

March 12, 2019

Thurman Chad Howell
Chief Financial Officer
Charlotte Water
4222 Westmont Drive
Charlotte, NC 28217

RE: Calculation of Water and Sewer System Development Fees for FY 2020

Dear Mr. Howell:

Raftelis Financial Consultants, Inc. (“Raftelis”) has completed an evaluation to develop cost-justified water and sewer system development fees for fiscal year (“FY”) 2020 for consideration by Charlotte Water. This letter documents the results of the analysis, which is based on an approach for establishing system development fees set forth in North Carolina General Statute 162A Article 8 – “System Development Fees.” As one of the largest and most respected utility financial, rate, management, and operational consulting firms in the U.S., and having prepared system development fee calculations for utilities in North Carolina and across the U.S. since 1993, Raftelis is qualified to perform system development fee calculations for water and sewer utilities in North Carolina.

Background

System development fees are one-time charges assessed to new water and/or sewer customers for their use of system capacity and serve as an equitable method by which to recover up-front system capacity costs from those using the capacity. North Carolina General Statute 162A Article 8 (“Article 8”) provides for the uniform authority to implement system development fees for public water and sewer systems in North Carolina and was passed by the North Carolina General Assembly and signed into law on July 20, 2017. According to the statute, system development fees must be adopted in accordance with the conditions and limitations of Article 8, and those fees in effect as of October 1, 2017 must conform to the requirements set forth in the Article no later than July 1, 2018.¹ In addition, the system development fees must also be prepared by a financial professional or licensed professional engineer, qualified by experience and training or education, who, according to the Article, shall:

- J Document in reasonable detail the facts and data used in the analysis and their sufficiency and reliability.
- J Employ generally accepted accounting, engineering, and planning methodologies, including the buy-in, incremental cost or marginal cost, and combined cost approaches for each

¹ Charlotte Water’s FY 2019 water and sewer system development fees, which were put in effect on July 1, 2018 were developed by Raftelis in accordance with the requirements set forth in Article 8.

service, setting forth appropriate analysis to the consideration and selection of an approach appropriate to the circumstances and adapted as necessary to satisfy all requirements of the Article.

- J Document and demonstrate the reliable application of the methodologies to the facts and data, including all reasoning, analysis, and interim calculations underlying each identifiable component of the system development fee and the aggregate thereof.
- J Identify all assumptions and limiting conditions affecting the analysis and demonstrate that they do not materially undermine the reliability of conclusions reached.
- J Calculate a final system development fee per service unit of new development and include an equivalency or conversion table for use in determining the fees applicable for various categories of demand.
- J Consider a planning horizon of not less than 10 years, nor more than 20 years.

This letter report documents the results of the calculation of water and sewer system development fees for FY 2020 by Raftelis for Charlotte Water in accordance with these requirements.

In general, system development fees are calculated based on (1) a cost analysis of the value of existing or planned infrastructure that is in place, or will be constructed, to serve new capacity demands, and (2) the existing or additional capacity associated with these assets. Article 8 is relatively explicit in the identification of infrastructure assets that may be included as part of the system development fee calculation, as the Article defines allowable assets to include the following types, as provided in Section 201:

“A water supply, treatment, storage, or distribution facility, or a wastewater collection, treatment, or disposal facility, including for reuse or reclamation of water, owned or operated, or to be owned and operated, by a local government unit and land associated with such facility.”

Therefore, the method used to calculate system development fees for Charlotte Water included system facility assets that satisfy this definition.

Article 8 references three methodologies that could be used to calculate system development fees. These include the buy-in method, the incremental cost method, and the combined cost method. A description of each of these methods follows:

Capacity Buy-In Method:

Under the Capacity Buy-In Method, a system development fee is calculated based on the proportional cost of each user’s share of existing system capacity. This approach is typically used when existing facilities are able to provide adequate capacity to accommodate future growth. The cost of capacity is derived by dividing the estimated value of existing facilities by the current capacity provided by existing facilities. Certain adjustments to the value of existing facilities are made for developer contributed assets, grant funds, and the amount of outstanding debt.

