed water lines that transport reclaimed water under pressure must be sized according to acceptable engineering practices for the needs of the reclaimed water users. The provider shall prevent high velocity scouring and maintain adequate fluid velocity to prevent the deposition of solids in the lines. Pipe specified for reclaimed water force mains must have an expected life of at least as long as that of the associated lift station and must be suitable for the reclaimed water being pumped and operating pressure to which it will be subjected. All pipe must be identified in the technical specifications with appropriate American Society for Testing and Materials, American National Standard Institute, or American Water Works Association standard numbers for both quality control (dimensions, tolerance, and installation such as bedding or backfill). All pipes and fittings must have a minimum working pressure rating of 150 pounds per square inch. Final plans and specifications must describe required pressure testing for all installed reclaimed water force mains. Minimum test pressure must be 1.5 times the maximum design pressure. Allowable leakage rates must be determined as described in 30 TAC §217.97, *Pressure Sewer Systems*.

(p) Gravity flow reclaimed water lines must meet the requirements of 30 TAC Chapter 217, Subchapter C, *Conventional Collection Systems*. The provider shall prevent high velocity scouring and maintain adequate fluid velocity to prevent the deposition of solids in the lines.

(q) All exposed piping and piping within a building must be either purple pipe or painted purple. All exposed piping should be stenciled in white with a warning reading **"NON-POTABLE WATER."** All exposed or buried reclaimed water piping constructed at a wastewater treatment facility is exempt from the color-coding requirement of this section.

(r) When applicable, in accordance with 30 TAC Chapter 217, *Design Criteria for Domestic Wastewater Systems,* the design of the distribution systems that will convey reclaimed water to a user must be submitted to the executive director and must receive an approval before the distribution system may be constructed. The design of the distribution systems must meet the

criteria of 30 TAC Chapter 217, *Design Criteria for Domestic Wastewater Systems*. When a municipality is the plan review authority for certain sewer systems that transport primarily domestic waste, in lieu of the commission, design submittal will not be subject to submittal to the commission and instead must be approved by the municipality.

(s) All ground level and elevated storage tanks must be designed, installed, and constructed in accordance with current AWWA standards with reference to materials to be used and construction practices to be followed, except for health-based standards strictly related to potable water storage and contact practices, where appropriately less restrictive standards may be applied.

II. Storage Requirements for Reclaimed Water

(a) Storage facilities for retaining reclaimed water prior to use must not be located within a floodway and must be protected from a 100-year flood.

(b) Outside the Edwards Aquifer Recharge Zone and the DRASTIC Zone

(1) Any holding pond designed to contain Type I or Type II effluent must have a lining with a permeability of no more than 1 x 10^{-4}cm/sc and conform to the following requirements:

(A) The ponds must be designed and constructed to prevent groundwater contamination;

(B) Soils used for pond lining must be free from foreign material such as paper, brush, trees, and large rocks; and

(C) All soil liners must be of compacted material, at least 24 inches thick, compacted in lifts no greater than 6 inches thick and compacted to 95% of Standard Proctor Density. In-situ clay soils meeting the soils liner requirements must be excavated and re-compacted a minimum of 6 inches below planned grade to assure a uniformly compacted finished surface.

(D) Soil liners must meet the following particle size gradation and Atterburg limits:

(i) 30% or more passing a number 200 mesh sieve; and

(ii) a liquid limit of 30% or greater; and a plasticity index of 15 or greater and have a permeability less than or equal to 1 X 10^{-4} cm/sec;

(E) Synthetic membrane linings must have a minimum thickness of 40 mils with a leak detection system. In situ liners at least 24 inches thick meeting a permeability less than or equal to 1 X 10^{-4} cm/sec are acceptable alternatives;

(F) Certification by a Texas licensed professional engineer must be furnished that the pond lining meets the appropriate criteria prior to utilization of the facilities;

(G) Soil embankment walls must have a top width of at least five feet. The interior and exterior slopes of soil embankment walls must be no steeper than one foot vertical to three feet horizontal unless alternate methods of slope stabilization are utilized. All soil embankment walls must be protected by a vegetative cover or other stabilizing material to prevent erosion. Erosion stops and water seals must be installed on all piping penetrating the embankments;

(H) An alternative method of pond lining that provides equivalent or better water quality protection than provided under this section may be utilized with the prior approval of the executive director; and

(2) Reclaimed water may be stored in leak-proof, fabricated tanks.

