



2020 COST OF SERVICE STUDY Water & Wastewater Impact Fees Update

City of Houston

June 2020



Section 1 - Introduction	1
1.1 Combined Utility System Overview	1
1.2 Chapter 395 of Texas Local Government Code	1
1.3 History of Houston Impact Fees	2
Section 2 - Water Land Use Assumptions	3
2.1 Water Service Area	3
2.2 Population and Employment Projections	3
Section 3 - Wastewater Land Use Assumptions	4
3.1 Wastewater Service Area	4
3.2 Population and Employment Projections	4
Section 4 - Water Capital Improvement Plan	5
4.1 Capacity Criteria	5
4.1.1 Raw Water and Water Production Facilities	5
4.1.2 Pump Stations	6
4.1.3 Storage Tanks	7
4.1.4 Transmission Mains	7
4.2 Eligible Existing and CIP Costs	7
4.2.1 Raw Water Facilities	8
4.2.2 Water Production Facilities	10
4.2.3 Pump Stations	11
4.2.4 Storage Tanks	11
4.2.5 Transmission Mains	12
4.2.6 Engineering Studies	18
4.3 Financing Costs	18
Section 5 - Wastewater Capital Improvement Plan	19
5.1 Capacity Criteria	19
5.1.1 Wastewater Treatment Plants	19
5.1.2 Lift Stations	20
5.1.3 Wastewater Collection System	20
5.2 Eligible Existing and CIP Costs	20
5.2.1 Wastewater Treatment Plants	20
5.2.2 Lift Stations	22

5.2.3 Collection System	22
5.2.4 Engineering Studies	23
5.3 Financing Costs	23
Section 6 - Maximum Water Impact Fee Calculation	25
6.1 Service Units	25
6.2 Maximum Water Impact Fee Calculation	26
Section 7 - Maximum Wastewater Impact Fee Calculation	27
7.1 Service Units	27
7.2 Maximum Impact Fee Calculations	28

Appendices

Appendix A Water Service Area
Appendix B Waste Water Service Area
Appendix C Wastewater Population and Employment Projections
Appendix D Water CIP Eligible Facilities
Appendix E Wastewater Treatment Plant Demand
Appendix F Wastewater CIP Eligible Facilities
Appendix G Service Unit Equivalent Table

Tables

Table 1.1	Historical and Current Impact Fees	2
Table 2.1	Water Service Area Population and Employment Projections	3
Table 3.1	Wastewater Service Area Population and Employment Projections	4
Table 4.1	Raw Water Eligible Existing Costs	10
Table 4.2	Water Production Facilities – Total Eligible Costs	11
Table 4.3	Water Pumping Facilities – Total Eligible Costs	11
Table 4.4	Water Storage Facilities – Total Eligible Costs	12
Table 4.5	Transmission Main Eligible Existing Costs	14
Table 4.6	Transmission Main Eligible CIP Costs	17
Table 4.7	Water Transmission Mains – Total Eligible Costs	17
Table 4.8	Water System Eligible CIP Costs	18
Table 5.1	Wastewater Treatment Facilities – Total Eligible Costs	21
Table 5.2	Wastewater Lift Stations – Total Eligible Costs	22

Table 5.3	Collection System – Total Eligible Costs	23
Table 5.4	Total Eligible CIP Costs for the 2020-2030 Wastewater Impact Fees	24
Table 7.1	Calculation of Wastewater Incremental Service Units	27

Section 1

INTRODUCTION

1.1 Combined Utility System Overview

The City of Houston, Texas (City) provides water and wastewater service to approximately 430,000 customer accounts. The Combined Utility System (CUS) is an infrastructure-intensive system that includes three large water purification plants, 39 wastewater treatment plants, and hundreds of water pump stations and wastewater lift stations.

The CUS must continue to remain financially viable in order to meet its mission of protecting public health, protecting the environment, and providing superior customer service. Financial viability includes having adequate impact fees to recover capital costs associated with future growth. In other words, making sure “growth pays for growth”. If the City adopts impact fees that are less than the maximum allowable impact fees, water and wastewater rates will exceed the true cost of service to supplement the reduced impact fee revenue.

1.2 Chapter 395 of Texas Local Government Code

Texas Local Government Code Chapter 395 (Chapter 395) authorizes a political subdivision, such as the City of Houston, to impose impact fees on new development within its corporate boundaries and extraterritorial jurisdiction (ETJ). Chapter 395 requires the political subdivision imposing an impact fee to update its land use assumptions plan (LUAP) and capital improvement plan (CIP) every five years. The schedule of costs associated with providing capacity in the water and wastewater systems for growth that is used to calculate the impact fee is known as the CIP. This is not the same as the City’s CIP that is adopted each year as part of the budget although there may be projects that appear in both CIPs.

According to Chapter 395, an impact fee may be imposed only to pay the costs of constructing capital improvements or facility expansions, including and limited to the construction contract price; surveying and engineering fees; land acquisition costs; court awards and costs; attorney’s fees; expert witness fees; fees paid to an engineer or financial consultant to prepare or update the CIP; and projected financing costs associated with growth-related projects identified in the CIP.

Impact fees may not be used to pay for non-growth related projects identified in the CIP such as repair, operation, or maintenance of existing or new capital improvements or facility expansions; upgrading, updating, expanding, or replacing existing capital improvements to serve existing development in order to meet stricter safety, efficiency, environmental, or regulatory standards; upgrading, updating, expanding, or replacing existing capital improvements to provide better service to existing development; administrative and operating costs of the political subdivision; or financing costs for non-growth-related projects.

1.3 History of Houston Impact Fees

In 1990, the City adopted water and wastewater impact fees in accordance with Chapter 395. This first study calculated maximum water and wastewater impact fees of \$1,542.63 and \$1,368.51 per service unit, respectively. The City implemented a water impact fee of \$200 per service unit, and a wastewater impact fee of \$700 per service unit.

The City has performed subsequent impact fee studies in 2000 and 2010 and calculated impact fees as shown in Table 1.1.

Table 1.1 Historical and Current Impact Fees

Description	1990 Study	2000 Study	2010 Study
Water Impact Fee:			
Maximum Impact Fee	\$1,542.63	\$2,308.40	\$3,835.44
Adopted Impact Fee	\$200.00	\$265.00	\$338.04
Wastewater Impact Fee:			
Maximum Impact Fee	\$1,368.51	\$1,573.39	\$3,427.07
Adopted Impact Fee	\$700.00	\$940.00	\$1,199.11

Notes:

- (1) The 1990 impact fees were established in Resolution 90-84, 6/13/1990.
- (2) The 2000 impact fees were established in Ordinance 2000-497, 6/14/2000.
- (3) The 2010 impact fees were established in Ordinance 2010-482, 6/30/2010 and 2010-583, 7/28/2010.

Beginning in 2011 and for each year thereafter, per the provisions of Chapter 47 of the Houston City Code, the water impact fee amount has been adjusted by an amount equal to the percentage increase, if any, of the United States Producers Price Index (PPI) for all Commodities (published by the Bureau of Labor Statistics, U.S. Department of Labor) multiplied by the sum of the water and wastewater impact fee for the preceding calendar year. Also, per the provisions of Chapter 47, the wastewater impact fee has not been adjusted.

To date, the water impact fee adopted in 2010 has increased to \$790.55 per service unit based on the water and wastewater PPI adjustment specified in Chapter 47. The wastewater impact fee has remained at \$1,199.11 per service unit.

Section 2

WATER LAND USE ASSUMPTIONS

Texas Local Government Code Chapter 395 authorizes a political subdivision, such as the City of Houston, to impose impact fees on new development within its corporate boundaries. Chapter 395 requires the political subdivision imposing an impact fee to update its LUAP and CIP every five years.

As part of the 2020 Impact Fee Study, the City updated its water LUAP and CIP. This section updates the water facilities LUAP for the years 2020 through 2040. This information will be used to update the water impact fees.

2.1 Water Service Area

Houston Public Works provides water service to customers within the Water Service Area. The Water Service Area includes the area within the City of Houston limits and areas outside the city limits where water is currently being provided on a retail and wholesale basis and/or may be provided to additional retail and wholesale customers in the future. Areas served by other utility providers and areas served by water authorities and Southeast Water Purification Plant (WPP) co-participants, which purchase water treatment capacity in large increments, are excluded from the Water Service Area.

Appendix A provides the Water Service Area Map, which shows the 2020 existing Water Service Area boundary and the projected 2030 and 2040 Water Service Area boundaries.

The City provides water service to approximately 489,000 retail customers as of June 30, 2019. These customers consist of residents and businesses located inside and outside the city limits.

The City also provides water service to wholesale customers inside and outside its city limits. Some of these customers contribute capital to purchase capacity at the water purification plants. These customers are not assessed impact fees and are therefore not included in the Water Service Area.

2.2 Population and Employment Projections

This section describes the population and employment growth projections in the Water Service Area. These projections are for the years 2020, 2030, and 2040, as shown below in Table 2.1.

Table 2.1 Water Service Area Population and Employment Projections¹

	2020	2030	2040
Population	2,696,815	3,061,272	3,474,983
Employment	1,997,542	2,295,099	2,636,980

¹ Population and employment projections are based on the Texas Water Development Board (TWDB) Region H Study, 2012-2013, projections and the 2019 Houston-Galveston Area Council (HGAC) projections, respectively, which are then geoprocesed by Houston Public Works for the Water Service Area.

Section 3

WASTEWATER LAND USE ASSUMPTIONS

Texas Local Government Code, Chapter 395, authorizes a political subdivision, such as the City of Houston, to impose impact fees on new development within its corporate boundaries. Chapter 395 requires the political subdivision imposing an impact fee to update its land use assumptions and CIP every five years.

As part of the 2020 Impact Fee Study, the City updated its wastewater LUAP and CIP. This section updates the wastewater facilities land use assumptions for the years 2020 through 2040. This information will be used to update the wastewater impact fees.

3.1 Wastewater Service Area

Houston Public Works provides wholesale and retail services to the Wastewater Service Area, including areas inside and outside the Houston City limits. Areas served by other utility providers and areas served by contract customers, which purchase wastewater treatment capacity in large increments, are excluded from the Wastewater Service Area.

Appendix B provides the Wastewater Service Area Map, which shows the 2020 existing Wastewater Service Area boundary and the projected 2030 and 2040 Wastewater Service Area boundaries.

The City provides wastewater service to approximately 431,000 retail customers as of June 30, 2019. These customers consist of residents and businesses located inside and outside the city limits.

The wholesale customers who contribute capital to purchase capacity at the wastewater treatment plants and discharge wastewater directly into the plants are not assessed impact fees and are therefore excluded from the Wastewater Service Area.

3.2 Population and Employment Projections

This section describes the population and employment projections in the Wastewater Service Area. These projections are for the years 2020, 2030, and 2040, as shown in Table 3.1 below.

Appendix C shows the population and employment projections for each wastewater treatment plant service area.

Table 3.1 Wastewater Service Area Population and Employment Projections²

	2020	2030	2040
Population	2,265,041	2,449,139	2,648,201
Employment	1,795,073	1,993,022	2,212,800

² Population and employment projections are based on the TWDB Region H Study, 2012-2013, projections and the 2019 HGAC projections, respectively, which are then geoprocesed by Houston Public Works for the Wastewater Service Area.

Section 4

WATER CAPITAL IMPROVEMENT PLAN

Impact fees provide the City of Houston a mechanism for recouping the cost associated with expanding the municipal water system to accommodate growth in the service area. The City of Houston owns and operates an infrastructure intensive system comprised of production facilities, pumping stations, storage facilities, and pipelines that are continuously improved and expanded. The CIP was updated as part of this study with capital project scope and cost provided by Houston Public Works³.

This section describes the basis for establishing which City of Houston water facilities are eligible to be included in the impact fee analysis. Next, the criteria for measuring infrastructure capacity are explained for each infrastructure type. Finally, the additional facilities required to accommodate growth during the study period are summarized.

The full list of all water impact fee eligible projects is provided in Appendix D.

4.1 Capacity Criteria

This section discusses the capacity of facilities that are eligible for inclusion in the calculation of the impact fees. The only capacities that are considered for inclusion are existing available capacities and planned increases in capacities to serve growth projected to occur during the study period. Available existing capacity is infrastructure that has been constructed but is not yet fully utilized because existing demand is less than existing capacity.

The growth-related capacities and criteria differ for the water and wastewater systems. For the water system, the capacities considered for inclusion in the calculation of the water impact fees are the raw water supplies, water production facilities (includes water purification plants and groundwater wells), pump stations, storage tanks, transmission mains, and engineering studies.

4.1.1 Raw Water and Water Production Facilities

The City obtains the majority of its raw water supply from three major reservoirs: Lake Conroe and Lake Houston in the San Jacinto River System and Lake Livingston in the Trinity River System. Water from the Trinity River System is pumped into the East WPP and the Southeast WPP through a system owned and operated by the Costal Water Authority (CWA). CWA is a governmental agency created by the State of Texas to own and operate the Trinity River Conveyance System. Water from the San Jacinto River System is transported from pumping stations at Lake Houston to the East WPP through the West Canal, providing a secondary source of water for the East WPP. The Northeast WPP also receives water from the San Jacinto River System. However, upon completion of the Luce Bayou Interbasin Transfer Project, the Northeast WPP will also begin to receive raw water from the Trinity River System. Allens Creek's future contribution to the City's raw water supply is not expected prior to 2030, therefore, expansion costs to develop Allens Creek were not included in the current Impact Fee Study. The City plans to consider these costs in the next Impact Fee Study.