Incremental Cost Method:

Under the Incremental Cost (or Marginal Cost) Method, a system development fee is calculated based on a new customer's proportional share of the incremental future cost of system capacity. This approach is typically used when existing facilities have limited or no capacity to accommodate future growth. The cost of capacity is calculated by dividing the total cost of growth-related capital investments over a period of time by the additional capacity provided as a result of the investments.

Combined Method:

Under the Combined Method, a system development fee is calculated based on the blended value of both the existing and expanded system capacity. As such, it is a combination of the Capacity Buy-In and Incremental Cost methods. This method is typically used when existing facilities provide adequate capacity to accommodate a portion of the capacity needs of new customers, but where significant investment in new facilities to address a portion of the capacity needs of future growth is also anticipated, or where some capacity is available in parts of the existing system, but incremental capacity will be needed for other parts of the system to serve new customers at some point in the future.

The Capacity Buy-In method was used to calculate the water and sewer system development fees for Charlotte Water, since in general, Charlotte Water's existing water and sewer treatment facilities have adequate capacity to accommodate the anticipated future growth over the near term. The following steps were completed to calculate the fees under the Capacity Buy-In Method:

1. The replacement value of existing system facilities was calculated, and adjustments were made to derive a net replacement value estimate in accordance with Article 8. Adjustments to the calculated replacement value included deducting accumulated depreciation, developer contributions, and a portion of outstanding debt.
2. The unit cost of system capacity was estimated by dividing the net replacement value of existing system facilities by the current capacity of the system.
3. The amount of capacity associated with a service unit of new development was estimated. One equivalent residential unit ("ERU") was defined as the smallest service unit of new development.
4. The system development fee for one service unit of development was calculated by multiplying the cost per unit of system capacity by the capacity associated with one ERU, as defined below.
5. The calculated system development fee for one ERU was scaled for different categories of demand. Meter capacity ratios were used to scale system development fees from a base meter size from the smallest unit of new development (one ERU) to different categories of demand, defined by different customer meter sizes.

System Development Fee Calculation

Step 1 – Estimate the Replacement Value of System Facilities and Apply Adjustments

A listing of fixed assets provided by Charlotte Water, as of June 30, 2018 was reviewed and each individual asset was categorized into one of the categories shown in Table 1. General assets, such as those related to administrative buildings, certain rolling stock, and certain equipment items were not directly attributable to either the water or sewer system. As a result, these assets were categorized as “Other – General.”

Table 1. Fixed Asset Categories by System

Water System	Sewer System
Right-of-Way	Right-of-Way
Land	Land
Source of Supply	Collection
Treatment	Conveyance
Pump Stations	Pump Stations
Transmission	Treatment
Distribution	Other - Sewer
Storage	
Other – Water	
Other – General	

Note: Assets not directly attributable to either the water or sewer system were categorized as “Other – General”.

The value of assets in categories identified as “Other - Water”, “Other - Sewer”, and “Other - General” were excluded from the calculation of system value as these asset categories were not specifically mentioned as allowable under Article 8. Excluded assets included those relating to administrative and other miscellaneous buildings, rolling stock, and various types of equipment.

Next, the replacement value of existing assets in allowable categories was estimated. Each asset’s original cost, as contained in the fixed asset listing provided by Charlotte Water, was escalated to 2018 dollars based on the year the asset was purchased and the corresponding escalation factor for that year. Escalation factors for each year were developed using the Engineering News Record’s Construction Cost Index (“ENR CCI”), which provides an annual index value representing the relative change in construction related costs for each year from 1908 to 2018. Using the ENR’s CCI to estimate an asset’s current replacement cost is an industry accepted method by which to value system facilities.

The replacement costs of the assets were adjusted by their indexed accumulated depreciation value to derive the replacement cost new less accumulated depreciation (“RCNLD”) value. The estimated RCNLD values for water and sewer system assets allowable under Article 8 are provided in Tables 2 and 3, respectively.