(3) Subsequent holding ponds utilized for the receipt and storage of reclaimed water of a quality that could cause or causes a violation of a surface water quality standard or impairment of groundwater for its actual or intended use will be also subject to the storage requirements of this section.

III. Specific Uses and Quality Standards for Reclaimed Water

(a) Numerical parameter limits pertaining to specific reclaimed water use categories are contained in this section. These limits apply to reclaimed water before discharge to initial holding ponds or a reclaimed water distribution system.

(b) The reclaimed water producer shall establish that the reclaimed water meets the quality limits at the sample point for the intended use in accordance with the monitoring requirements identified in Section IV, *Sampling and Analysis.*

(c) During the period starting from the date of issuance and lasting through the completion of the construction of the pump station, the authorization is subjected to the following requirements:

(1) Type II Reclaimed Water Use. The type of use is that where the public would not come in contact with the reclaimed water. The uses allowed by this authorization are:

- industrial process water including aggregate wash water and concrete plant cooling water;
- irrigation of sod farms, silviculture, limited access highway rights of way, and other areas where human access is restricted or unlikely to occur;
- maintenance of impoundments or natural water bodies where direct human contact is not likely;

- soil compaction or dust control in construction areas where application procedures minimize aerosol drift to public areas;
- cooling tower makeup water (cooling towers that produce significant aerosols adjacent to public areas may have special requirements); and
- irrigation or other nonpotable uses of reclaimed water at a wastewater treatment facility.

(2) The following conditions apply to Type II use of reclaimed water. At a minimum, the reclaimed water producer shall transfer only reclaimed water of the following quality as described for Type II reclaimed water use. Type II reclaimed water on a 30-day average must have a quality of no more than:

$CBOD_5$	15 mg/l *(30-day daily average)*
Fecal Coliform	200 CFU/100 ml *(geometric mean)*
Fecal Coliform	800 CFU/100 ml *(single grab sample)*

(3) Type I Reclaimed Water Use. The type of use is that where the public would come in contact with the reclaimed water. The uses allowed by this authorization are:

- residential irrigation, including: landscape irrigation at individual homes, public parks, schoolyards, athletic fields, or golf courses with unrestricted public access; and
- maintenance of impoundments or natural water bodies where recreational activities, such as wading or fishing, are anticipated even though the water body was not specifically designed for such a use.

(4) The following conditions apply to Type I use of reclaimed water. At a minimum, the reclaimed water producer shall transfer only reclaimed water of the following quality as described for Type I reclaimed water use. Type I reclaimed water on a 30-day average must have a quality of no more than:

$CBOD_5$	5 mg/l *(30-day daily average)*
Turbidity	3 NTU *(30-day daily average)*
Fecal Coliform	20 CFU/100 ml *(geometric mean)*
Fecal Coliform	75 CFU/100 ml *(single grab sample)*

(d) Test Procedures

(1) Test procedures for the analysis of pollutants must comply with procedures specified in 30 TAC §§319.11 - 319.12. Measurements, tests, and calculations must accurately represent the reclaimed water.

(2) All laboratory tests submitted to demonstrate compliance with this authorization must meet the requirements of 30 TAC Chapter 25, *Environmental Testing Laboratory Accreditation and Certification.*

IV. Sampling and Analysis

(a) The reclaimed water producer shall sample the reclaimed water prior to distribution to user to assure that the water quality is in accord with the intended contracted use.

(b) Analytical methods must be in accord with those specified in 30 TAC Chapter 319, *Monitoring and Reporting.*

(c) The minimum sampling and analysis frequency for Type I reclaimed water is twice per week. The minimum sampling and analysis frequency for Type II reclaimed water is once per week.

(d) The monitoring must be done after the final treatment unit.

(e) The records of the monitoring must be done on a monthly basis and be available at the facility site for inspection by representatives of the Commission for at least five years.

V. Record Keeping and Reporting

(a) The reclaimed water provider and user shall maintain records on site for a period of at least five years.

(1) Records to be maintained by the provider include:

(A) copies of notifications made to the commission concerning reclaimed water projects;

(B) as applicable, copies of contracts made with each reclaimed water user (this requirement does not include reclaimed water users at residences that have separate distribution lines for potable water);

(C) records of volume of water delivered to each reclaimed water user per delivery (this requirement does not apply to reclaimed water users at residences that have separate distribution lines for potable water); and

(D) reclaimed water quality analyses.