³ Capital project scope and cost information is provided from multiple sources, including the full adopted City CIP and analysis using the City's existing hydraulic models.

The City of Houston sells raw water in addition to treated water. For the purpose of calculating the water impact fee, we will focus on the treated water capacity of the system. Therefore, the capacity requirement associated with the raw water facilities is calculated based on the required production capacity by 2030.

The design criteria for water production facilities are based on the assumed maximum day demand, calculated as follows:

$$2020 \text{ Average Day Demand (ADD)} = 150 \text{ gallons per capita per day (gpcd)} * \text{population}$$

For the City of Houston, the 2020 population provided in the Land Use Assumptions section, times the average day criteria of 150 gpcd, provides the following ADD for water production:

$$2020 \text{ ADD} = 150 \text{ gpcd} * 2,696,815 \text{ population} = 404.5 \text{ million gallons per day (MGD)}$$

Using a maximum day to average day demand factor of 1.4, per Houston Public Works, the maximum day demand (MDD) for water production is calculated as follows:

$$2020 \text{ Maximum Day Demand (MDD)} = 1.4 \times 404.5 \text{ MGD} = 566.3 \text{ MGD}$$

The 2030 ADD and MDD for water production, using the same formulas as above, is calculated as follows:

$$2030 \text{ ADD} = 150 \text{ gpcd} \times 3,061,272 \text{ population} = 459.2 \text{ MGD}$$

$$2030 \text{ MDD} = 1.4 \times 459.2 \text{ MGD} = 642.9 \text{ MGD}$$

The incremental maximum day demand, or study period demand, related to raw water and water production capacity requirements during the study period is 76.6 MGD:

$$\text{Incremental MDD} = 2030 \text{ MDD} - 2020 \text{ MDD}$$

$$\text{Incremental MDD} = 642.9 \text{ MGD} - 566.3 \text{ MGD} = 76.6 \text{ MGD}$$

4.1.2 Pump Stations

The Texas Commission on Environmental Quality (TCEQ) requires pump station capacity to be a minimum of 0.36 gallons per minute (gpm) per connection, provided the City's system has a storage capacity exceeding 200 gallons per connection⁴. The City's storage capacity meets this criterion as detailed in Section 4.2.4.

2020 Pump Station Capacity Requirement

$$= 0.36 \text{ gpm per connection} \times \text{number of connections} \times 24 \text{ hrs/day} \\ \times 60 \text{ min/hr}$$

2020 Pump Station Capacity Requirement

$$= 0.36 \text{ gpm} \times 949,259 \text{ connections} \times 24 \text{ hrs/day} \times 60 \text{ min/hr} \\ = 492.1 \text{ MGD}$$

2030 Pump Station Capacity Requirement

$$= 0.36 \text{ gpm} \times 1,025,200 \text{ connections} \times 24 \text{ hrs/day} \times 60 \text{ min/hr} \\ = 531.5 \text{ MGD}$$

⁴ Number of existing connections provided by Houston Public Works based on reports submitted to TCEQ. Projected number of connections are determined by applying population growth rate, based on population projections provided in the LUAP, to the number of existing connections.

The incremental capacity requirement related to pump stations during the study period is the difference between the 2030 pump station capacity requirement and the 2020 pump station capacity requirement, or 39.4 MGD:

$$\text{Incremental Pump Station Capacity} = 531.5 \text{ MGD} - 492.1 \text{ MGD} = 39.4 \text{ MGD}$$

4.1.3 Storage Tanks

The TCEQ requires the City's water system to provide 200 gallons of storage per connection. The calculation of this storage requirement is as follows:

$$\begin{aligned} \text{2020 Storage Capacity Requirement} \\ &= 200 \text{ gallons per connection} \times 949,259 \text{ connections} \\ &= 189.9 \text{ million gallons (MG)} \end{aligned}$$

$$\begin{aligned} \text{2030 Storage Capacity Requirement} \\ &= 200 \text{ gallons per connection} \times 1,025,200 \text{ connections} = 205.0 \text{ MG} \end{aligned}$$

The incremental storage tank capacity required during the study period is the difference between the 2030 storage capacity requirement and the 2020 storage capacity requirement, or 15.1 MG:

$$\text{Incremental Storage Capacity} = 205.0 \text{ MG} - 189.9 \text{ MG} = 15.1 \text{ MG}$$

4.1.4 Transmission Mains

The projected maximum day demand is used to determine the required capacity for transmission mains. Therefore, the capacity criteria for transmission mains are the same as the raw water and water production capacity criteria previously calculated in Section 4.1.1.

The incremental maximum day demand related to transmission main capacity requirements during the study period is 76.6 MGD:

$$\text{Incremental MDD} = 642.9 \text{ MGD} - 566.3 \text{ MGD} = 76.6 \text{ MGD}$$

4.2 Eligible Existing and CIP Costs

The capacity criteria were used to determine which existing and planned City of Houston water facilities are eligible for inclusion in the calculation of the maximum water impact fee. A portion of the cost of existing assets may be included if there is unused capacity available to serve the projected study period growth. The value associated with these assets is determined using the Original Cost valuation approach⁵.

Projects included in the full adopted City CIP can serve to rehabilitate and renew the system, enhance the system to improve efficiency and meet regulatory requirements, increase the system capacity, or achieve a combination of these objectives. Only those projects or portions of projects related to the capacity required to serve the study period projected growth (2020 to 2030) can be included in the impact fee calculation. Additionally, projects are excluded from the impact fee calculation if the costs cannot be accurately delineated if alternate mechanisms for cost recovery are in place.

⁵ The Original Cost valuation approach uses the original cost assigned to the asset in the accounting records without adjusting for accumulated depreciation. Other valuation approaches include Original Cost Less Depreciation, Replacement Cost New, and Replacement Cost New Less Depreciation.

Financing costs associated with the water system have been estimated based on outstanding debt and historic funding policies, consistent with previous City of Houston impact fee studies.

Facilities included in the impact fee study are raw water supply and transmission, water production facilities, pump stations, storage facilities, transmission mains and engineering studies. Appendix D provides detailed information for eligible water assets and CIP projects for the 2020 to 2030 planning period.

4.2.1 Raw Water Facilities

Houston Public Works provided a diagram of the CWA system showing the capacity and demand projections for each raw water facility for the study period 2020 through 2030. In addition to the facilities included in the 2010 impact fee study, the City has completed construction of the Luce Bayou Interbasin Transfer Project to transfer water to the Northeast WPP.

As calculated in Section 4.1.1, the projected growth for the study period will require 76.5 MGD of capacity to serve new customers. Based on the projected demands provided by Houston Public Works, this is expected to be delivered from the following raw water facilities:

CWA System A

The current capacity of the CWA System A is 260.0 MGD. Based on the CWA System diagram provided by Houston Public Works staff, demand is expected to increase from 164.0 MGD in 2020 to 175.0 MGD in 2030. This incremental or study period demand of 11.0 MGD can be provided from the original 205.0 MGD capacity documented in the 2010 impact fee study. As such, the eligible allocation is based on a capacity of 205.0 MGD:

$$\text{Study Period Allocation} = \text{Study Period Demand} / \text{Total Capacity}$$

$$\text{Study Period Allocation} = 11.0 \text{ MGD} / 205.0 \text{ MGD} = 5.4\%$$

Line A-2 (formerly Southwest Lateral)

The current capacity of Line A-2 is 260.0 MGD. Demand is expected to increase from 164.0 MGD in 2020 to 175.0 MGD in 2030. However, the only cost information available for Line A-2 is related to the 162.4 MGD capacity documented in the 2010 impact fee study. Because no costs associated with capacity in excess of 162.4 MGD is available and the existing 2020 demand exceeds this capacity, none of the documented costs can be included in the impact fee calculation.

CWA System C

The current capacity of the CWA System C is 296.0 MGD. Demand is expected to increase from 186.0 MGD in 2020 to 226.0 MGD in 2030. However, the only cost information available for the CWA System C is related to the 225.8 MGD capacity documented in the 2010 impact fee study. Most of the incremental demand of 40.0 MGD can be provided from the 225.8 MGD capacity documented in the 2010 study, but the remaining 0.2 MGD that is required to serve projected study period growth cannot be included in the impact fee calculation:

$$\text{Study Period Allocation} = 39.8 \text{ MGD} / 225.8 \text{ MGD} = 17.6\%$$

Ship Channel Crossing

The Ship Channel Crossing delivers water to CWA Systems A, B, and C, and its current capacity is 880.0 MGD. Demand is expected to increase from 555.0 MGD in 2020 to 606.0 MGD in 2030.

This incremental demand of 51.0 MGD can be provided from the original 670.0 MGD facility. As such, the eligible allocation is based on a capacity of 670.0 MGD:

$$\text{Study Period Allocation} = 51.0 \text{ MGD} / 670.0 \text{ MGD} = 7.6\%$$

Lynchburg Pump Station

The current capacity of the Lynchburg Pump Station is 921.0 MGD. Demand is expected to increase from 555.0 MGD in 2020 to 606.0 MGD in 2030. This incremental demand of 51.0 MGD can be provided from the original 694.0 MGD capacity documented in the 2010 impact fee study. As such, the eligible allocation is based on a capacity of 694.0 MGD:

$$\text{Study Period Allocation} = 51.0 \text{ MGD} / 694.0 \text{ MGD} = 7.3\%$$

Lynchburg Reservoir

The current capacity of the Lynchburg Reservoir is 1,500.0 MGD. Demand is expected to increase from 555.0 MGD in 2020 to 606.0 MGD in 2030. This incremental demand of 51.0 MGD can be provided from the 1,300.0 MGD capacity documented in the 2010 impact fee study. As such, the eligible allocation is based on a capacity of 1,300.0 MGD:

$$\text{Study Period Allocation} = 51.0 \text{ MGD} / 1,300.0 \text{ MGD} = 3.9\%$$

CWA Main Canal

The current capacity of the CWA Main Canal is 1,300.0 MGD. Demand is expected to increase from 555.0 MGD in 2020 to 606.0 MGD in 2030. This incremental demand of 51.0 MGD can be provided from the existing 1,300.0 MGD facility:

$$\text{Study Period Allocation} = 51.0 \text{ MGD} / 1,300.0 \text{ MGD} = 3.9\%$$

Trinity River Pump Station

The current capacity of the Trinity River Pump Station is 1,055.0 MGD. Demand is expected to increase from 555.0 MGD in 2020 to 606.0 MGD in 2030. This incremental demand of 51.0 MGD can be provided from the 273.0 MGD expansion documented in the 2010 impact fee study. As such, the eligible allocation is based on a capacity of 273.0 MGD:

$$\text{Study Period Allocation} = 51.0 \text{ MGD} / 273.0 \text{ MGD} = 18.7\%$$

Luce Bayou Interbasin Transfer Project

The new Luce Bayou Interbasin Transfer Project has a capacity of 400.0 MGD. The remaining incremental demand calculated in Section 4.1.1 is expected to be delivered through the Luce Bayou Interbasin Transfer Project. This incremental demand of 25.6 MGD can be provided from the existing 400.0 MGD facility:

$$\text{Study Period Allocation} = 25.6 \text{ MGD} / 400.0 \text{ MGD} = 6.4\%$$

For raw water facilities, the eligible costs are determined by multiplying by the eligible study period allocation for each facility listed above by the cost associated with the capacity, as shown in Table 4.1.

Table 4.1 Raw Water Eligible Existing Costs

Facility	Documented Capacity	Documented Cost ¹	Required Capacity	Eligible %	Eligible Cost
CWA System A	205.0	\$10,064,000	11.0	5.4%	\$543,456
CWA System C	225.8	192,206,000	39.8	17.6%	33,828,256
Ship Channel Crossing	670.0	13,912,000	51.0	7.6%	1,057,312
Lynchburg Pump Station	694.0	78,736,000	51.0	7.3%	5,747,728
Lynchburg Reservoir	1,300.0	20,128,000	51.0	3.9%	784,992
CWA Main Canal	1,300.0	47,064,000	51.0	3.9%	1,835,496
Trinity River Pump Station	273.0	79,837,000	51.0	18.7%	14,929,519
Luce Bayou Interbasin Transfer Project	400.0	373,597,259	25.6	6.4%	23,910,225
Total		\$815,544,259	76.6	10.1%	\$82,636,984

Notes:

(1) CWA facility costs obtained from 2010 impact fee study report.

4.2.2 Water Production Facilities

Houston Public Works provided the capacities of the existing WPPs and groundwater wells, as well as future WPP expansions and wells in the CIP. The existing 2020 and planned 2030 production capacities for the water system are 908.6 MGD and 1,251.1 MGD, respectively. However, 225.9 MGD of the existing capacity and 268.8 MGD of the planned expansion are reserved for the water authorities and Southeast WPP co-participants, leaving only 682.7 MGD and 756.4 MGD of capacity for 2020 and 2030, respectively. Of the 682.7 MGD of existing capacity in 2020, 566.3 MGD is needed to meet the maximum day demand of existing customers (see Section 4.1.1). Therefore, 116.4 MGD is available to serve new development. The CIP includes 73.7 MGD of available production capacity so the total available capacity during the study period is 190.1 MGD:

$$\text{Total Available Production Capacity} = \text{Available Existing Capacity} + \text{Future CIP Capacity}$$

$$\text{Total Available Production Capacity} = 116.4 \text{ MGD} + 73.7 \text{ MGD} = 190.1 \text{ MGD}$$

From the Production Facilities capacity criteria in Section 4.1.1, approximately 76.6 MGD is required to serve growth during the study period. This represents 40.3 percent of the 190.1 MGD total available capacity:

$$\text{Study Period Allocation} = \text{Study Period Demand} / \text{Total Available Capacity}$$

$$\text{Study Period Allocation} = 76.6 \text{ MGD} \div 190.1 \text{ MGD} = 40.3\%$$

Total eligible existing and CIP costs for water production facilities are shown in Table 4.2 below.

