

March 7, 2022

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 2023

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”) 2023 for consideration by Charlotte Water. This letter documents the results of the analysis, which was based on an approach for establishing system development fees set forth in North Carolina General Statute 162A Article 8 – “System Development Fees.”

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 and was modified by Session Law 2021-76 and House Bill 344, which was approved on July 2, 2021. According to the statute, system development fees were required to be adopted in accordance with the conditions and limitations of Article 8, and the fees were required to 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:

- Document in reasonable detail the facts and data used in the analysis and their sufficiency and reliability.
- Employ generally accepted accounting, engineering, and planning methodologies, including the buy-in, incremental cost or marginal cost, and combined cost approaches for each service, setting forth appropriate analysis to the consideration and selection of an approach

¹ Charlotte Water’s system development fees in FY 2019 and in each subsequent fiscal year, through FY 2022 were prepared by Raftelis in accordance with the requirements set forth in Article 8.

appropriate to the circumstances and adapted as necessary to satisfy all requirements of the Article.

- Employs generally accepted accounting, engineering, and planning methodologies, including the buy-in, incremental cost or marginal cost, and combined methods for each service, setting forth appropriate analysis as to the consideration and selection of a method appropriate to the circumstances and adapted as necessary to satisfy all requirements of Article 8.
- 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.
- Identify all assumptions and limiting conditions affecting the analysis and demonstrate that they do not materially undermine the reliability of conclusions reached.
- 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.
- Consider a planning horizon of not less than five years, nor more than 20 years.
- Uses the gallons per day per service unit that the local government unit applies to its water or sewer system engineering for planning purposes for water or sewer, as appropriate, in calculating the system development fee.

This letter report documents the results of the calculation of water and sewer system development fees for FY 2023 in accordance with these requirements. In general, system development fees are calculated based on (1) a cost analysis of the 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 providing a general benefit to the area that facility serves and is owned or operated, or to be owned or operated, by a local governmental unit. This shall include facilities for the reuse or reclamation of water and any land associated with the facility.”

Therefore, the method used to calculate system development fees for Charlotte Water included system facility assets that satisfied 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 is included in the following paragraphs:

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 can 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. Adjustments to the value of existing facilities are made for developer contributed assets, grant funds, and 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 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 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 assumed to be demanded by one service unit of new development was identified. 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.

- 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, or the smallest unit of new development (one ERU), to different categories of demand, as defined by the 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, 2021 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”.

Assets in categories identified as “Other - Water”, “Other - Sewer”, and “Other - General” were excluded from the calculation of system value as these assets were not specifically identified 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 values of existing assets in allowable categories were estimated. Each asset’s original cost, as contained in the fixed asset listing provided by Charlotte Water, was escalated to current year (2022) 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 costs for each year from 1908 to 2022. 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 to derive the replacement cost new less accumulated depreciation (“RCNLD”) amounts. The estimated

RCNLD values for water and sewer system assets allowable under Article 8 are summarized in Tables 2 and 3, respectively.

Table 2. Water System Value (RCNLD)

Description	RCNLD Value
Right-of-Way	\$13,756,441
Land	47,368,149
Source of Supply	88,718,404
Treatment	230,966,233
Pump Stations	56,406,316
Transmission	496,056,789
Distribution	988,100,458
Storage	<u>24,880,980</u>
Total	\$1,946,253,770

Table 3. Sewer System Value (RCNLD)

Description	RCNLD Value
Right-of-Way	\$47,425,924
Land	34,602,567
Collection	1,502,296,746
Conveyance	847,139,961
Pump Stations	214,962,231
Treatment	<u>848,844,906</u>
Total	\$3,495,272,334

As shown in Table 2, the RCNLD value of the water system was estimated to be approximately \$1.9 billion, and, as shown in Table 3, the RCNLD value of the sewer system was estimated to be approximately \$3.5 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. Charlotte Water tracks assets that were contributed by developers and identifies them in the fixed asset register as such. 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 \$584 million and \$947 million, respectively.