(2) The reclaimed water provider or producer shall report to the commission on a monthly basis the following information on forms furnished by the executive director. Such reports are due to the commission by the 20th day of the month following the reporting period.

(A) volume of reclaimed water delivered to provider; and

(B) quality of reclaimed water delivered to a user or provider reported as a monthly average for each quality criteria except those listed as "not to exceed" that must be reported as individual analyses.

(b) The provider shall provide written notice to the Water Quality Application Team (MC 148) and the appropriate TCEQ regional office at least thirty (30) days prior to transfer of Type I reclaimed water.

VI. Transfer of Reclaimed Water

(a) Reclaimed water transferred from a provider to a user must be done on a demand only basis. A reclaimed water user may refuse delivery of such water at any time.

(b) All reclaimed water transferred to a user must be of at least the treatment quality specified in Section IV, *Sampling and Analysis.*

(c) Transfer must be accomplished via pipes or tank trucks.

(d) The transfer of reclaimed water must be terminated immediately if a provider becomes aware of the misuse of the reclaimed water by the user, regardless of contract provisions.

VII. Restrictions

(a) This authorization does not convey any property right and does not grant any exclusive privilege.

(b) This authorization does not allow the use of reclaimed water on land that is authorized as a disposal site under either a Texas Discharge Pollutant Elimination System (TPDES) permit or a Texas Land Application Permit (TLAP).

VIII. Responsibilities and Contracts

(a) The producer of reclaimed water will not be liable for misapplication of reclaimed water by users, except as provided in this section. Both the reclaimed water provider and user have, but are not limited to, the following responsibilities:

(1) The reclaimed water producer shall:

(A) transfer reclaimed water of at least the minimum quality required by this chapter at the point of delivery to the user for the specified use;

(B) sample and analyze the reclaimed water and report such analyses in accordance with Section IV, *Sampling and Analysis,* and Section V, *Record keeping and Reporting*; and

(C) notify the executive director in writing within five (5) days after obtaining knowledge of reclaimed water use not authorized by the executive director's reclaimed water use approval.

(2) The reclaimed water provider shall:

(A) assure construction of reclaimed water distribution lines/systems in accordance with 30 TAC Chapter 217, *Design of Domestic Wastewater Systems*, and in accordance with approved plans and specifications;

(B) transfer reclaimed water of at least the minimum quality required by this chapter at the point of delivery to the user for the specified use;

(C) notify the executive director in writing within five (5) days after obtaining knowledge of reclaimed water use not authorized by the executive director's reclaimed water use approval; and

(D) not be found in violation of this chapter for the misuse of the reclaimed water by the user if transfer of such water is shut off promptly upon knowledge of misuse regardless of contract provisions.

(3) The reclaimed water user shall:

(A) use the reclaimed water in accordance with this authorization; and

(B) maintain and provide records as required by Section III, *Record Keeping and Reporting.*