Table 2. Water System Value (RCNLD)

Description	RCNLD Value
Right-of-Way	\$10,041,894
Land	40,842,895
Source of Supply	89,884,201
Treatment	211,418,819
Pump Stations	36,345,930
Transmission	456,445,729
Distribution	726,692,183
Storage	23,389,326
Total	\$1,595,060,977

Table 3. Sewer System Value (RCNLD)

Description	RCNLD Value
Right-of-Way	\$38,217,316
Land	30,224,997
Collection	1,051,229,280
Conveyance	769,832,894
Pump Stations	101,463,004
Treatment	<u>716,618,227</u>
Total	\$2,707,585,718

As shown in Table 2, the RCNLD value of the water system was estimated to be approximately \$1.6 billion, and, as shown in Table 3, the RCNLD value of the sewer system was estimated to be approximately \$2.7 billion. Several additional adjustments were made to the estimated water and sewer system RCNLD values in accordance with Article 8, which included adjustments for developer contributed assets, and a portion of outstanding debt, as described below.

Developer Contributed Assets:

The listing of fixed assets was reviewed to identify assets that were contributed or paid for by developers, and these assets were subtracted from the RCNLD value, as these assets do not represent an investment in system capacity by Charlotte Water. The total RCNLD value of contributed water and sewer system assets was estimated to be approximately \$458 million and \$761 million, respectively.

Outstanding Debt Credit:

A credit was applied to the RCNLD value to reflect that a portion of the outstanding debt associated with system facilities will likely be repaid with water and sewer user charges. The amount of the credit was calculated by first estimating the amount of existing outstanding debt attributable to both the water and sewer systems. Then, the amount of existing outstanding debt anticipated to be funded with system development fee revenues and water and sewer user charges was estimated. The portion of outstanding debt anticipated to be funded with water and sewer user charges was credited in the system development fee calculation.

Charlotte Water’s outstanding debt is comprised of General Obligation Bonds, Revenue Bonds, and State Revolving Loans. The total outstanding debt was approximately \$1.5 billion as of June 30, 2018 according to the City of Charlotte’s FY 2018 Comprehensive Annual Financial Report, which included audited financial information for Charlotte Water. The total amount of outstanding debt was allocated between the water and sewer systems in proportion to the net book value (original cost, less accumulated depreciation) of each system, excluding developer contributed assets and non-infrastructure assets, such as administrative buildings, rolling stock, and equipment. The net book value of assets was used to reflect the actual cost incurred to acquire the asset and to exclude assets that are fully depreciated, as the debt used to finance such assets has likely been repaid and is no longer outstanding. A summary of the outstanding debt allocation is provided in Table 4.

Table 4. Allocation of Outstanding Debt to the Water and Sewer Systems

Description	Amount
Total Outstanding Debt	\$1,504,276,000
Water System NBV	\$784,238,380
Sewer System NBV	<u>1,377,861,748</u>
Total	\$2,162,100,128
Water System NBV (%)	36.3%
Sewer System NBV (%)	<u>63.7%</u>
Total	100.0%
Estimated Water System Outstanding Debt	\$545,631,980
Estimated Sewer System Outstanding Debt	<u>958,644,020</u>
Total Outstanding Debt	\$1,504,276,000

The historical annual system development fee revenues collected by Charlotte Water over a five-year period from FY 2013 through FY 2017 were compared to the historical annual principal payments made by Charlotte Water over the same time-period. This information was obtained from Comprehensive Annual Financial Reports for the City of Charlotte, which included audited financial information for Charlotte Water. The amount of system development fee revenues collected over this time-period were assumed to be used to make principal payments on the outstanding debt. Any principal payments made over this time period in excess of the amount of system development fee revenues collected were assumed to be funded with water and sewer user charges.

Based on this approach to calculating the debt credit, it was calculated that water system development fee revenues from FY 2013 to FY 2017 were sufficient to pay for 25.1 percent of principal payments on outstanding water system debt over this time period. The remaining portion, approximately 74.9 percent, was assumed to be funded with water user charges. Therefore, the water system’s revenue credit for outstanding debt was estimated to be 74.9 percent of the outstanding water debt, or approximately \$409 million (74.9% × \$545,631,980).

Similarly, it was calculated that sewer system development fee revenues from FY 2013 to FY 2017 were sufficient to pay for 18.2 percent of principal payments on outstanding sewer system debt. The remaining portion, approximately 81.8 percent, was assumed to be funded with sewer user charges. Therefore, the sewer system’s revenue credit for outstanding debt was estimated to be 81.8 percent of the outstanding sewer debt, or approximately \$785 million (81.8% × \$958,644,020). The resulting adjustments to the water and sewer RCNLD values for developer contributions and a portion of outstanding debt are shown in Table 5.