Table 4.2 Water Production Facilities – Total Eligible Costs

Facility	Available Capacity	Cost	Required Capacity	Eligible %	Eligible Cost
Existing Assets	116.4	\$56,257,726	46.9	40.3%	\$22,671,864
Future CIP	73.7	422,189,535	29.7	40.3%	170,142,383
Total	190.1	\$478,447,261	76.6	40.3%	\$192,814,247

4.2.3 Pump Stations

Houston Public Works provided the capacities of the existing pump stations, as well as future pump stations in the CIP. The existing 2020 and planned 2030 pumping capacities for the water system are 682.7 MGD and 705.2 MGD, respectively. Of the 682.7 MGD of existing capacity in 2020, 492.1 MGD is needed to meet the maximum day demand of existing customers (see Section 4.1.2). Therefore, 190.6 MGD is available to serve new development. The CIP includes 22.5 MGD of planned pumping capacity so the total available capacity during the study period is 213.1 MGD:

$$\text{Total Available Pumping Capacity} = 190.6 \text{ MGD} + 22.5 \text{ MGD} = 213.1 \text{ MGD}$$

From the Pump Station Facilities capacity criteria in Section 4.1.2, approximately 39.4 MGD is required to serve growth during the study period. Based on an analysis completed by Houston Public Works using the existing hydraulic model, the planned 22.5 MGD pump station in the CIP will be fully utilized by the projected growth during the study period. Therefore, the remaining 16.9 MGD of required capacity will be provided from existing assets. This represents 8.8 percent of the 190.6 MGD total available existing capacity:

$$\text{Study Period Allocation} = 16.9 \text{ MGD} \div 190.6 \text{ MGD} = 8.9\%$$

Total eligible existing and CIP costs for water pumping facilities are shown in Table 4.3 below.

Table 4.3 Water Pumping Facilities – Total Eligible Costs

Facility	Available Capacity	Cost	Required Capacity	Eligible %	Eligible Cost
Existing Assets	190.6	\$44,760,693	16.9	8.9%	\$3,983,702
Future CIP	22.5	63,505,000	22.5	100.0%	63,505,000
Total	213.1	\$108,265,693	39.4	62.3%	\$67,488,702

4.2.4 Storage Tanks

Houston Public Works provided the total existing capacity of the existing storage tanks – 363.5 MG. Of the 363.5 MG of existing capacity, 189.9 MG is needed to meet the TCEQ requirements for existing customers (see Section 4.1.3). Therefore, 173.6 MG is available to serve new development. No CIP projects are planned to expand storage tank capacity for the study period.

From the Storage Tank capacity criteria in Section 4.1.3, approximately 15.1 MG is required to serve growth during the study period. This represents 8.7 percent of the 173.6 MG total available capacity:

$$\text{Study Period Allocation} = 15.1 \text{ MG} \div 173.6 \text{ MG} = 8.7\%$$

Total eligible existing and CIP costs for water storage facilities are shown in Table 4.4 below.

Table 4.4 Water Storage Facilities – Total Eligible Costs

Facility	Available Capacity	Cost	Required Capacity	Eligible %	Eligible Cost
Existing Assets	173.6	\$71,391,918	15.1	8.7%	\$6,211,097
Future CIP	0.0	0	0.0	0.0%	0
Total	173.6	\$71,391,918	15.1	8.7%	\$6,211,097

4.2.5 Transmission Mains

As with the pump stations, Houston Public Works assisted with the analysis and determination of eligible transmission mains using the existing water distribution system model. Houston Public Works identified several existing large transmission mains and reduced the sizes within the model to the minimum diameter allowable under projected 2020 and 2030 demands. The incremental capacities for each pipe are used to allocate associated costs to the impact fee calculation.

96-inch Genoa Red Bluff Transmission Main

The 96-inch Genoa Red Bluff Transmission Main from Highway 3 to Fuqua could be downsized to 78 inches, with a capacity of 129.0 MGD, to meet the 2020 demand. An 84-inch pipeline, with a capacity of 157.1 MGD, is required to serve the projected 2030 demand.

$$\text{Study Period Allocation} = \frac{2030 \text{ Required Capacity} - 2020 \text{ Required Capacity}}{\text{Total Pipeline Capacity}}$$

$$\text{Study Period Allocation} = (157.1 \text{ MGD} - 129.0 \text{ MGD}) / 223.1 \text{ MGD} = 12.6\%$$

72-inch Ella Transmission Main

The 72-inch Ella Transmission Main could be downsized to 60 inches, with a capacity of 64.8 MGD, to meet the 2020 demand. A 72-inch pipeline, with a capacity of 104.5 MGD, is required to serve the projected 2030 demand.

$$\text{Study Period Allocation} = (104.5 \text{ MGD} - 64.8 \text{ MGD}) / 104.5 \text{ MGD} = 38.0\%$$

72-inch Fuqua Transmission Main (70A-1 & 70A-2)

The projected 2020 and 2030 demands through the 72-inch Fuqua Transmission Main are 66.3 MGD and 69.0 MGD, respectively.

$$\text{Study Period Allocation} = (69.0 \text{ MGD} - 66.3 \text{ MGD}) / 104.5 \text{ MGD} = 2.6\%$$

66-inch Moers Transmission Main (70A-3)

The projected 2020 and 2030 demands through the 66-inch Moers Transmission Main are 47.6 MGD and 69.0 MGD, respectively.

$$\text{Study Period Allocation} = (69.0 \text{ MGD} - 47.6 \text{ MGD}) / 83.3 \text{ MGD} = 25.7\%$$

66-inch Monroe Transmission Main (70A-4)

The projected 2020 and 2030 demands through the 66-inch Monroe Transmission Main are 41.2 MGD and 69.0 MGD, respectively.

$$\text{Study Period Allocation} = (69.0 \text{ MGD} - 41.2 \text{ MGD}) / 83.3 \text{ MGD} = 33.4\%$$

60-inch Airport Transmission Main (70B)

The projected 2020 and 2030 demands through the 60-inch Airport Transmission Main are 39.2 MGD and 64.8 MGD, respectively.

$$\text{Study Period Allocation} = (64.8 \text{ MGD} - 39.2 \text{ MGD}) / 64.8 \text{ MGD} = 39.5\%$$

60-inch Broadway Transmission Main (70C)

The projected 2020 and 2030 demands through the 60-inch Broadway Transmission Main are 39.2 MGD and 64.8 MGD, respectively.

$$\text{Study Period Allocation} = (64.8 \text{ MGD} - 39.2 \text{ MGD}) / 64.8 \text{ MGD} = 39.5\%$$

48-inch Sims Bayou Discharge Water Line (74A-1)

The projected 2020 and 2030 demands through the 48-inch Sims Bayou Discharge Water Line are 20.9 MGD and 36.0 MGD, respectively.

$$\text{Study Period Allocation} = (36.0 \text{ MGD} - 20.9 \text{ MGD}) / 36.0 \text{ MGD} = 41.9\%$$

42-inch Sims Bayou Discharge Water Line (74A-1 & 74A-2)

The projected 2020 and 2030 demands through the 42-inch Sims Bayou Discharge Water Line are 14.4 MGD and 25.3 MGD, respectively.

$$\text{Study Period Allocation} = (25.3 \text{ MGD} - 14.4 \text{ MGD}) / 25.3 \text{ MGD} = 43.1\%$$

36-inch Sims Bayou Discharge Water Line (74B)

The projected 2020 and 2030 demands through the 36-inch Sims Bayou Discharge Water Line are 11.5 MGD and 15.7 MGD, respectively.

$$\text{Study Period Allocation} = (15.7 \text{ MGD} - 11.5 \text{ MGD}) / 15.7 \text{ MGD} = 26.8\%$$

30-inch Sims Bayou Discharge Water Line (74C)

The projected 2020 and 2030 demands through the 30-inch Sims Bayou Discharge Water Line are 6.2 MGD and 10.0 MGD, respectively.

$$\text{Study Period Allocation} = (10.0 \text{ MGD} - 6.2 \text{ MGD}) / 10.0 \text{ MGD} = 38.0\%$$

42-inch Bellaire Braes Discharge Water Line

The projected 2020 and 2030 demands through the 42-inch Bellaire Braes Discharge Water Line are 20.9 MGD and 25.3 MGD, respectively.

$$\text{Study Period Allocation} = (25.3 \text{ MGD} - 20.9 \text{ MGD}) / 25.3 \text{ MGD} = 17.4\%$$

For transmission main facilities, the eligible costs are determined by multiplying by the eligible study period allocation for each facility listed above by the cost associated with the capacity, as shown in Table 4.5.

Table 4.5 Transmission Main Eligible Existing Costs

Facility	Capacity	Cost	Required Capacity	Eligible %	Eligible Cost
96" Genoa Red Bluff	223.1	\$47,496,000	28.1	12.6%	\$5,984,496
72" Ella	104.5	124,194,000	39.7	38.0%	47,193,720
72" Fuqua (70A-1, 70A-2)	104.5	41,569,000	2.7	2.6%	1,080,794
66" Moers (70A-3)	83.3	17,850,000	21.4	25.7%	4,587,450
66" Monroe (70A-4)	83.3	32,428,000	27.8	33.4%	10,830,952
60" Airport (70B)	64.8	15,664,000	25.6	39.5%	6,187,280
60" Broadway (70C)	64.8	15,664,000	25.6	39.5%	6,187,280
48" Sims Bayou (74A-1)	36.0	5,008,000	15.1	41.9%	2,098,352
42" Sims Bayou (74A-1, 74A-2)	25.3	23,634,000	10.9	43.1%	10,186,254
36" Sims Bayou (74B)	15.7	14,191,000	4.2	26.8%	3,803,188
30" Sims Bayou (74C)	10.0	14,875,000	3.8	38.0%	5,652,500
42" Bellaire Braes	25.3	7,319,000	4.4	17.4%	1,273,506
Total		\$359,892,000		29.2%	\$105,065,772

Houston Public Works also evaluated several large diameter transmission main projects in the CIP to determine what portion of these are required to serve the projected growth for the study period.

120-inch Northeast Transmission Line

The City's share of the proposed 120-inch Northeast Transmission Line is 51.2 MGD. Upon completion, the projected demand from existing customers is 35.5 MGD. The projected 2030 demand through the 120-inch main is 51.2 MGD.

$$\text{Study Period Allocation} = (51.2 \text{ MGD} - 35.5 \text{ MGD}) / 51.2 \text{ MGD} = 30.7\%$$

108-inch Northeast Transmission Line

The City's share of the proposed 108-inch Northeast Transmission Line is 51.2 MGD. Upon completion, the projected demand from existing customers is 35.5 MGD. The projected 2030 demand through the 108-inch main is 51.2 MGD.

$$\text{Study Period Allocation} = (51.2 \text{ MGD} - 35.5 \text{ MGD}) / 51.2 \text{ MGD} = 30.7\%$$

66-inch IH-45 Transmission Main

The proposed 66-inch IH-45 Transmission Main, from the Northeast Transmission Line to the Acres Homes Pump Station, will have a capacity of 83.3 MGD. The projected 2030 demand through this pipeline is 21.0 MGD.

$$\text{Study Period Allocation} = 2030 \text{ Required Capacity} / \text{Total Pipeline Capacity}$$

$$\text{Study Period Allocation} = 21.0 \text{ MGD} / 83.3 \text{ MGD} = 25.2\%$$

72-inch Transmission Main to Southwest Repump

The proposed 72-inch Transmission Main to Southwest Repump will have a capacity of 104.5 MGD. The projected 2030 demand through this pipeline is 104.5 MGD.

$$\text{Study Period Allocation} = 104.5 \text{ MGD} / 104.5 \text{ MGD} = 100.0\%$$

48-inch Transmission Main along Fuqua/Orem

The proposed 48-inch Transmission Main along Fuqua/Orem will have a capacity of 36.0 MGD. The projected 2030 demand through this pipeline is 36.0 MGD.

$$\text{Study Period Allocation} = 36.0 \text{ MGD} / 36.0 \text{ MGD} = 100.0\%$$

54-inch Southeast Transmission Main

The City's share of the proposed 54-inch Southeast Transmission Main is 9.0 MGD. The projected 2030 demand through this pipeline is 9.0 MGD.

$$\text{Study Period Allocation} = 9.0 \text{ MGD} / 9.0 \text{ MGD} = 100.0\%$$

24-inch Transmission Main along Old Galveston Road

The proposed 24-inch Transmission Main along Old Galveston Road will have a capacity of 5.0 MGD. The projected 2030 demand through this pipeline is 5.0 MGD.

$$\text{Study Period Allocation} = 5.0 \text{ MGD} / 5.0 \text{ MGD} = 100.0\%$$

24-inch Transmission Main along Cullen (IH-610 to Airport)