Debt Credit:

Article 8 specifies that the buy-in calculation should be determined using generally accepted methods, including the consideration of debt credits and other generally accepted valuation adjustments. Article 8 also states that in applying the incremental cost or the combined cost methods to calculate a system development fee, the analysis must include a credit against the projected aggregate cost of capital improvements and that in no case shall the credit be less than 25

percent of the aggregate cost of capital improvements. In calculating the system development fees for Charlotte Water, a debt credit was included in the calculation as described below. Note that while the system development fee methodology used for Charlotte Water is neither the incremental cost or the combined cost methods, rather the buy-in method was used, debt credits of at least 25 percent of the individual net RCNLD values of the water system and the sewer system were incorporated into the fee calculation.

The debt credit was applied to reflect that a portion of the outstanding debt associated with system facilities will be repaid with water and sewer user charges and a portion will be repaid with system development fee revenues. An adjustment was made to prevent recovering the cost of the assets twice, once when assessing system development fees to new customers, and then again when these customers pay user charges.

The amount of the credit was calculated by first identifying the amount of existing outstanding debt attributable to both the water and sewer systems that funded qualifying facilities. Then, the amount of existing outstanding debt anticipated to be funded with system development fee revenues and the portion anticipated to be funded with water and sewer user charges was estimated. The portion of outstanding debt anticipated to be funded with water and sewer user charges was then credited in the system development fee calculation.

The debt used to finance qualifying assets was comprised of General Obligation Bonds, Revenue Bonds, Revenue Bond Anticipation Notes, Federal Revolving Loans, and State Revolving Loans. The total outstanding debt used to fund qualifying assets was approximately \$1.4 billion as of June 30, 2021 according to the City of Charlotte's FY 2021 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 these assets has 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	\$1,443,095,000
Water System NBV	\$917,473,884
Sewer System NBV	<u>1,803,743,305</u>
Total	\$2,721,217,189
Water System NBV (%)	33.7%
Sewer System NBV (%)	66.3%
Total	100.0%
Estimated Water System Outstanding Debt	\$486,547,704
Estimated Sewer System Outstanding Debt	<u>956,547,296</u>
Total Outstanding Debt	\$1,443,095,000

The historical annual system development fee revenues collected by Charlotte Water over a five-year period from FY 2016 through FY 2020 were compared to the historical annual debt principal payments made by Charlotte Water over the same time-period. This information was obtained from past Comprehensive Annual Financial Reports for the City of Charlotte. The system development fee revenues collected over this time-period were estimated to have been used to make principal payments on outstanding debt. Any principal payments made over this time-period in excess of the amount of system development fee revenues collected were estimated to have been funded with water and sewer user charges.

Based on this approach, it was estimated that water system development fee revenues from FY 2016 to FY 2020 were sufficient to pay for 41.1 percent of the principal payments on outstanding water system debt. The remaining portion, approximately 58.9 percent, was estimated to have been funded with water user charges. Therefore, the revenue credit for the outstanding debt of the water system was calculated to be approximately \$287 million ($58.9\% \times \$486,547,704$).

However, a debt credit of \$287 million would not meet the requirement of Article 8 (under the incremental method or combined method) for the credit to be no less than 25 percent of the water system's aggregate cost of capital improvements. In this case, the water system's debt credit in comparison to the RCNLD value was calculated to be roughly 21 percent ($\$287 \text{ million} \div \$1,363 \text{ million} = 21 \text{ percent}$). Therefore, the debt credit was adjusted upward by roughly \$53.8 million so that the debt credit would be equal to 25 percent of the water system's net RCNLD value ($[\$287 \text{ million} + \$53.8 \text{ million}] \div \$1,363 \text{ million} = 25 \text{ percent}$).²