Table 5. Calculation of Net Water and Sewer System Value

Description	Amount
<u>Water System:</u>	
System Facilities RCNLD	\$1,595,060,977
Less: Developer Contributed Assets	-458,274,358
Less: Credit for Outstanding Debt	<u>-408,749,123</u>
Net System Value (RCNLD)	\$728,037,496
<u>Sewer System:</u>	
System Facilities RCNLD	\$2,707,585,718
Less: Developer Contributed Assets	-761,228,312
Less: Credit for Outstanding Debt	<u>-784,636,436</u>
Net System Value (RCNLD)	\$1,161,720,971

Step 2 – Calculate the Unit Cost of System Capacity

The cost per unit of system capacity was calculated by dividing the adjusted RCNLD values (derived in Step 1) by the water and sewer system capacities. The combined treatment capacity of the water system (including the Dukes, Franklin, and Vest WTP’s) is currently 242 million gallons per day (“MGD”). Therefore, the cost per unit of system capacity for the water system was calculated to be \$3.01 per gallon, per day ($\$728,037,496 \div 242.0 \text{ MGD}$).

The treatment capacity of the sewer system is 123 MGD, based on the known individual treatment capacities of Charlotte Water’s five wastewater treatment plants (Irwin Creek, Mallard Creek, McAlpine Creek, McDowell Creek, and Sugar Creek). Therefore, the cost per unit of system capacity for the sewer system was calculated to be \$9.44 per gallon, per day ($\$1,161,720,971 \div 123.0 \text{ MGD}$).

Step 3 – Estimate the Amount of Capacity Per Service Unit of New Development

The smallest service unit of new development was defined as one ERU. One ERU of peak day capacity was defined to be 269 gallons per day (“GPD”). This amount was estimated based on information contained in Charlotte Water’s Water Distribution System Master Plan.² For example, the Master Plan noted that the average consumption per account, per day for single family residential customers from 2008 to 2014 was estimated to be 188 GPD, using a linear regression analysis. Furthermore, the Master Plan notes that on average, from 2007 to 2014, the system’s maximum day level of demand was 1.43 times the level of its average day demand. Therefore, the

² Water Distribution System Master Plan - Demand Projections Technical Memorandum, Black & Veatch, March 21, 2016.

peak day capacity requirement associated with one service unit of new residential development was estimated to be 269 GPD based on the following calculation:

$$J \text{ Residential average day consumption per account of } 188 \text{ GPD} \times \text{System peak day factor of } 1.43 = 269 \text{ GPD}$$

Step 4 – Calculate the System Development Fee for One ERU

The system development fee for one ERU was calculated by multiplying the unit cost of capacity from Step 2 by the capacity associated with one ERU from Step 3. The calculations are provided in Table 6.

Table 6. Calculation of Water and Sewer System Development Fees for Base Meter Size

Description	Amount
Water System:	
Net System Value	\$728,037,496
System Capacity (MGD)	242.0
Unit Cost of Capacity (\$ / gallon per day)	\$3.01
Capacity Required for 1 ERU (gallons per day)	269.0
System Development Fee (5/8-inch meter)	\$809.26
Sewer System:	
Net System Value	\$1,161,720,971
System Capacity (MGD)	123.0
Unit Cost of Capacity (\$ / gallon, per day)	\$9.44
Capacity Required for 1 ERU (gallons per day)	269.0
System Development Fee (5/8-inch meter)	\$2,540.67

Step 5 – Scale the System Development Fees for Various Categories of Demand

The system development fees for various categories of demand were scaled using water meter capacity ratios. The scaling factors were based on rated meter capacities for each meter size, as published by the American Water Works Association in *Principles of Water Rates, Fees, and Charges*.³ For private fire line meters, the meter capacity ratings were obtained from manufacturer ratings, and Charlotte Water policy on scaling for these meters. The meter scaling factors are shown in Table 7.

Table 7. Meter Capacities and Scaling Factors by Meter Size

Meter Size	Rated Meter Capacity (gpm)	Scaling Factor
5/8" Displacement	20	1.0
1" Displacement	50	2.5
1-1/2" Displacement	100	5.0

³ Manual of Water Supply Practices (M1), Principles of Water Rates, Fees, and Charges, American Water Works Association, 7th Edition, Table VII.2-5 on p. 338.