IX. Enforcement

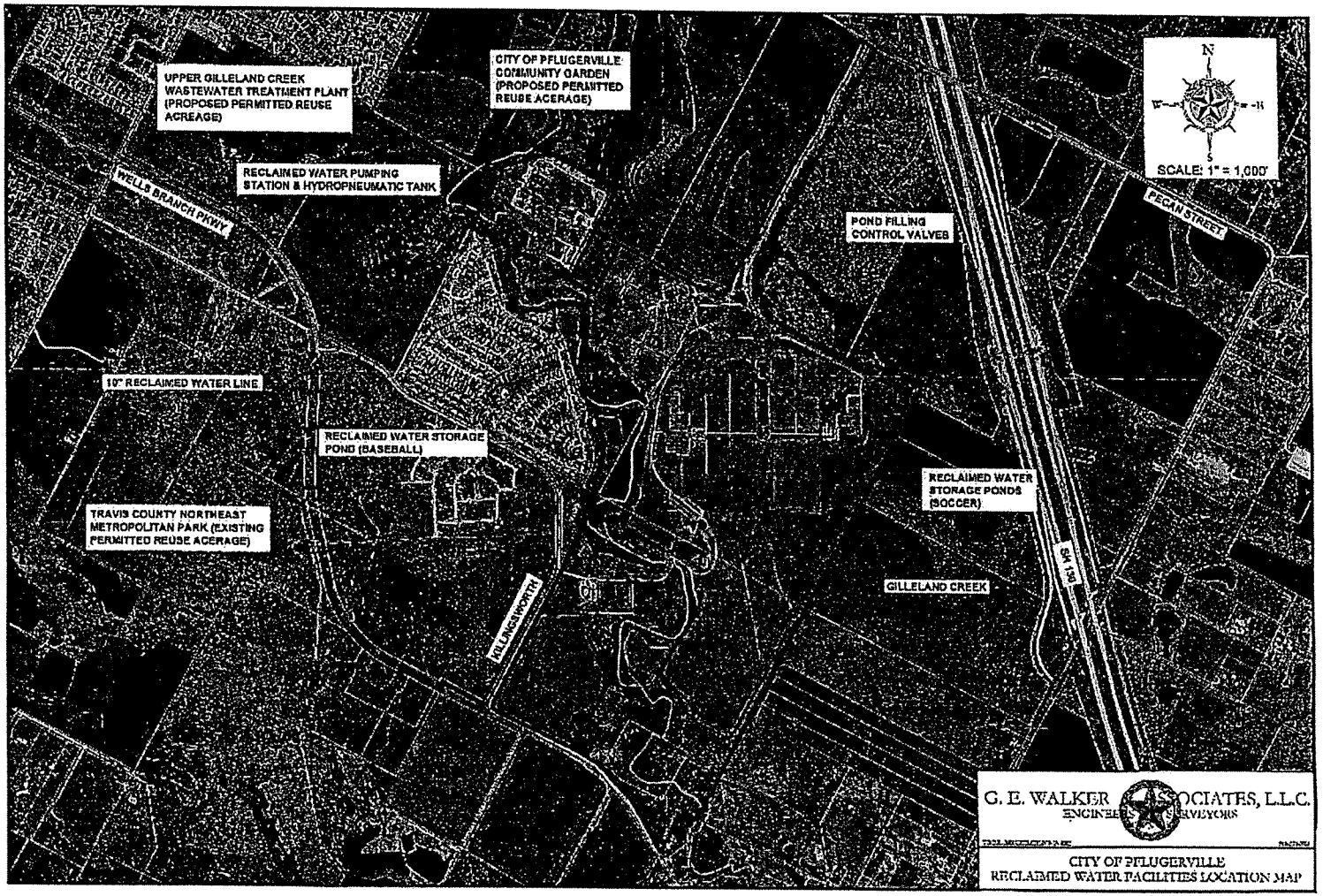
If the producer, provider and/or user fail to comply with the terms of this authorization, the executive director may take enforcement action provided by the Texas Water Code §26.019 and §26.136.

X. Standard Provisions

(a) This authorization is granted in accordance with the rules and orders of the commission and the laws of the state of Texas.

(b) Acceptance of this authorization constitutes an acknowledgment and agreement that the provider and user will comply with all the terms, provisions, conditions, limitations and restrictions embodied in this authorization and with the rules and other orders of the commission and the laws of the state of Texas. Agreement is a condition precedent to the granting of this authorization.

Attachment A



APPENDIX B

INTERLOCAL AGREEMENT FOR WATER AND WASTEWATER SERVICE

RESOLUTION OF THE CITY OF PFLUGERVILLE, TEXAS APPROVING AN INTERLOCAL AGREEMENT FOR WATER AND WASTEWATER SERVICE

WHEREAS: Travis County owns and will operate a public park in the Pflugerville area known as Northeast Metro Park (the Park) located on the east side of the City of Pflugerville (the City); and

WHEREAS: Travis County has applied for water, wastewater and irrigation water service from the City for use in the Park; and

WHEREAS: the City is capable of providing such water, wastewater and irrigation water service to Travis County for the Park; and

WHEREAS: the City and Travis County desire to enter into an agreement regarding the provision of such water, wastewater, and irrigation water service; NOW THEREFORE,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF PFLUGERVILLE, TEXAS:

That the attached interlocal agreement between the City of Pflugerville and Travis County regarding the provision of water, wastewater and irrigation water service, Exhibit A, is hereby approved; and the City Manager is authorized and directed to execute this document on behalf of the City.

APPROVED this 11th day of April, 2000.

CITY OF PFLUGERVILLE, TEXAS

By: _____
Doyle Bridgefarmer, Mayor

ATTEST:

_____
Karen Thompson, City Secretary

FIRST AMENDMENT TO NORTHEAST METRO PARK UTILITIES INTERLOCAL COOPERATION AGREEMENT

This amendment ("First Amendment") is entered into by and between Travis County, Texas, (the "County") and the City of Pflugerville (the "City"), hereinafter collectively referred to as the "Parties".