For sewer, it was estimated that sewer system development fee revenues from FY 2016 to FY 2020 were sufficient to pay for 24.5 percent of the principal payments on outstanding sewer system debt. The remaining portion, approximately 75.5 percent, was estimated to have been funded with sewer user charges. Therefore, the revenue credit for outstanding debt of the sewer system was calculated to be approximately \$722 million ($75.5\% \times \$956,547,296$). A debt credit of

² Note that Article 8 does not require Charlotte Water to apply a debt credit of no less than 25 percent of the aggregate cost of the capital improvements when using the buy-in method. However, for conservativeness Charlotte Water instructed Raftelis to apply a minimum credit of 25 percent to the system development fee calculations.

approximately \$722 million is equal to 28.4 percent of the sewer system’s net RCNLD value (\$722 million ÷ \$2,548 million = 28.4 percent); therefore, the debt credit for sewer exceeds the minimum requirement of Article 8 (under the incremental method or combined method) for a debt credit and no further adjustment to this debt credit was needed.

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
Water System:	
System Facilities RCNLD	\$1,946,253,770
Less: Developer Contributed Assets	-583,701,756
Less: Credit for Outstanding Debt	-286,794,139
Less: Adj to Meet Min Debt Credit	<u>-53,843,865</u>
Net System Value (RCNLD)	\$1,021,914,010
Sewer System:	
System Facilities RCNLD	\$3,495,272,334
Less: Developer Contributed Assets	-947,376,172
Less: Credit for Outstanding Debt	<u>-722,418,818</u>
Net System Value (RCNLD)	\$1,825,477,344

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 \$4.22 per gallon, per day (\$1,021,914,010 ÷ 242.0 MGD).

The wastewater 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 \$14.84 per gallon, per day (\$1,825,477,344 ÷ 123.0 MGD).

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

Section 205 of Article 8 states that the system development fee calculation shall “...use the gallons per day per service unit that the local governmental unit applies to its water or sewer system engineering for planning purposes for water or sewer, as appropriate, in calculating the system development fee.” Therefore, for the water system, one ERU of peak day capacity for the water system 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.³ The Master

³ Water Distribution System Master Plan - Demand Projections Technical Memorandum, Black & Veatch, March 21, 2016.

Plan documented that the average consumption per account per day for single family residential customers from 2008 to 2014 was estimated to be 188 GPD. The Master Plan also documented that on average, from 2007 to 2014, the system’s maximum day level of demand was 1.43 times its average day demand. Therefore, the peak day capacity requirement associated with one service unit of new residential development was estimated to be 269 GPD based on the following calculation:

$$\begin{aligned}
 &\text{Residential average day consumption per account of 188 GPD} \\
 &\times \text{System peak day factor of 1.43} \\
 &= \text{Maximum-day capacity for single-family residential of 269 GPD}
 \end{aligned}$$

For the sewer system, one ERU of capacity demand was defined as 250 GPD. According to Charlotte Water, this amount represents the amount of capacity relied upon for internal planning and design purposes and that is anticipated to be demanded by one dwelling unit. This capacity amount is specified in Charlotte Water’s current design manual.⁴

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 demanded by one ERU from Step 3. The calculations are provided in Table 6.

Table 6. Calculation of Water and Sewer System Development Fees for One ERU

Description	Amount
Water System:	
Net System Value	\$1,021,914,010
System Capacity (MGD)	242.0
Unit Cost of Capacity (\$ / gallon per day)	\$4.22
Capacity Required for 1 ERU (gallons per day)	269.0
System Development Fee per ERU	\$1,136
Sewer System:	
Net System Value	\$1,825,477,344
System Capacity (MGD)	123.0
Unit Cost of Capacity (\$ / gallon, per day)	\$14.84
Capacity Required for 1 ERU (gallons per day)	250.0
System Development Fee per ERU	\$3,710

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

⁴ Chapter 4. Design of Sanitary Sewers, Water and Sewer Policies, Procedures, Standards and Specifications, Charlotte-Mecklenburg Utility Department, July 1995.

published by the American Water Works Association in *Principles of Water Rates, Fees, and Charges*.⁵ The meter capacity ratings for ultrasonic meter types were provided by Charlotte Water. The meter capacity ratings for private fire line meters were obtained from manufacturer ratings and Charlotte Water policy on scaling for these meters. The meter scaling factors are shown in Table 7.