2" Displacement	160	8.0
3" Singlejet	320	16.0
3" Compound, Class I	320	16.0
3" Turbine, Class I	350	17.5
4" Compound, Class I	500	25.0
4" Singlejet	500	25.0
4" Turbine, Class I	630	31.5
4" x 1" FMCT	Water - 700; Sewer - 50	Water - 35; Sewer - 2.5
6" Singlejet	1,000	50.0
6" Compound, Class I	1,000	50.0
6" Turbine, Class I	1,300	65.0
6" x 1.5" FMCT	Water - 1,600; Sewer - 100	Water - 80.0; Sewer - 5.0
8" Compound, Class I	1,600	80.0
8" Turbine, Class II	2,800	140.0
8" x 2" FMCT	Water - 2,800; Sewer - 160	Water - 140.0; Sewer - 8.0
10" Turbine, Class II	4,200	210.0
10" x 2" FMCT	Water - 4,400; Sewer - 160	Water - 220.0; Sewer - 8.0
10" x 12" x 2" FMCT	Water - 5,000; Sewer - 160	Water - 250.0; Sewer - 8.0
12" Turbine, Class II	5,300	265.0
2" Fire Line	160	8.0
4" Fire Line	400	20.0
6" Fire Line	900	45.0
8" Fire Line	1,800	90.0
10" Fire Line	2,250	112.5
12" Fire Line	3,525	176.3

gpm = gallons per minute

Note: The rated meter capacities for the private fire lines were based on manufacturer ratings that were adjusted based on Charlotte Water policies for scaling of private fire line meters.

The system development fees for various meter sizes were calculated by multiplying the system development fee for one ERU by the meter scaling factors shown in Table 7. The resulting water and sewer system development fees for all meter sizes are shown in Table 8. The system development fees for private fire lines are also shown in the table.

Table 8. Water and Sewer System Development Fees by Meter Size

Meter Size	Water Fee	Sewer Fee
5/8" Displacement	\$809	\$2,541
1" Displacement	\$2,023	\$6,352
1-1/2" Displacement	\$4,046	\$12,703
2" Displacement	\$6,474	\$20,325
3" Singlejet	\$12,948	\$40,651
3" Compound, Class I	\$12,948	\$40,651
3" Turbine, Class I	\$14,162	\$44,462
4" Compound, Class I	\$20,232	\$63,517
4" Singlejet	\$20,232	\$63,517

4" Turbine, Class I	\$25,492	\$80,031
4" x 1" FMCT	\$28,324	\$6,352
6" Singlejet	\$40,463	\$127,034
6" Compound, Class I	\$40,463	\$127,034
6" Turbine, Class I	\$52,602	\$165,144
6" x 1.5" FMCT	\$64,741	\$12,703
8" Compound, Class I	\$64,741	\$203,254
8" Turbine, Class II	\$113,297	\$355,694
8" x 2" FMCT	\$113,297	\$20,325
10" Turbine, Class II	\$169,946	\$533,542
10" x 2" FMCT	\$178,038	\$20,325
10" x 12" x 2" FMCT	\$202,316	\$20,325
12" Turbine, Class II	\$214,455	\$673,279
2" Fire Line	\$6,474	n/a
4" Fire Line	\$16,185	n/a
6" Fire Line	\$36,417	n/a
8" Fire Line	\$72,834	n/a
10" Fire Line	\$91,042	n/a
12" Fire Line	\$142,673	n/a

The water and sewer system development fees shown in Table 8 represent the maximum cost justified level of system development fees that can be assessed by Charlotte Water, as stated in Article 8. If Charlotte Water chooses to assess fees that are less than those shown in the table, the adjusted fee amounts should still reflect the scaling factors by meter size, as shown in Table 7.

We appreciate the opportunity to assist Charlotte Water with the calculation of its water and sewer system development fees. Should you have questions or need any additional information, please do not hesitate to contact me at 518-391-8944.

Very truly yours,

RAFTELIS FINANCIAL CONSULTANTS, INC.



John Mastracchio, CFA
Vice President