The proposed 24-inch Transmission Main along Cullen, from IH-610 to Airport, will have a capacity of 5.0 MGD. The projected 2030 demand through this pipeline is 5.0 MGD.

$$\text{Study Period Allocation} = 5.0 \text{ MGD} / 5.0 \text{ MGD} = 100.0\%$$

24-inch Transmission Main along Cullen (Airport to E. Orem)

The proposed 24-inch Transmission Main along Cullen, from Airport to E. Orem, will have a capacity of 5.0 MGD. The projected 2030 demand through this pipeline is 5.0 MGD.

$$\text{Study Period Allocation} = 5.0 \text{ MGD} / 5.0 \text{ MGD} = 100.0\%$$

48-inch Transmission Main from Cottingham Rd. to State Hwy. 288

The proposed 48-inch Transmission Main, from Cottingham Rd. to State Hwy. 288, will have a capacity of 36.0 MGD. The projected 2030 demand through this pipeline is 36.0 MGD.

$$\text{Study Period Allocation} = 36.0 \text{ MGD} / 36.0 \text{ MGD} = 100.0\%$$

Groundwater Reduction Plan (GRP) Conversion Waterlines: Northeast Area Group B, Segment 1

The proposed GRP Conversion Waterlines: Northeast Area Group B, Segment 1, will have a capacity of 15.7 MGD. The projected 2030 demand through this pipeline is 15.7 MGD.

$$\text{Study Period Allocation} = 15.7 \text{ MGD} / 15.7 \text{ MGD} = 100.0\%$$

GRP Conversion Waterlines: Northeast Area Group B, Segment 2

The proposed GRP Conversion Waterlines: Northeast Area Group B, Segment 2, will have a capacity of 10.0 MGD. The projected 2030 demand through this pipeline is 10.0 MGD.

$$\text{Study Period Allocation} = 10.0 \text{ MGD} / 10.0 \text{ MGD} = 100.0\%$$

GRP Conversion Waterlines: Northeast Area Group B, Segment 3

The proposed GRP Conversion Waterlines: Northeast Area Group B, Segment 3, will have a capacity of 1.5 MGD. The projected 2030 demand through this pipeline is 1.5 MGD.

$$\text{Study Period Allocation} = 1.5 \text{ MGD} / 1.5 \text{ MGD} = 100.0\%$$

GRP Conversion Waterlines: Northeast Area Group C, Segment 1

The proposed GRP Conversion Waterlines: Northeast Area Group C, Segment 1, will have a capacity of 5.0 MGD. The projected 2030 demand through this pipeline is 5.0 MGD.

$$\text{Study Period Allocation} = 5.0 \text{ MGD} / 5.0 \text{ MGD} = 100.0\%$$

GRP Conversion Waterlines: Northeast Area Group C, Segment 2

The proposed GRP Conversion Waterlines: Northeast Area Group C, Segment 2, will have a capacity of 1.5 MGD. The projected 2030 demand through this pipeline is 1.5 MGD.

$$\text{Study Period Allocation} = 1.5 \text{ MGD} / 1.5 \text{ MGD} = 100.0\%$$

For transmission main facilities, the eligible costs are determined by multiplying by the eligible study period allocation for each facility listed above by the cost associated with the capacity, as shown in Table 4.6.

Table 4.6 Transmission Main Eligible CIP Costs

Facility	Capacity	Cost	Required Capacity	Eligible %	Eligible Cost
120" Northeast Transmission Line	51.2	\$1,111,344	15.7	30.7%	\$341,183
108" Northeast Transmission Line	51.2	90,978,990	15.7	30.7%	27,930,550
66" IH-45	83.3	35,760,325	21.0	25.2%	9,011,602
72" to SW Repump	104.5	135,652,386	104.5	100.0%	135,652,386
48" along Fuqua/Orem	36.0	42,075,986	36.0	100.0%	42,075,986
54" Southeast	9.0	22,464,084	9.0	100.0%	22,464,084
24" along Old Galveston Rd	5.0	26,383,546	5.0	100.0%	26,383,546
24" along Cullen, IH-610 to Airport	5.0	9,059,720	5.0	100.0%	9,059,720
24" along Cullen, Airport to E Orem	5.0	7,318,780	5.0	100.0%	7,318,780
48" from Cottingham to SH 288	36.0	5,136,486	36.0	100.0%	5,136,486
GRP Group B, Segment 1	15.7	5,893,000	15.7	100.0%	5,893,000
GRP Group B, Segment 2	10.0	3,958,000	10.0	100.0%	3,958,000
GRP Group B, Segment 3	1.5	2,021,000	1.5	100.0%	2,021,000
GRP Group C, Segment 1	5.0	8,605,000	5.0	100.0%	8,605,000
GRP Group C, Segment 2	1.5	2,835,000	1.5	100.0%	2,835,000
Total		\$399,253,647		77.3%	\$308,686,323

Total eligible existing and CIP costs for water transmission mains are shown in Table 4.7 below.

Table 4.7 Water Transmission Mains – Total Eligible Costs

Facility	Total Cost	Eligible %	Eligible Cost
Existing Mains	\$359,892,000	29.2%	\$105,065,772
Future CIP	\$399,253,647	77.3%	\$308,686,323
Total	\$759,145,647	54.5%	\$413,752,095

4.2.6 Engineering Studies

The 2020 Water and Wastewater Impact Fee Update is required to determine the cost of growth and resulting maximum impact fees for the study period 2020 to 2030. Therefore, 100 percent of the study cost⁶ is allocated to the study period. One half of the study is for the water impact fee update and the other half is for the wastewater impact fee update, as shown in the formula below:

$$\text{Impact Fee Study Cost Allocated to Water} = \frac{\$142,500}{2} = \$71,250$$

4.3 Financing Costs

As allowed by Chapter 395, financing costs associated with existing infrastructure with available capacity to serve new development are included in the eligible impact fee CIP. Houston Public Works provided debt service payment schedules for First Lien, Subordinate Lien (water only), and Junior Lien, which were used to determine the proportional interest payments associated with the existing infrastructure eligible for inclusion in the impact fee calculations.

Projected financing costs on eligible future CIP projects are also allowed by Chapter 395. It is assumed, per Houston Public Works, that the City will issue debt for 80 percent of future CIP projects. Using this assumption, combined with assumed debt parameters of 5.0 percent annual interest and a 30-year term, projected interest payments on eligible CIP projects are included in the impact fee calculation.

Table 4.8 provides a summary of the eligible existing assets and CIP projects, along with the eligible financing costs, for each infrastructure type.

Table 4.8 Water System Eligible CIP Costs

Facility Type	Existing Assets		Future CIP		Total Eligible Cost
	Eligible Cost	Eligible Financing	Eligible Cost	Eligible Financing	
Raw Water	\$82,636,984	\$41,820,180	\$0	\$0	\$124,457,164
Production	22,671,864	7,587,379	170,142,383	129,518,242	329,919,868
Pump Stations	3,983,702	1,333,188	63,505,000	48,342,193	117,164,083
Storage Tanks	6,211,097	2,078,609	0	0	8,289,706
Transmission	105,065,772	35,161,372	308,686,322	234,982,660	683,896,126
Studies	0	0	71,250	0	71,250
Total	\$220,569,419	\$87,980,728	\$542,404,955	\$412,843,095	\$1,263,798,197

⁶ The 2020 Impact Fee Update is part of Carollo’s CUS Water and Wastewater Rate Study contract (Contract No. 4600015370).

Section 5

WASTEWATER CAPITAL IMPROVEMENT PLAN

Impact fees provide the City with a mechanism for funding or recouping the cost associated with expanding the municipal wastewater system to accommodate growth in the service area. The City of Houston owns and operates an infrastructure intensive system comprised of treatment facilities, lift stations, and collection mains that must be continuously improved and expanded. The schedule for future investment in the wastewater system is known as the CIP. The CIP was updated as part of this study with capital project scope and cost provided by Houston Public Works⁷.

This section describes the basis for establishing which City of Houston wastewater facilities are eligible to be included in the impact fee analysis. Next, the criteria for measuring infrastructure capacity are explained for each infrastructure type. Finally, the additional facilities required to accommodate growth during the study period are summarized.

The full list of all wastewater impact fee eligible projects is provided in Appendix F.

5.1 Capacity Criteria

This section discusses the capacity of facilities that are eligible for inclusion in the calculation of the impact fees. The only capacities that are considered for inclusion are existing available capacities and planned increases in capacities to serve growth projected to occur during the study period. Available existing capacity is infrastructure that has been constructed but is not yet fully utilized because existing demand is less than existing capacity.

The growth-related capacities and criteria differ for the water and wastewater systems. For the wastewater system, the capacities considered for inclusion in the calculation of the wastewater impact fees are the wastewater treatment plants, lift stations, collection mains, and engineering studies.

5.1.1 Wastewater Treatment Plants

Due to the decentralized nature of the treatment system, it is necessary to evaluate each treatment plant in terms of its capacity to accommodate expected growth in the areas which each plant serves. This evaluation required analysis of projected wastewater system needs by individual wastewater treatment plants and associated collection systems.

Appendix E provides detailed information for each wastewater treatment plant's demand for the 2020 to 2030 planning period and the cost associated with the incremental demand at each plant. The projected demands for each plant, provided in Appendix E, are based on the land use assumptions for the plant's service area, provided in Appendix C.

Houston Public Works provided the current wastewater treatment plant capacity of 1,771.8 MGD, which is the sum of the 2-hour peak permit capacity at each of the City's 39 wastewater treatment plants.

⁷ Capital project scope and cost information is provided from multiple sources, including the full adopted City CIP and the City's need assessment analysis.

Houston Public Works also provided actual 2-hour peak demands observed at each plant to estimate the current total demand placed on the system by the existing population, which is 1,687.8 MGD. Finally, Houston Public Works estimated the 2-hour peak capacity at each plant required to serve the projected 2030 population, which is 1,810.9 MGD. The incremental demand, which is the difference between the projected 2030 2-hour peak capacity requirement and the current total 2-hour peak demand, is 123.1:

$$\begin{aligned} \text{Incremental 2 – hr Peak Demand} \\ = 2030 \text{ 2 – hr Peak Demand} - 2020 \text{ 2 – hr Peak Demand} \end{aligned}$$

$$\text{Incremental 2 – hr Peak Demand} = 1,810.9 \text{ MGD} - 1,687.8 \text{ MGD} = 123.1 \text{ MGD}$$

5.1.2 Lift Stations

In order to estimate the lift station capacity requirements for the 10-year growth, Houston Public Works assumed the lift station demands mirror those estimated for the wastewater treatment plant capacity. Therefore, an additional 123.1 MGD of lift station capacity is required to serve the projected growth during the study period.

5.1.3 Wastewater Collection System

Development of projected demand permits evaluation of the collection system capacity to collect wastewater from within a service area in which demand is projected and discharge it into that service area's treatment plant. As with the wastewater treatment plants and lift stations, the collection system capacities required to serve the projected growth during the study period were estimated based on the total wastewater system capacity requirements of 123.1 MGD.

5.2 Eligible Existing and CIP Costs

The capacity criteria were used to determine which City of Houston wastewater facilities are eligible for inclusion in the calculation of the maximum wastewater impact fee. Projects included in the full adopted City CIP can serve to rehabilitate and renew the system, enhance the system to improve efficiency and meet regulatory requirements, increase the system capacity, or achieve a combination of these objectives. Only those projects or portions of projects related to the capacity required to serve the study period projected growth (2020 to 2030) can be included in the impact fee calculation. Additionally, projects are excluded from the impact fee calculation if the costs cannot be accurately delineated or if alternate mechanisms for cost recovery are in place.

Financing costs associated with the wastewater system have been estimated based on outstanding debt and historic funding policies, consistent with previous City of Houston impact fee studies.

Facilities included in the impact fee study are wastewater treatment facilities, lift stations, collection mains, and engineering studies. Appendix F provides detailed information for eligible wastewater assets and CIP projects for the 2020 to 2030 planning period.

5.2.1 Wastewater Treatment Plants

Currently, the City's Wastewater Service Area includes 39 wastewater treatment plants with the total 2-hour peak capacity of 1,771.8 MGD. Of the 1,771.8 MGD of existing 2-hour peak capacity in 2020, 1,687.8 MGD is needed to meet the 2-hour peak flow from existing customers (see Section 5.1.1). Therefore, 84.0 MGD is available to serve new development.

From the Wastewater Treatment capacity criteria in Section 5.1.1, approximately 123.1 MGD of 2-hour peak capacity is required to serve growth during the study period. Based on the plant-by-plant analysis completed by Houston Public Works, only 29.7 MGD of this capacity is available at existing wastewater treatment plants where it can be utilized by projected study period growth. As such, an additional 93.4 MGD of 2-hour peak capacity in expansion CIP is needed to meet the demands of the projected study period growth. Thus, the total available 2-hour peak capacity during the study period is 177.4 MGD:

$$\text{Total Available 2 – hour Peak Treatment Capacity} = \text{Available Existing Capacity} + \text{Future CIP Capacity}$$

$$\text{Total Available 2 – hour Peak Treatment Capacity} = 84.0 \text{ MGD} + 93.4 \text{ MGD} = 177.4 \text{ MGD}$$

The allocation factor for the existing assets is based on the portion of existing available 2-hour peak capacity that will be utilized by the projected study period growth:

$$\text{Study Period Allocation} = \text{Study Period 2 – hour Peak Flow} / \text{Total Available 2 – hour Peak Capacity}$$

$$\text{Study Period Allocation} = 29.7 \text{ MGD} / 84.0 \text{ MGD} = 35.4\%$$

The portion of wastewater treatment plant improvement CIP associated with the existing available 2-hour peak capacity that will be utilized by the projected study period growth can be allocated to the impact fee calculation because it excludes the cost to improve existing 2-hour peak capacity that is required to serve existing customers. The eligible portion is determined using the same allocation factor used for the existing assets.