RECITALS

WHEREAS, on April 22, 2000, the Parties executed the Northeast Metro Park Utilities Interlocal Cooperation Agreement (the "Agreement"), which provided for construction and operation of a treated wastewater effluent distribution system (the "Reuse System") for the County's Northeast Metro Park (the "Park");

WHEREAS, the Reuse System constructed under the Agreement is now inadequate to meet the growing needs of the Park;

WHEREAS, the City is planning to expand the capacity of its wastewater treatment plant;

WHEREAS, it would be mutually beneficial to the Parties to upgrade the Reuse System in conjunction with the City's modification of its wastewater treatment plant;

NOW, THEREFORE, the Parties agree to amend the Northeast Metro Park Utilities Interlocal Cooperation Agreement as follows:

1. Section I.c, REUSE SYSTEM, is amended to read as follows:

c. REUSE SYSTEM

i. The City and the County agree to upgrade the existing Reuse System. The ~~City~~ County shall pay for and the City shall, on behalf of the County, purchase and install a reclaimed water pump with a capacity of 1200 gallons per minute, including a pond valve and control panels ("Pump"), which shall become part of the Reuse System. The City shall pay for and install a rehabilitated hydro tank, an air compressor, a disk filter, and a flow chart recorder and SCADA system software ("City-Owned Items"), which shall become part of the Reuse System. The City shall design and construct the upgraded Reuse System in accordance with all applicable federal, state, and local regulations. The Pump and treated wastewater effluent distribution lines shall be owned by the County and all other components of the Reuse System shall be owned by the City. The City shall provide copies of all purchase contacts, invoices, technical manuals, warranties, and other documentation associated with purchase of the Pump.

ii. The County shall contribute to the Reuse System upgrade by paying the City a total of $383,608 as follows:

Pump	$202,900
City-Owned Items	$116,708
Engineering	$48,000
Inspection	$16,000
	$383,608

iii. While the Reuse System is being upgraded, in lieu of treated wastewater effluent, the City shall supply potable water to the Park at the rate provided in Section II.d "on demand" by and in the quantities determined by the County to be necessary for its irrigation needs in the Park. Upon completion of the Reuse System upgrade and approval by the Texas Commission on Environmental Quality and any other regulatory entities with jurisdiction, the City shall provide treated wastewater effluent "on demand" by and in the quantities determined by the County to be necessary for its irrigation needs in the Park. The City shall operate and maintain the Reuse System at its sole cost expense, including cost of electricity, subject to reimbursement under Section II.d.

iv. The City agrees that the Pump shall be dedicated primarily to supplying treated wastewater effluent to the Park and, unless otherwise agreed by the County, the use of the Pump for such purpose shall have priority over, and the Pump shall not be dedicated or used to meet, any other need or requirement that diminishes or interferes with the provision of treated wastewater effluent to the Park in the quantities determined by the County to be necessary. The City shall not modify or operate the City's wastewater treatment plant or the Reuse System, including the City-Owned Items, in any way that either diminishes or interferes with the ability of the Pump or the Reuse System to provide treated wastewater effluent to the Park in the quantities determined by the County to be necessary, or that requires the County to pay any amount not specifically provided for in this Agreement for treated wastewater effluent or operation, maintenance, or upgrade of the Reuse System.

v. If this Agreement is terminated, the City shall have the option of purchasing the Pump from the County at its then-current fair market value. If the City does not purchase the Pump from the County within 30 days of the termination of this Agreement, the City shall remove the Pump from the City's wastewater treatment plant and deliver it to the Park, unless otherwise agreed by the Parties.

2. Section II.d, FEES, is amended to read as follows:

d. For potable water while the Reuse System is being upgraded, the County shall pay $1.25 per 1000 gallons. For treated wasetewater effluent, the County shall pay $0.24 per 1000 gallons for the first year after the effective date of the First Amendment of this Agreement. Thereafter, the County agrees to pay a per gallon rate calculated to reflect the City's actual operation and maintenance costs for the Reuse System from the prior year. Effluent volumes used shall be calculated by multiplying the period of time the City is

operating the pump to send effluent to the County's ponds in the Park by the capacity of the pump. The capacity of the pump shall be recalibrated annually.