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 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
2" Displacement	160	8.0
3" Singlejet	320	16.0
3" Compound, Class I	320	16.0
3" Compound, Class II	350	17.5
3" Turbine, Class I	350	17.5
3" Ultrasonic	500	25.0
4" Compound, Class I	500	25.0
4" Singlejet	500	25.0
4" Compound, Class II	600	30.0
4" Turbine, Class I	630	31.5
4" x 1" FMCT	Water - 700; Sewer - 50	Water - 35; Sewer - 2.5
4" Ultrasonic	880	44.0
6" Singlejet	1,000	50.0
6" Compound, Class I	1,000	50.0
6" Compound, Class II	1,350	67.5
6" Turbine, Class I	1,300	65.0
6" x 1.5" FMCT	Water - 1,600; Sewer - 100	Water - 80.0; Sewer - 5.0
6" Ultrasonic	1,400	70.0
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
8" Ultrasonic	2,800	140.0

⁵ 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.

Table 7 Continued

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
10" Ultrasonic	4,500	225.0
12" FMCT w/ 2 inch at Crossover	4,400	220.0
12" Turbine, Class II	5,300	265.0
12" Ultrasonic	5,500	275.0
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

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

Meter Size	Water Fee	Sewer Fee
5/8" Displacement	\$1,136	\$3,710
1" Displacement	\$2,840	\$9,276
1-1/2" Displacement	\$5,680	\$18,552
2" Displacement	\$9,087	\$29,683
3" Singlejet	\$18,175	\$59,365
3" Compound, Class I	\$18,175	\$59,365
3" Compound, Class II	\$19,879	\$64,931
3" Turbine, Class I	\$19,879	\$64,931
3" Ultrasonic	\$28,398	\$92,758
4" Compound, Class I	\$28,398	\$92,758
4" Singlejet	\$28,398	\$92,758
4" Compound, Class II	\$34,078	\$111,310
4" Turbine, Class I	\$35,782	\$116,875
4" x 1" FMCT	\$39,758	\$9,276
4" Ultrasonic	\$49,981	\$163,254
6" Singlejet	\$56,796	\$185,516
6" Compound, Class I	\$56,796	\$185,516
6" Turbine, Class I	\$73,835	\$241,171
6" Compound, Class II	\$76,675	\$250,447
6" x 1.5" FMCT	\$90,874	\$18,552

Table 8 Continued

6" Ultrasonic	\$79,515	\$259,722
8" Compound, Class I	\$90,874	\$296,826
8" Turbine, Class II	\$159,030	\$519,445
8" x 2" FMCT	\$159,030	\$29,683
8" Ultrasonic	\$159,030	\$519,445
10" Turbine, Class II	\$238,545	\$779,167
10" x 2" FMCT	\$249,904	\$29,683
10" Ultrasonic	\$255,584	\$834,822
10" x 12" x 2" FMCT	\$283,982	\$29,683
12" FMCT w/ 2" at Crossover	\$249,904	\$816,270
12" Turbine, Class II	\$301,021	\$983,235
12" Ultrasonic	\$312,381	\$1,020,338
2" Fire Line	\$9,087	n/a
4" Fire Line	\$22,719	n/a
6" Fire Line	\$51,117	n/a
8" Fire Line	\$102,234	n/a
10" Fire Line	\$127,792	n/a
12" Fire Line	\$200,264	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 per 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, ASA, CFA, P.E.
Executive Vice President