Houston Public Works projected the cost of the additional 93.4 MGD of 2-hour peak capacity that is required to meet the demand placed on the wastewater treatment plants by the projected growth during the study period. This cost is included at 100 percent based on Houston Public Works’ analysis.

Total eligible existing and CIP costs for wastewater treatment facilities are shown in Table 5.1 below.

Table 5.1 Wastewater Treatment Facilities – Total Eligible Costs

Facility	Available Capacity	Cost	Required Capacity	Eligible %	Eligible Cost
Existing Assets ¹	84.0	\$88,006,965	29.7	35.4%	\$31,154,466
Improvement CIP ²	84.0	32,799,208	29.7	35.4%	11,610,920
Expansion CIP ³	93.4	116,712,412	93.4	100.0%	116,712,412
Total	177.4	\$237,518,585	123.1	67.1%	\$159,477,798

Notes:

- (1) Costs associated with existing assets are based on fixed asset register provided by Houston Public Works.
- (2) Costs associated with improvement CIP projects are provided by Houston Public Works from the full adopted City CIP.
- (3) Costs associated with expansion CIP projects are provided by Houston Public Works from the full adopted City CIP.

Costs associated with expansion CIP projects are developed by Houston Public Works based on an average cost of \$1.25 million per MGD of 2-hour peak capacity.

5.2.2 Lift Stations

The current 2-hour peak capacity of the City's wastewater lift stations is 2,231.0 MGD (excluding the wastewater treatment plant influent pump stations). As stated in Section 5.1.2, the lift station capacity requirements are assumed to mirror the wastewater treatment capacity requirements. Therefore, of the 2,231.0 MGD of existing capacity, 1,687.8 MGD is needed to meet the existing 2-hour peak flow during the study period. Therefore, 543.2 MGD is available to serve new development. No additional capacity is planned during the study period.

Based on the lift station capacity criteria in Section 5.1.2, it is assumed that 123.1 MGD of the existing available capacity will be used to serve future customers during the study period. This represents 22.7 percent of the 543.2 MGD of total available capacity:

$$\text{Study Period Allocation} = 123.1 \text{ MGD} / 543.2 \text{ MGD} = 22.7\%$$

Total eligible existing and CIP costs for wastewater lift stations are shown in Table 5.2 below.

Table 5.2 Wastewater Lift Stations – Total Eligible Costs

Facility	Available Capacity	Cost	Required Capacity	Eligible %	Eligible Cost
Existing Assets ¹	543.2	\$89,628,954	123.1	22.7%	\$20,345,773
Improvement CIP ²	543.2	74,067,791	123.1	22.7%	16,813,389
Expansion CIP	0.0	0	0.0	0.0%	0
Total	543.2	\$163,696,745	123.1	22.7%	\$37,159,162

Notes:

- (1) Costs associated with existing assets are based on fixed asset register provided by Houston Public Works.
- (2) Costs associated with improvement CIP projects are provided by Houston Public Works from the full adopted City CIP.

5.2.3 Collection System

It is assumed that the capacity of the large diameter collection mains mirrors the lift station capacity. As such, the assumed current capacity of the City's large diameter collection mains is 2,231.0 MGD. Of the 2,231.0 MGD of existing capacity, 1,687.8 MGD is needed to meet the existing 2-hour peak flow during the study period. Therefore, 543.2 MGD is available to serve new development.

Based on the collection mains capacity criteria in Section 5.1.3, it is assumed that 123.1 MGD of the existing available capacity will be used to serve future customers during the study period. This represents 22.7 percent of the 543.2 MGD of total available 2-hour peak capacity:

$$\text{Study Period Allocation} = 123.1 \text{ MGD} / 543.2 \text{ MGD} = 22.7\%$$

The proposed Developer Participation Contract (R-800) was included in the full adopted City CIP provided by Houston Public Works. This project will provide service to future customers and is 100 percent eligible for inclusion in the impact fee calculation.

Total eligible existing and CIP costs for wastewater collection mains are shown in Table 5.3.

Table 5.3 Collection System – Total Eligible Costs

Facility	Available Capacity	Cost	Required Capacity	Eligible %	Eligible Cost
Existing Assets	543.2	\$402,994,114	123.1	22.7%	\$91,479,664
Improvement CIP	543.2	17,565,009	123.1	22.7%	3,987,257
Developer Participation	N/A	8,554,000	N/A	100.0%	8,554,000
Total	543.2	\$429,113,123	123.1	22.7%	\$104,020,921

Notes:

- (1) Costs associated with existing assets are based on fixed asset register provided by Houston Public Works.
- (2) Costs associated with improvement CIP projects are provided by Houston Public Works from the full adopted City CIP.
- (3) Costs associated with developer participation projects are provided by Houston Public Works.

5.2.4 Engineering Studies

The 2020 Water and Wastewater Impact Fee Update is required to determine the cost of growth and resulting maximum impact fees for the study period 2020 to 2030. Therefore, 100 percent of the study cost⁸ is allocated to the study period. One half of the study fee is for the water impact fee update and the other half is for the wastewater impact fee update, as shown in the formula below:

$$\text{Impact Fee Study Cost Allocated to Wastewater} = \frac{\$142,500}{2} = \$71,250$$

5.3 Financing Costs

As allowed by Chapter 395, financing costs associated with existing infrastructure with available capacity to serve new development are included in the eligible impact fee CIP. Houston Public Works provided debt service payment schedules for First Lien and Junior Lien, which were used to determine the proportional interest payments associated with the existing infrastructure eligible for inclusion in the impact fee calculations.

Projected financing costs on eligible future CIP projects are also allowed by Chapter 395. It is assumed, based on discussions with Houston Public Works, that the City will issue debt for 80 percent of future CIP projects. Using this assumption, combined with assumed debt parameters of 5.0 percent annual interest and a 30-year term, projected interest payments on eligible CIP projects are included in the impact fee calculation.

Table 5.4 provides a summary of the eligible existing assets and CIP projects, along with the eligible financing costs, for each infrastructure type.

⁸ The 2020 Impact Fee Update is part of Carollo’s CUS Water and Wastewater Rate Study contract (Contract No. 4600015370).

Table 5.4 Total Eligible CIP Costs for the 2020-2030 Wastewater Impact Fees

Facility Type	Ex. Assets / Improvement CIP		Expansion CIP		Total Eligible Cost
	Eligible Cost	Eligible Financing	Eligible Cost	Eligible Financing	
Treatment	\$42,765,386	\$17,879,385	\$116,712,412	\$88,845,508	\$266,202,691
Lift Stations	37,159,162	18,703,096	0	0	55,862,258
Collection Mains	95,466,921	29,581,835	8,554,000	0	133,602,756
Studies	0	0	71,250	0	71,250
Total	\$175,391,469	\$66,164,316	\$125,337,662	\$88,845,508	\$455,738,955

Section 6

MAXIMUM WATER IMPACT FEE CALCULATION

6.1 Service Units

The differentiated costs between customer types are allocated through the application of the equivalent service unit concept. Chapter 395 defines a methodology to calculate the maximum impact fee per service unit by dividing the total eligible costs of capital improvements needed to serve new growth during the study period by the total increase in service units projected to occur over the study period. Since the single family residential customer is the most popular customer type, it is defined as 1.0 service unit. Appendix G provides the current equivalency factors, which are used to relate the average demands of other customer types to the demand of the typical single family residential customer. This section addresses the calculation of incremental service units and uses the findings in the LUAP and CIP to calculate the maximum allowable water impact fee.

In order to calculate the maximum allowable water impact fee, it is first necessary to estimate the growth in water demand in terms of incremental service units. We determine the number of people currently served per residential service unit and the number of employees currently served per nonresidential service unit. These calculations are provided in Table 6.1.

Table 6.1 Calculation of Water Incremental Service Units

Service Unit Calculation		Residential	Non-Residential
2019 Total Production Volume (kgal)	<i>a</i>	125,898,000	
2019 Billed Volume (kgal)	<i>b</i>	49,786,724	51,134,561
2019 Total Billed Volume (kgal)	<i>c</i>	100,921,285	
2019 Production Volume (kgal)	$d=a*b/c$	62,108,295	63,789,705
2019 Production per Day (gal)	$e=d/365*1000$	170,159,712	174,766,315
Service Unit (gpd)	<i>f</i>	250	250
2019 Service Units	$g=e/f$	680,639	699,065
2019 Population/Employment	<i>h</i>	2,688,749	1,991,567
Service Units per Capita	$i=g/h$	0.25	0.35
2020 WSA Population/Employment	<i>j</i>	2,696,815	1,997,542
2020 WSA Service Units	$k=i*j$	674,204	699,140
2030 WSA Population/Employment	<i>l</i>	3,061,272	2,295,099
2030 WSA Service Units	$m=i*l$	765,318	803,285
Incremental Service Units	$n=m-l$	91,114	104,145
Total Incremental Service Units		195,259	

The residential and nonresidential incremental service units are added together to produce the total incremental service units, which is used to calculate the maximum allowable water impact fee.

6.2 Maximum Water Impact Fee Calculation

Impact fees are the quotient of the total eligible cost for the study period from Table 4.8 divided by the incremental water service units from Table 6.1. This fee equals the calculated water impact fee for 1.0 service unit.

$$\text{Calculated Water Impact Fee} = \frac{\text{Total Eligible Costs}}{\text{Incremental Water Service Units}} =$$

$$\$1,263,798,197 / 195,259 \text{ service units} = \$6,472.42 \text{ per service unit}$$

Chapter 395 requires the calculation of a credit to apply to the impact fee to reduce it by the estimated amount that a new customer may pay through its water and wastewater service charges once it becomes a ratepayer. Alternatively, Chapter 395 allows a utility to reduce the calculated impact fee by 50 percent to avoid calculating the credit. The City has elected to apply the 50 percent reduction, which results in a maximum allowable water impact fee of \$3,236.21 per service unit:

$$\text{Maximum Allowable Water Impact Fee} = 50\% * \text{Calculated Water Impact Fee} =$$

$$50\% * \$6,472.42 = \$3,236.21 \text{ per service unit}$$

Section 7

MAXIMUM WASTEWATER IMPACT FEE CALCULATION

7.1 Service Units

The differentiated costs between customer types are allocated through the application of the equivalent service unit concept. Chapter 395 defines a methodology to calculate the maximum impact fee per service unit by dividing the total eligible costs of capital improvements needed to serve new growth during the study period by the total increase in service units to occur over the study period. Since the single family residential customer is the most popular customer type, it is defined as 1.0 service unit. Appendix G provides the current equivalency factors, which used to relate the average demands of other customer types to the demand of the typical single family residential customer. This section addresses the calculation of incremental service units and uses the findings in the LUAP and CIP to calculate the maximum allowable wastewater impact fee.

In order to calculate the maximum allowable wastewater impact fee, it is first necessary to estimate the growth in wastewater demand in terms of incremental service units. We determine the number of people currently served per residential service unit and the number of employees currently served per nonresidential service unit. These calculations are provided in Table 7.1.

Table 7.1 Calculation of Wastewater Incremental Service Units

Service Unit Calculation		Residential	Non-Residential
2019 Total Treated Volume (kgal)	<i>a</i>	98,394,964	
2019 Billed Volume (kgal)	<i>b</i>	47,207,096	22,115,726
2019 Total Billed Volume (kgal)	<i>c</i>	69,322,822	
2019 Treated Volume (kgal)	$d=a*b/c$	67,004,493	31,390,471
2019 Treated per Day (gal)	$e=d/365*1000$	183,573,953	86,001,290
WW Flow Rate per Service Unit (gpd)	<i>f</i>	250	250
2019 Service Units	$g=e/f$	734,296	344,005
2019 Population/Employment	<i>h</i>	2,258,266	1,789,704
Service Units per Capita	$i=g/h$	0.33	0.19
2020 WWSA Population/Employment	<i>J</i>	2,265,041	1,795,073
2020 WWSA Service Units	$k=i*j$	747,463	341,064
2030 WWSA Population/Employment	<i>l</i>	2,449,139	1,993,022
2030 WWSA Service Units	$m=i*l$	808,216	378,674
Incremental Service Units	$n=m-l$	60,753	37,610
Total Incremental Service Units		98,363	

The residential and nonresidential incremental service units are added together to produce the total incremental service units, which is used to calculate the maximum allowable wastewater impact fee.