3. All other provisions of the Northeast Metro Park Utilities Interlocal Cooperation Agreement shall remain in effect.

4. This amendment is effective on the later of the dates below.

TRAVIS COUNTY, TEXAS

Samuel T. Biscoe

Samuel T. Biscoe
County Judge
Date: 1-24-06

CITY OF PFLUGERVILLE

David Buesing

By: David Buesing
Its: City Manager
Date: 2-14-06

APPENDIX C

RECLAIMED WATER MODEL RESULTS

City of Pflugerville

Reclaimed Water Master Plan

Summary of Hydraulic Modeling Results

Scenario	Max Day Demand (MGD)	Proposed Pump		Fire Flow Node	Existing 1 MG Standpipe (D = 36' & H from 759' to 888')	System Pressure		Pipe 1			Pipe 2			Pipe 3			Pipe 4			Pipe 5			Pipe 6			Pipe 7			Pipe 8			Pipe 9		
		Max. Flow (GPM)	Head at Max. Flow (psi)		Level Change %	Min. (psi)	Max. (psi)	D (in)	Q (MGD)	V (fps)	D (in)	Q (MGD)	V (fps)	D (in)	Q (MGD)	V (fps)	D (in)	Q (MGD)	V (fps)	D (in)	Q (MGD)	V (fps)	D (in)	Q (MGD)	V (fps)	D (in)	Q (MGD)	V (fps)	D (in)	Q (MGD)	V (fps)	D (in)	Q (MGD)	V (fps)
S1	D1 = 1 (Cooling) D1F1 = 0.5 (Cooling) D1F2 = 0.5 (Irrigation) D2 = 2 (Industrial) D2F = 1 (Cooling) D3 = 0.76 (Irrigation) Total = 5.76	4,667	141	N/A	N/A	45 psi at D1	173 psi at D2F	20	6.72	4.8	20	5.90	4.2	16	3.00	3.3	10	1.00	2.8	12	2.90	5.6	12	2.63	5.2	12	1.75	3.5	12	0	0	10	1.75	5.0
S2	D1 = 1 (Cooling) D1F1 = 0.5 (Cooling) D1F2 = 0.5 (Irrigation) D2 = 2 (Industrial) D2F = 1 (Cooling) D3 = 0.76 (Irrigation) Total = 5.77	4,611	126	N/A	Water Level changes between 888 ft and 867 ft (0.16 MG) with 100% recovery.	48 psi at SP point	150 psi at D2F	20	6.64	4.7	20	5.72	3.9	16	3.00	3.3	10	1.00	2.8	12	2.78	5.5	12	2.09	4.0	12	1.86	3.7	12	1.38	2.7	10	1.75	5.0
S3	D1 = 1 (Cooling) D1F1 = 0.5 (Cooling) D1F2 = 0.5 (Irrigation) D2 = 2 (Industrial) D2F = 1 (Cooling) D3 = 0.76 (Irrigation) Total = 5.78	6,326	135	D2F	N/A	40 psi at D1	165 psi at D2F	20	9.11	6.5	20	8.74	6.2	16	5.88	6.5	12	3.88	7.6	12	2.29	4.5	12	2.15	4.2	12	1.8	3.5	12	0	0	10	1.50	4.3
S4	D1 = 1 (Cooling) D1F1 = 0.5 (Cooling) D1F2 = 0.5 (Irrigation) D2 = 2 (Industrial) D2F = 1 (Cooling) D3 = 0.76 (Irrigation) Total = 5.79	5,146	110	D2F	Water Level changes between 888 ft and 839 ft (0.38 MG) with 60% recovery to 873 ft.	36 psi at SP point.	130 psi at D2F	20	7.41	5.6	20	6.05	4.3	16	5.88	6.5	12	3.88	7.6	12	2.29	4.5	12	2.15	4.2	12	1.8	3.5	12	1.48	2.9	10	1.75	5.0

Notes:

1. Results are from extended period simulations running for 24 hours.
2. Pipe flows and velocities are maximum values within 24 hours. Different pipes will have maximum values occurring at different times.
3. Maximum pressures were not related to pressures associated with fire flows as timing was different.