7.2 Maximum Impact Fee Calculations

Impact fees are the quotient of the total eligible cost for the study period from Table 5.4 divided by the incremental service units from Table 7.1. This fee equals the calculated wastewater impact fee for 1.0 service unit:

$$\text{Calculated Wastewater Impact Fee} = \frac{\text{Total Eligible Costs}}{\text{Incremental Wastewater Service Units}} =$$

$$\$455,738,955 / 98,363 \text{ service units} = \$4,633.24 \text{ per service unit}$$

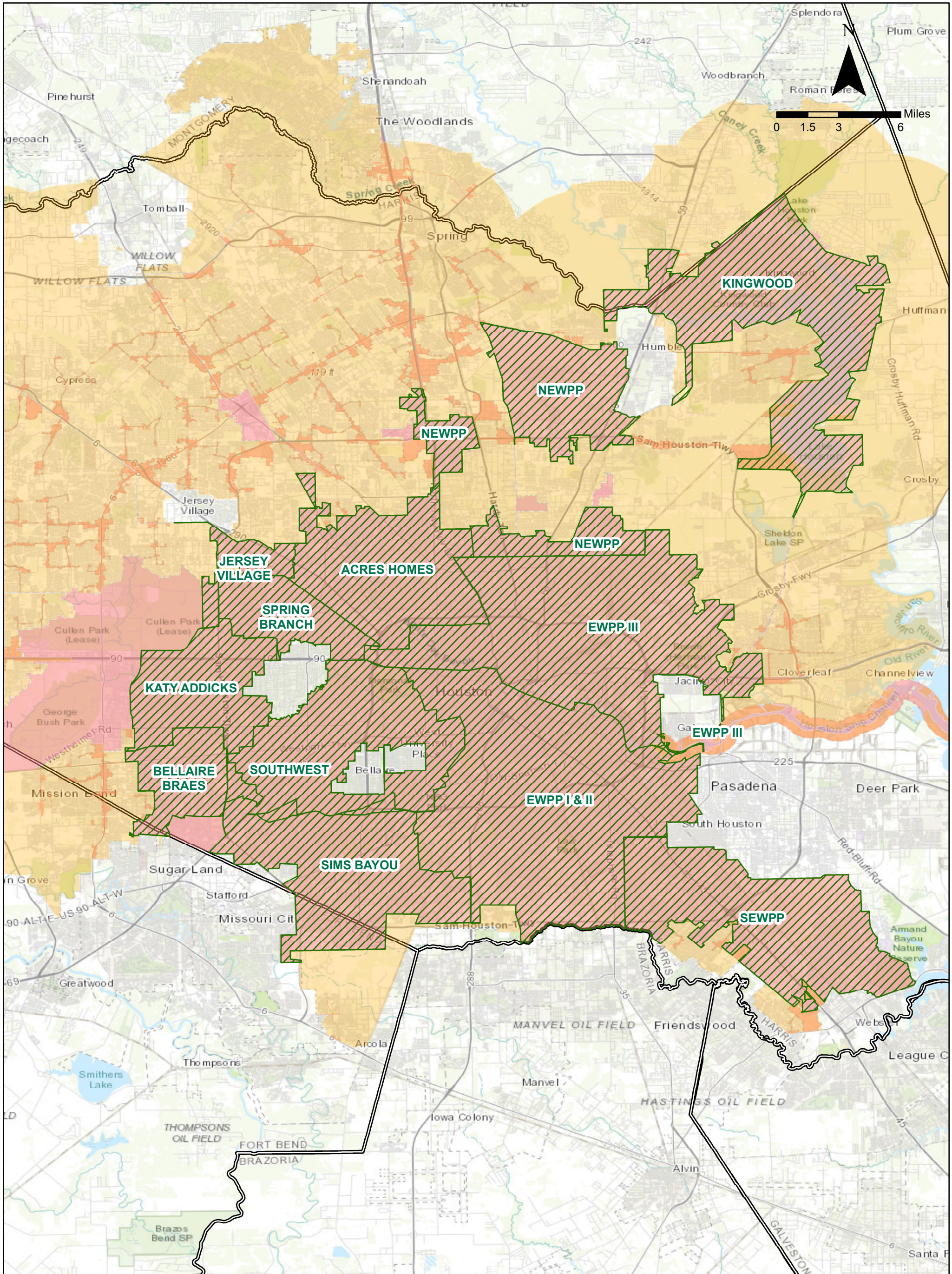
Chapter 395 requires the calculation of a credit to apply to the impact fee to reduce it by the estimated amount that a new customer may pay through its water and wastewater service charges once it becomes a ratepayer. Alternatively, Chapter 395 allows a utility to reduce the calculated impact fee by 50 percent to avoid calculating the credit. The City has elected to apply the 50 percent reduction, which results in a maximum allowable wastewater impact fee of \$2,316.62 per service unit:

$$\text{Maximum Allowable Wastewater Impact Fee}$$

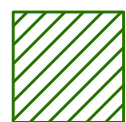
$$= 50\% * \text{Calculated Wastewater Impact Fee} =$$

$$50\% * \$4,633.24 = \$2,316.62 \text{ per service unit}$$

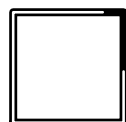
Appendix A
WATER SERVICE AREA



**City of Houston
Water Service Area
(WSA)**



Water Service Area



County Boundaries



ETJ

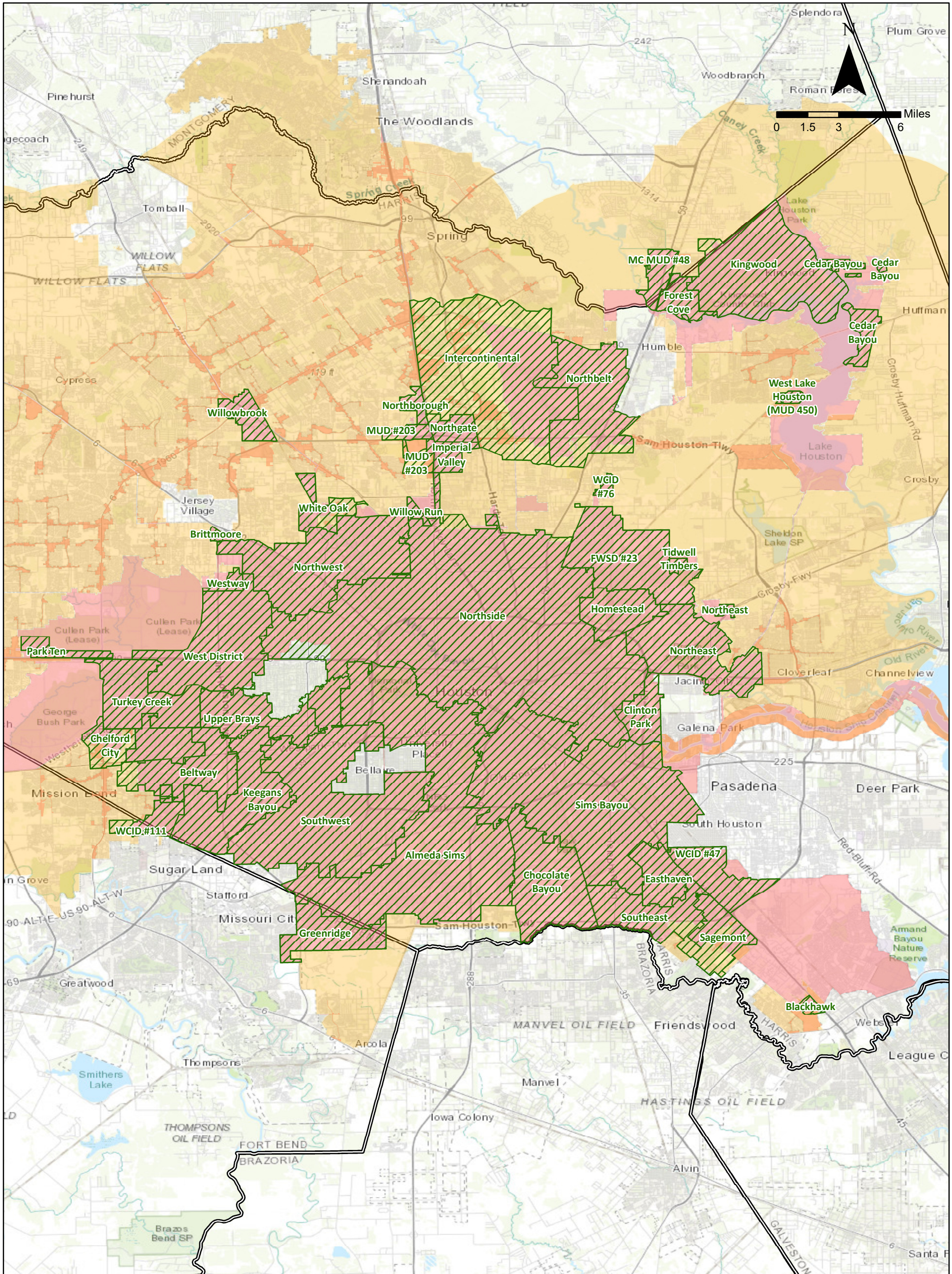


City Limits

Legend



Appendix B
WASTEWATER SERVICE AREA



**City of Houston
Wastewater Service Area
(WWSA)**

Legend

- WWSA**
- ETJ**
- City Limits**
- County Boundaries**



Appendix C
WASTEWATER POPULATION AND
EMPLOYMENT PROJECTIONS

Wastewater Population and Employment Projections by Service Area

#	Wastewater Treatment Plants (Owned & Operated by COH)	POPULATION			EMPLOYMENT		
		2020	2030	2040	2020	2030	2040
1	69th Street (includes Willow Run SA but excludes Macgregor#1 LS SA)	473,316	505,879	546,996	706,310	721,440	800,996
2	Alameda Sims (with Macgregor#1 LS SA)	215,677	240,376	259,914	57,236	68,109	75,620
3	Beltway	72,506	77,530	83,832	66,168	91,432	101,515
4	Cedar Bayou	4,181	4,278	4,626	296	299	332
5	Chocolate Bayou	33,262	41,769	45,164	6,155	6,313	7,009
6	Clinton Park	2,805	3,146	3,402	3,096	3,172	3,522
7	Easthaven	15,336	17,044	18,430	8,564	8,809	9,780
8	Forest Cove	4,119	4,258	4,604	2,257	2,274	2,525
9	FWSD-23	42,908	46,348	50,115	7,063	7,068	7,847
10	Greenridge	32,888	33,875	36,628	3,604	4,058	4,505
11	Homestead	7,961	8,617	9,317	4,938	4,935	5,479
12	Imperial Valley	18,051	19,144	20,700	12,833	13,512	15,002
13	Intercont. Airport (larger boundary)	63,169	72,579	78,479	21,048	23,358	25,934
14	Keegans Bayou	125,266	134,063	144,960	116,169	167,488	185,957
15	Kingwood Central	56,282	58,519	63,275	9,383	9,613	10,673
16	Kingwood West	3,990	5,910	6,390	4,294	4,520	5,018
17	Metro Central	16,278	19,294	20,862	7,823	7,976	8,856
18	MUD-203	3,825	4,435	4,795	8,344	9,314	10,341
19	Northbelt	39,484	43,671	47,220	19,977	20,284	22,521
20	Northeast	33,023	33,899	36,654	20,455	21,054	23,376
21	Northgate	23,864	25,027	27,061	34,118	35,013	38,874
22	Northwest	83,660	89,868	97,172	78,711	94,012	104,379
23	Park Ten	5,878	5,892	6,370	12,784	13,074	14,516
24	Sagemont	33,212	36,320	39,273	8,287	8,483	9,418
25	Sims Bayou (North+ South)	221,701	235,588	254,737	83,835	86,823	96,397
27	Southeast	36,730	40,504	43,796	7,317	7,431	8,250
28	Southwest	277,221	300,249	324,653	234,249	265,391	294,657
29	Tidwell Timbers	1,987	2,017	2,181	103	103	114
30	Turkey Creek	57,170	62,427	67,501	43,857	45,210	50,195
31	Upper Brays	90,302	97,641	105,577	71,001	87,260	96,882
32	WCID-111	22,269	23,474	25,382	6,480	6,583	7,309
33	WCID-47	28,635	29,726	32,142	7,669	7,674	8,520
34	WCID-76	3,272	3,429	3,708	155	156	173
35	West District	81,209	87,060	94,137	96,721	114,864	127,530
36	West Lake Houston	2,414	2,607	2,819	-	-	-
37	Westway	4,538	4,689	5,071	8,951	11,117	12,343
38	White Oak	17,925	18,638	20,153	2,611	2,841	3,154
39	Willowbrook	8,724	9,347	10,107	12,211	11,959	13,278
TOTAL:		2,265,041	2,449,139	2,648,201	1,795,073	1,993,022	2,212,800