APPENDIX D

RECLAIMED WATER STORAGE VOLUME ANALYSIS

City of Pflugerville

Reclaimed Water Storage Volume Analysis

September 5, 2014

Mix of Usage

Cooling Tower	**52.1%**
Irrigation	**13.2%**
Industrial	**34.7%**
	100.0%

20,000 Gallon Hydropneumatic Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	1.46	42%
5.30	2.07	39%
5.85	2.26	39%
9.00	3.33	37%

100,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	2.08	59%
5.30	2.88	54%
5.85	3.13	54%
9.00	4.43	49%

250,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	2.7	77%
5.30	3.62	68%
5.85	3.9	67%
9.00	5.31	59%

Ground Storage Required for 50% usage

3.50	1.75	50%	**41,000**
5.30	2.65	50%	**62,000**
5.85	2.93	50%	**69,000**
9.00	4.50	50%	**105,000**
9.00	5.00	56%	**190,000**
9.00	5.76	64%	**337,000**

City of Pflugerville

Reclaimed Water Storage Volume Analysis

September 5, 2014

Mix of Usage

Cooling Tower	**100.0%**
Irrigation	**0.0%**
Industrial	**0.0%**
	100.0%

20,000 Gallon Hydropneumatic Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	2.20	63%
5.30	3.25	61%
5.85	3.57	61%
9.00	5.39	60%

100,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	2.5	71%
5.30	3.66	69%
5.85	4.02	69%
9.00	6	67%

250,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	2.76	79%
5.30	3.98	75%
5.85	4.35	74%
9.00	6.41	71%

Ground Storage Required for 50% usage

3.50	1.75	50%	-
5.30	2.65	50%	-
5.85	2.93	50%	-
9.00	4.50	50%	-
9.00	5.00	56%	**-**
9.00	5.76	64%	**63,000**

City of Pflugerville

Reclaimed Water Storage Volume Analysis

September 5, 2014

Mix of Usage

Cooling Tower	**0.0%**
Irrigation	**100.0%**
Industrial	**0.0%**
	100.0%

20,000 Gallon Hydropneumatic Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	0.62	18%
5.30	0.88	17%
5.85	0.96	16%
9.00	1.41	16%

100,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	0.92	26%
5.30	1.24	23%
5.85	1.33	23%
9.00	1.85	21%

250,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	1.3	37%
5.30	1.67	32%
5.85	1.77	30%
9.00	2.35	26%

Ground Storage Required for 50% usage

3.50	1.75	50%	**468,000**
5.30	2.65	50%	**709,000**
5.85	2.93	50%	**782,000**
9.00	4.50	50%	**1,203,000**
9.00	5.00	56%	**1,445,000**
9.00	5.76	64%	**1,853,000**

City of Pflugerville

Reclaimed Water Storage Volume Analysis

September 5, 2014

Mix of Usage

Cooling Tower	**0.0%**
Irrigation	**0.0%**
Industrial	**100.0%**
	100.0%

20,000 Gallon Hydropneumatic Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	1.27	36%
5.30	1.8	34%
5.85	1.96	34%
9.00	2.89	32%

100,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	1.92	55%
5.30	2.67	50%
5.85	2.88	49%
9.00	3.85	43%

250,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	2.51	72%
5.30	3.3	62%
5.85	3.54	61%
9.00	4.9	54%

Ground Storage Required for 50% usage

3.50	1.75	50%	**64,000**
5.30	2.65	50%	**97,000**
5.85	2.93	50%	**107,000**
9.00	4.50	50%	**165,000**
9.00	5.00	56%	**274,000**
9.00	5.76	64%	**454,000**

City of Pflugerville

Reclaimed Water Storage Volume Analysis

September 5, 2014

Mix of Usage

Cooling Tower	**33.3%**
Irrigation	**33.3%**
Industrial	**33.3%**
	100.0%

20,000 Gallon Hydropneumatic Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	1.08	31%
5.30	1.53	29%
5.85	1.67	29%
9.00	2.45	27%

100,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	1.6	46%
5.30	2.18	41%
5.85	2.36	40%
9.00	3.27	36%

250,000 Gallon Ground Storage Tank

Plant Flow (MGD)	System Capacity (MGD)	
3.50	2.15	61%
5.30	2.8	53%
5.85	2.99	51%
9.00	4.07	45%

Ground Storage Required for 50% usage

3.50	1.75	50%	**140,000**
5.30	2.65	50%	**211,000**
5.85	2.93	50%	**233,000**
9.00	4.50	50%	**358,000**
9.00	5.00	56%	**491,000**
9.00	5.76	64%	**715,000**