Appendix D
WATER CIP ELIGIBLE FACILITIES

Water CIP Eligible Facilities

Description	Asset/Project Costs	Current Capacity (MGD)	Allocation Basis Capacity (MGD)	Capacity Required to Serve Existing Customers (MGD)	Existing Available Capacity (MGD)	Allocated to Beyond 2020 (%)	Allocated to Beyond 2020 (\$)	Study Period Required Capacity (2020 - 2030)	Allocated to 2020-2030 Impact Fees (%)	Allocated to 2020-2030 Impact Fees(\$)	Allocated to Impact Fees after 2030 (%)	Allocated to Impact Fees after 2030 (\$)
RAW WATER FACILITIES												
CWA System A	\$ 10,064,000	260.0	205.0	164.0	41.0	20.0%	\$ 2,012,800	11.0	5.4%	\$ 543,456	14.6%	\$ 1,469,344
Line A-2 (formerly Southwest Lateral)	77,177,000	260.0	162.4	164.0	0.0	0.0%	0	0.0	0.0%	0	0.0%	0
CWA System C	192,206,000	296.0	225.8	186.0	39.8	17.6%	33,828,256	39.8	17.6%	33,828,256	0.0%	0
Ship Channel Crossing	13,912,000	880.0	670.0	555.0	115.0	17.2%	2,392,864	51.0	7.6%	1,057,312	9.6%	1,335,552
Lynchburg Pump Station (Original)	78,736,000	694.0	694.0	555.0	139.0	20.0%	15,747,200	51.0	7.3%	5,747,728	12.7%	9,999,472
Lynchburg Pump Station (Expansion)	41,138,000	227.0	118.0	0.0	118.0	100.0%	41,138,000	0.0	0.0%	0	100.0%	41,138,000
Lynchburg Reservoir	20,128,000	1500.0	1300.0	555.0	745.0	57.3%	11,533,344	51.0	3.9%	784,992	53.4%	10,748,352
CWA Main Canal	47,064,000	1300.0	1300.0	555.0	745.0	57.3%	26,967,672	51.0	3.9%	1,835,496	53.4%	25,132,176
Trinity River Pump Station (Original)	23,088,000	615.0	615.0	615.0	0.0	0.0%	0	0.0	0.0%	0	0.0%	0
Trinity River Pump Station (Expansion)	79,837,000	440.0	273.0	14.0	259.0	94.9%	75,765,313	51.0	18.7%	14,929,519	76.2%	60,835,794
Luce Bayou Transfer Pipeline	373,597,259	400.0	400.0	0.0	400.0	100.0%	373,597,259	25.6	6.4%	23,910,225	93.6%	349,687,034
Total RAW WATER FACILITIES:	\$ 956,947,259						\$ 582,982,708			\$ 82,636,984		\$ 500,345,724

Description	Asset/Project Costs	Total Capacity (MGD)	Available Capacity (MGD)	Allocated to Beyond 2020 (%)	Allocated to Beyond 2020 (\$)	Required Capacity (2020 - 2030)	Allocated to 2020-2030 Impact Fees (%)	Allocated to 2020-2030 Impact Fees(\$)	Allocated to Impact Fees after 2030 (%)	Allocated to Impact Fees after 2030 (\$)
WATER PRODUCTION FACILITIES										
Existing Assets	\$ 439,138,917	908.6	116.4	12.8%	\$ 56,257,726	46.9	40.3%	\$ 22,671,864	59.7%	\$ 33,585,862
Water Production CIP										
Northeast WPP Expansion	1,937,249,000	342.5	73.7	20.5%	397,431,535	29.7	40.3%	160,164,909	59.7%	237,266,626
New/Replacement Groundwater Wells	24,758,000			100.0%	24,758,000		40.3%	9,977,474	59.7%	14,780,526
Total WATER PRODUCTION FACILITIES:	\$ 2,401,145,917		190.10		\$ 478,447,261	76.60		\$ 192,814,247		\$ 285,633,015
PUMP STATIONS										
Existing Assets	\$ 160,325,947	682.7	190.6	27.9%	\$ 44,760,693	16.9	8.9%	\$ 3,983,702	91.1%	\$ 40,776,992
Pump Station CIP										
New Groundwater Pump Station	63,505,000	190.6	22.5	100.0%	63,505,000	22.5	100.0%	63,505,000	0.0%	0
Total PUMP STATIONS:	\$ 223,830,947		213.10		\$ 108,265,693	39.40		\$ 67,488,702		\$ 40,776,992
STORAGE FACILITIES										
Existing Assets	\$ 149,487,110	363.5	173.6	47.8%	\$ 71,391,918	15.1	8.7%	\$ 6,211,097	91.3%	\$ 65,180,821
Storage Facilities CIP	0	0.0	N/A	N/A	N/A	N/A	N/A	0	N/A	0
Total STORAGE FACILITIES:	\$ 149,487,110		173.60		\$ 71,391,918	15.10		\$ 6,211,097		\$ 65,180,821

Description	Asset/Project Costs	Total Capacity (MGD)	Capacity Required to Serve Existing Customers (MGD)	Allocated to Beyond 2020 (%)	Allocated to Beyond 2020 (\$)	Required Capacity (2020 - 2030)	Allocated to 2020-2030 Impact Fees (%)	Allocated to 2020-2030 Impact Fees(\$)	Allocated to Impact Fees after 2030 (%)	Allocated to Impact Fees after 2030 (\$)
TRANSMISSION MAINS										
Existing Assets										
96" Genoa Red Bluff	\$ 47,496,000	223.1	129.0	42.2%	\$ 20,043,312	28.1	12.6%	\$ 5,984,496	29.6%	\$ 14,058,816
72" Ella	124,194,000	104.5	64.8	38.0%	47,193,720	39.7	38.0%	47,193,720	0.0%	0
72" Fuqua (70A-1, 70A-2)	41,569,000	104.5	66.3	36.6%	15,214,254	2.7	2.6%	1,080,794	34.0%	14,133,460
66" Moers (70A-3)	17,850,000	83.3	47.6	42.9%	7,657,650	21.4	25.7%	4,587,450	17.2%	3,070,200
66" Monroe (70A-4)	32,428,000	83.3	41.2	50.5%	16,376,140	27.8	33.4%	10,830,952	17.1%	5,545,188
60" Airport (70B)	15,664,000	64.8	39.2	39.5%	6,187,280	25.6	39.5%	6,187,280	0.0%	0
60" Broadway (70C)	15,664,000	64.8	39.2	39.5%	6,187,280	25.6	39.5%	6,187,280	0.0%	0
48" Sims Bayou (74A-1)	5,008,000	36.0	20.9	41.9%	2,098,352	15.1	41.9%	2,098,352	0.0%	0
42" Sims Bayou (74A-1, 74A-2)	23,634,000	25.3	14.4	43.1%	10,186,254	10.9	43.1%	10,186,254	0.0%	0
36" Sims Bayou (74B)	14,191,000	15.7	11.5	26.8%	3,803,188	4.2	26.8%	3,803,188	0.0%	0
30" Sims Bayou (74C)	14,875,000	10.0	6.2	38.0%	5,652,500	3.8	38.0%	5,652,500	0.0%	0
42" Bellaire Braes	7,319,000	25.3	20.9	17.4%	1,273,506	4.4	17.4%	1,273,506	0.0%	0
Transmission Mains CIP										
120" Northeast Transmission Line	1,111,344	51.2	35.5	30.7%	341,183	15.7	30.7%	341,183	0.0%	0
108" Northeast Transmission Line	90,978,990	51.2	35.5	30.7%	27,930,550	15.7	30.7%	27,930,550	0.0%	0
66" IH-45	35,760,325	83.3	0.0	100.0%	35,760,325	21.0	25.2%	9,011,602	74.8%	26,748,723
72" to SW Repump	135,652,386	104.5	0.0	100.0%	135,652,386	104.5	100.0%	135,652,386	0.0%	0
48" along Fuqua/Orem	42,075,986	36.0	0.0	100.0%	42,075,986	36.0	100.0%	42,075,986	0.0%	0
54" Southeast	22,464,084	9.0	0.0	100.0%	22,464,084	9.0	100.0%	22,464,084	0.0%	0
24" along Old Galveston Rd	26,383,546	5.0	0.0	100.0%	26,383,546	5.0	100.0%	26,383,546	0.0%	0
24" along Cullen, IH-610 to Airport	9,059,720	5.0	0.0	100.0%	9,059,720	5.0	100.0%	9,059,720	0.0%	0
24" along Cullen, Airport to E Orem	7,318,780	5.0	0.0	100.0%	7,318,780	5.0	100.0%	7,318,780	0.0%	0
48" from Cottingham to SH 288	5,136,486	36.0	0.0	100.0%	5,136,486	36.0	100.0%	5,136,486	0.0%	0
GRP Group B, Segment 1	5,893,000	15.7	0.0	100.0%	5,893,000	15.7	100.0%	5,893,000	0.0%	0
GRP Group B, Segment 2	3,958,000	10.0	0.0	100.0%	3,958,000	10.0	100.0%	3,958,000	0.0%	0
GRP Group B, Segment 3	2,021,000	1.5	0.0	100.0%	2,021,000	1.5	100.0%	2,021,000	0.0%	0
GRP Group C, Segment 1	8,605,000	5.0	0.0	100.0%	8,605,000	5.0	100.0%	8,605,000	0.0%	0
GRP Group C, Segment 2	2,835,000	1.5	0.0	100.0%	2,835,000	1.5	100.0%	2,835,000	0.0%	0
Total TRANSMISSION MAINS:	\$ 759,145,647				\$ 477,308,482			\$ 413,752,095		\$ 63,556,387
Engineering Studies										
Engineering Impact Fee Study	\$ 71,250	N/A	N/A	100.0%	\$ 71,250	N/A	100.0%	\$ 71,250	0.00%	\$ -
Total Engineering Studies:	\$ 71,250				\$ 71,250			\$ 71,250		\$ -
TOTAL WATER CIP	\$ 4,490,628,130				\$ 1,718,467,312			\$ 762,974,374		\$ 955,492,939

Appendix E

WASTEWATER TREATMENT PLANT DEMAND

Wastewater Treatment Plant Demands and Expansion Costs

WWTPs (Owned & Operated by COH)	Appropriated CIP Cost for Expansion Added Through 2030	Interest Cost for Expansion Added Through 2030	Total Eligible Cost of Plant Expansions	Permit Daily Average Flow (MGD)	Permit 2-hr Peak Flow/Total Capacity (MGD)	2-hr Peak Capacity Utilized/ Existing Capacity (MGD)	2-hr Peak Capacity Available (MGD)	Estimated Total Peak Flow Demand (2020-2030) ⁽¹⁾	Additional Peak Capacity Expansion Needs (MGD)	Total Available Treatment Capacity (MGD)	Estimated Existing Available Capacity to be Utilized (2020 - 2030)
69th Street (includes Willow Run SA but excludes Macgregor#1 LS SA)	\$16,180,368	\$12,317,053	\$28,497,421	200.00	400.00	400.00	0.00	12.94	12.94	12.94	0.00
Alameda Sims (with Macgregor#1 LS SA)	15,523,878	11,817,310	27,341,188	20.00	90.00	90.00	0.00	12.42	12.42	12.42	0.00
Beltway	6,001,615	4,568,636	10,570,250	13.34	40.02	38.02	2.00	6.80	4.80	6.80	2.00
Cedar Bayou	69,388	52,820	122,208	1.50	6.99	6.99	0.00	0.06	0.06	0.06	0.00
Chocolate Bayou	6,553,969	4,989,107	11,543,076	7.00	28.27	28.27	0.00	5.24	5.24	5.24	0.00
Clinton Park	0	0	0	2.00	10.20	9.79	0.41	0.33	0.00	0.41	0.33
Easthaven	376,375	286,509	662,884	3.00	15.45	14.74	0.71	1.01	0.30	1.01	0.71
Forest Cove	113,829	86,650	200,479	0.95	3.80	3.80	0.00	0.09	0.09	0.09	0.00
FWSD-23	2,986,264	2,273,247	5,259,511	7.00	47.60	47.60	0.00	2.39	2.39	2.39	0.00
Greenridge	1,022,012	777,991	1,800,002	7.05	30.00	30.00	0.00	0.82	0.82	0.82	0.00
Homestead	0	0	0	4.00	18.90	17.99	0.91	0.35	0.00	0.91	0.35
Imperial Valley	719,840	547,967	1,267,808	4.00	9.72	9.72	0.00	0.58	0.58	0.58	0.00
Intercont. Airport (larger boundary)	0	0	0	8.00	32.00	12.13	19.87	3.86	0.00	19.87	3.86
Keegans Bayou	20,241,634	15,408,629	35,650,262	23.10	69.30	69.30	0.00	16.19	16.19	16.19	0.00
Kingwood Central	0	0	0	7.00	36.98	34.91	2.07	1.21	0.00	2.07	1.21
Kingwood West	1,356,860	1,032,889	2,389,749	1.50	4.50	4.50	0.00	1.09	1.09	1.09	0.00
Metro Central	0	0	0	5.00	15.00	12.87	2.13	1.17	0.00	2.13	1.17
MUD-203	129,956	98,927	228,883	1.50	4.57	4.00	0.57	0.67	0.10	0.67	0.57
Northbelt	0	0	0	5.00	22.00	17.56	4.44	1.39	0.00	4.44	1.39
Northeast	1,274,690	970,338	2,245,027	7.25	50.00	50.00	0.00	1.02	1.02	1.02	0.00
Northgate	0	0	0	3.71	11.13	9.87	1.26	0.44	0.00	1.26	0.44
Northwest	10,838,249	8,250,449	19,088,698	18.00	82.00	82.00	0.00	8.67	8.67	8.67	0.00
Park Ten	0	0	0	3.50	10.50	6.00	4.50	0.14	0.00	4.50	0.14
Sagemont	735,375	559,793	1,295,169	6.14	24.56	24.00	0.56	1.15	0.59	1.15	0.56
Sims Bayou (North+ South)	7,725,142	5,880,644	13,605,787	61.00	193.68	193.68	0.00	6.18	6.18	6.18	0.00
Southeast	0	0	0	5.33	32.30	27.49	4.81	1.66	0.00	4.81	1.66
Southwest	15,484,514	11,787,346	27,271,860	60.00	180.00	178.92	1.08	13.47	12.39	13.47	1.08
Tidwell Timbers	38,625	29,403	68,028	0.49	1.95	1.95	0.00	0.03	0.03	0.03	0.00
Turkey Creek	0	0	0	12.00	64.10	39.87	24.23	2.78	0.00	24.23	2.78
Upper Brays	0	0	0	18.00	69.99	63.03	6.96	6.74	0.00	6.96	6.74
WCID-111	789,168	600,742	1,389,911	7.20	19.00	19.00	0.00	0.63	0.63	0.63	0.00
WCID-47	0	0	0	5.76	20.16	18.00	2.16	0.45	0.00	2.16	0.45
WCID-76	0	0	0	0.70	2.80	2.47	0.33	0.07	0.00	0.33	0.07
West District	7,867,169	5,988,760	13,855,929	26.40	95.44	91.91	3.53	9.83	6.29	9.83	3.53
West Lake Houston	0	0	0	0.30	1.20	1.00	0.20	0.08	0.00	0.20	0.08
Westway	454,963	346,333	801,296	1.00	3.74	3.47	0.27	0.64	0.36	0.64	0.27
White Oak	0	0	0	4.00	15.98	14.99	0.99	0.31	0.00	0.99	0.31
Willowbrook	228,529	173,964	402,493	2.00	8.00	8.00	0.00	0.18	0.18	0.18	0.00
TOTAL	\$116,712,412	\$88,845,508	\$205,557,921	563.71	1,771.83	1,687.82	84.00	123.09	93.37	177.37	29.72

NOTE:
(1) Due to growth, using flow rates of 50 gpcd, 35 gpcd & 30% Base Flow, and observed dry to wet peaking factor at individual WWTPs)

Appendix F

WASTEWATER CIP ELIGIBLE FACILITIES

Wastewater CIP Eligible Facilities

Description	Asset/Project	Costs	Total Capacity (MGD)	Available Capacity (MGD)	Allocated to Beyond 2020 (%)	Allocated to Beyond 2020 (\$)	Required Capacity (2020 - 2030)	Allocated to 2020-2030 Impact Fees (%)	Allocated to 2020-2030 Impact Fees(\$)	Allocated to Impact Fees after 2030 (%)	Allocated to Impact Fees after 2030 (\$)
WASTEWATER TREATMENT FACILITIES											
Existing Assets	\$	1,856,318,344	1,771.8	84.0	4.7%	\$ 88,006,965	29.7	35.4%	\$ 31,154,466	64.6%	\$ 56,852,499
Wastewater Treatment Facilities - Improvement CIP											
Wastewater Treatment Plant Improvements		113,125,000	1,771.8	84.0	4.7%	5,363,190	29.7	35.4%	1,898,569	64.6%	3,464,621
Alameda Sims Wastewater Treatment Plant		13,451,000	1,771.8	84.0	4.7%	637,704	29.7	35.4%	225,747	64.6%	411,957
WW Improvements under M/N		79,381,000	1,771.8	84.0	4.7%	3,763,407	29.7	35.4%	1,332,246	64.6%	2,431,161
69th Street Wastewater Treatment Plant		44,585,000	1,771.8	84.0	4.7%	2,113,749	29.7	35.4%	748,267	64.6%	1,365,482
Wastewater Treatment Plant Consolidation		204,587,000	1,771.8	84.0	4.7%	9,699,350	29.7	35.4%	3,433,570	64.6%	6,265,780
Harvey Damage Mitigation		236,700,000	1,771.8	84.0	4.7%	11,221,808	29.7	35.4%	3,972,521	64.6%	7,249,287
Wastewater Treatment Facilities - Expansion CIP											
69th St. (includes Willow Run SA but excludes Macgregor#1 LS SA)		16,180,368	12.9	12.9	100.0%	16,180,368	12.9	100.0%	\$16,180,368	0.0%	\$0
Alameda Sims (with Macgregor#1 LS SA)		15,523,878	12.4	12.4	100.0%	15,523,878	12.4	100.0%	15,523,878	0.0%	0
Beltway		6,001,615	4.8	4.8	100.0%	6,001,615	4.8	100.0%	6,001,615	0.0%	0
Cedar Bayou		69,388	0.1	0.1	100.0%	69,388	0.1	100.0%	69,388	0.0%	0
Chocolate Bayou		6,553,969	5.2	5.2	100.0%	6,553,969	5.2	100.0%	6,553,969	0.0%	0
Easthaven		376,375	0.3	0.3	100.0%	376,375	0.3	100.0%	376,375	0.0%	0
Forest Cove		113,829	0.1	0.1	100.0%	113,829	0.1	100.0%	113,829	0.0%	0
FWSD-23		2,986,264	2.4	2.4	100.0%	2,986,264	2.4	100.0%	2,986,264	0.0%	0
Greenridge		1,022,012	0.8	0.8	100.0%	1,022,012	0.8	100.0%	1,022,012	0.0%	0
Imperial Valley		719,840	0.6	0.6	100.0%	719,840	0.6	100.0%	719,840	0.0%	0
Keegans Bayou		20,241,634	16.2	16.2	100.0%	20,241,634	16.2	100.0%	20,241,634	0.0%	0
Kingwood West		1,356,860	1.1	1.1	100.0%	1,356,860	1.1	100.0%	1,356,860	0.0%	0
MUD-203		129,956	0.1	0.1	100.0%	129,956	0.1	100.0%	129,956	0.0%	0
Northeast		1,274,690	1.0	1.0	100.0%	1,274,690	1.0	100.0%	1,274,690	0.0%	0
Northwest		10,838,249	8.7	8.7	100.0%	10,838,249	8.7	100.0%	10,838,249	0.0%	0
Sagemont		735,375	0.6	0.6	100.0%	735,375	0.6	100.0%	735,375	0.0%	0
Sims Bayou (North+ South)		7,725,142	6.2	6.2	100.0%	7,725,142	6.2	100.0%	7,725,142	0.0%	0
Southwest		15,484,514	12.4	12.4	100.0%	15,484,514	12.4	100.0%	15,484,514	0.0%	0
Tidwell Timbers		38,625	0.0	0.0	100.0%	38,625	0.0	100.0%	38,625	0.0%	0
WCID-111		789,168	0.6	0.6	100.0%	789,168	0.6	100.0%	789,168	0.0%	0
West District		7,867,169	6.3	6.3	100.0%	7,867,169	6.3	100.0%	7,867,169	0.0%	0
Westway		454,963	0.4	0.4	100.0%	454,963	0.4	100.0%	454,963	0.0%	0
Willowbrook		228,529	0.2	0.2	100.0%	228,529	0.2	100.0%	228,529	0.0%	0
Total WASTEWATER TREATMENT FACILITIES:	\$	2,664,859,757		177.4		\$ 237,518,585	123.1		\$ 159,477,798		\$ 78,040,787

Description	Asset/Project	Costs	Total Capacity (MGD)	Available Capacity (MGD)	Allocated to Beyond 2020 (%)	Allocated to Beyond 2020 (\$)	Required Capacity (2020 - 2030)	Allocated to 2020-2030 Impact Fees (%)	Allocated to 2020-2030 Impact Fees(\$)	Allocated to Impact Fees after 2030 (%)	Allocated to Impact Fees after 2030 (\$)
LIFT STATIONS											
Existing Assets	\$	368,118,919	2,231.0	543.2	24.3%	\$ 89,628,954	123.1	22.7%	\$ 20,345,773	77.3%	\$ 69,283,181
Lift Stations - Improvement CIP											
Wastewater Force Main Renewal		74,158,000	2,231.0	543.2	24.3%	18,055,861	123.1	22.7%	4,098,680	77.3%	13,957,181
Lift Station Renewal & Replacement		204,549,000	2,231.0	543.2	24.3%	49,803,235	123.1	22.7%	11,305,335	77.3%	38,497,900
Harvey Damage Mitigation		25,500,000	2,231.0	543.2	24.3%	6,208,695	123.1	22.7%	1,409,374	77.3%	4,799,321
Total LIFT STATIONS:	\$	672,325,919		543.2		\$ 163,696,745	123.1		\$ 37,159,162		\$ 126,537,583
COLLECTION SYSTEMS											
Existing Assets	\$	1,655,154,398	2,231.0	543.2	24.3%	\$ 402,994,114	123.1	22.7%	\$ 91,479,664	77.3%	\$ 311,514,450
Collection Systems - Improvement CIP											
Sewer Line Replacement by Other Govt		14,721,000	2,231.0	543.2	24.3%	3,584,243	123.1	22.7%	813,623	77.3%	2,770,620
Large Diameter Sewer (LDS) Rehab		29,421,000	2,231.0	543.2	24.3%	7,163,374	123.1	22.7%	1,626,086	77.3%	5,537,288
Harvey Damage Mitigation		28,000,000	2,231.0	543.2	24.3%	6,817,392	123.1	22.7%	1,547,548	77.3%	5,269,844
Collection Systems - Expansion CIP											
Developer Participation		8,554,000	N/A	N/A	100.0%	8,554,000	N/A	100.0%	8,554,000	0.0%	0
Total COLLECTION SYSTEMS:	\$	1,735,850,398		543.2		\$ 429,113,123			\$ 104,020,921		\$ 325,092,202
ENGINEERING STUDIES											
Engineering Impact Fee Study	\$	71,250	N/A	N/A	100.0%	\$ 71,250	N/A	100.0%	\$ 71,250	0.00%	\$ -
Total ENGINEERING STUDIES:	\$	71,250				\$ 71,250			\$ 71,250		\$ -
TOTAL WASTEWATER CIP:	\$	5,073,107,324				\$ 830,399,703			\$ 300,729,131		\$ 529,670,572

Appendix G
SERVICE UNIT EQUIVALENT TABLE

Impact Fee Service unit Equivalency Table

Recommended SUs are based on 1.0 SU = 250 gpd. (UPDATED 08/26/2019)

#	Type of Development	Service Unit Equivalent	PER
1.	Bakery	0.0019	Square Foot
2.	Banquet Hall (No Cooking, Warming Kitchen Only)	0.0200	Occupant
3.	Barber Shop	0.6048	Bowl
4.	Beauty Shop or Beauty Salon	0.6048	Bowl
5.	Bowling Alley (Dining Additional Charge)	0.8000	Lane
6.	Car Repair (Office Additional Charge)	0.00020	Square Foot
7.	Carwash, Tunnel, Self-Service	8.00	Carwash
8.	Carwash, Tunnel, With Attendant	39.60	Carwash
9.	Carwash, Wand Type, Self-Serve	1.54	Carwash Bay
10.	Church or Fellowship Hall	0.0037	Occupant
11.	Club, Tavern, or Lounge	0.0399	Occupant
12.	Concert Hall	0.0399	Occupant
13.	Country Club	0.4032	Member
		0.1008	Guest
14.	Dance School or Dance Studio	0.0399	Occupant
15.	Day Care Center	0.0399	Occupant
16.	Dormitory (Dining Additional Charge)	0.3604	Bed
17.	Fire Station (Dining Additional Charge)	0.3604	Capita
18.	Fitness Center/Club – Freestanding	0.0015	Square Foot
19.	Fitness Club – Within Shopping Center	0.0399	Occupant
20.	Funeral Home (Services Per Week)	0.39	Service
21.	Gas Station with Carwash	11.78	Station
22.	Gas Station Without Carwash	2.21	Station
23.	Grocery Store, 5,000-28,999 Sq. Ft	0.00033	Square Foot
24.	Grocery Store, 29,000 + Sq. Ft	0.0009	Square Foot
25.	Homeless Shelter (No Cooking or Dining)	0.1323	Bed
26.	Hospital (Dining Additional Charge)	0.8001	Bed
27.	Hotel or Motel, With or W/O Kitchenettes	0.7554	Room
28.	Manufacturing	0.00020	Square Foot
29.	Mobile Home Park	1.00	Space
30.	Movie Theater	0.0200	Seat
31.	Nail Salon (Manicure or Pedicure)	0.0004	Square Foot
		0.3024	Bowl
32.	Nursing Home (Salon & Dining Additional Charge)	0.3604	Bed
33.	Office (Includes Studio, Therapy & Massage)	0.000237	Square Foot
34.	Park	0.0200	Occupant
35.	Post Office, Excluding Dock	0.000320	Square Foot
36.	Prison	0.3654	Capita
37.	Racquetball Court	0.6426	Court
38.	Recreational Vehicle Park	0.3000	Vehicle
39.	Residence, Apartment with Washer / Dryer	0.4762	Unit
40.	Residence. Apartment Without Washer / Dryer	0.4046	Unit
41.	Residence, Condominium	0.4762	Unit
42.	Residence, Single Family or Townhouse, Up To 3000 Sq. Ft (Additional Charge Of 0.0002 SU Per Sq. Ft Over 3000 Sq. Ft)	1.000	Unit
43.	Restaurant, Fast Food	0.0021	Square Foot
44.	Restaurant, Full Service / Dining / Bar Area	0.0033	Square Foot
45.	Retail	0.000281	Square Foot
46.	School (College, High, Middle, Elementary)	0.0198	Seat
47.	Skating Rink	0.0200	Capita
48.	Stadium	0.0126	Seat
49.	Swimming Pool	0.0200	Swimmer
50.	Toilet (Park Amenity)	0.1640	Toilet
51.	Transportation Terminal (Dining Additional Charge)	0.0200	Passenger
52.	Warehouse	0.000121	Square Foot
53.	Washeteria	0.5639	Machine
54.	Water Dispensing Unit – Freestanding	4.5630	Unit